Addis Ababa University
School of Graduate Studies

Socio-economic Burden of Malaria in Zeghie Peninsula, West Gojjam Zone, Amhara National Regional State, Northwestern Ethiopia

Fanuel Nibret

Addis Ababa

July 2007

Socio-economic Burden of Malaria in Zeghie Peninsula, West Gojjam Zone, Amhara National Regional State, Northwestern Ethiopia

A Thesis Submitted to
The School of Graduate Studies
Addis Ababa University

In Partial Fulfillment of the Requirements
for Degree of Masters of Arts
In Development Studies,
Environment and Development

Fanuel Nibret

College of Social Sciences
Institute of Development Research

July 2007

ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

INSTITUTE OF DEVELOPMENT RESEARCH (IDR)

Title

Socio-economic Burden of Malaria in Zeghie Peninsula, West Gojjam Zone, Amhara National Regional State, Northwestern Ethiopia

By
Fanuel Nibret Lijalem

DEVELOPMENT STUDIES

APPROVED BY THE BOARD OF EXAMINERS:	SIGNATURE
Munyeh Yesuf FACULTY CHAIRMAN	
Getachew Yoseph ADVISOR	
Fenta Mandefro EXTERNAL EXAMINER	
Getnet Alemu INTERNAL EXAMINER	

Table of Contents

		Page
	Acknowledgement	vi
	Acronyms	vii
	Glossary of Local Terms	viii
	List of Tables	ix
	List of Map and Figures	x
	Abstract	xi
	Chapter One	
1	**Introduction**	1
1.1	Background	1
1.2	Statement of the Problem	2
1.3	Objectives of the Study	5
1.3.1	General Objective	5
1.3.2	Specific Objectives	5
1.4	Research questions	5
1.5	Significance of the Study	5
1.6	Scope of the Study	6
1.7	Limitations of the Study	6
1.8	Organization of the Paper	7
	Chapter Two	
2	**Review of Related Literature**	8
2.1	Conceptual Framework	8

2.2	Historical Background of Malaria	13
2.3	Burden of Malaria	15
2.3.1	Economic Burden of Malaria	15
2.3.2	Social Burden of Malaria	17
2.3.2.1	Impact of Malaria on Health	17
2.3.2.2	Impact of Malaria on Education	19
2.4	Factors Aggravating the Condition of Malaria	20
2.4.1	Human Induced Problems	20
2.4.2	Migration and Climatic Anomalies	21
2.4.3	Socio-economic Condition of the People	21
2.4.4	Peoples' Attitude	22
2.5	The Emergence, Effect and Control of Malaria in Ethiopia	22

Chapter Three

3	**Research Methods**	26
3.1	Study Procedure	26
3.2	Study Site Selection	26
3.3	Data Collection	28
3.3.1	Primary Source of information	28
3.3.2	Secondary Source of Information	29
3.3.3	Sampling Techniques	29
3.3.4	Data Analysis	30
3.3.5	Ethical Consideration	30

Chapter Four

4	**Socio-economic Background of the Study Area**	32
4.1	The Setting	32

4.2	The People and Land Use	33
4.3	Demographic Structure	35
4.4	Livelihood Strategy	36
4.5	Occupation and Income	37
4.6	Socio-economic Institutions in Zeghie Peninsula	41

Chapter Five

5	**Socio-economic Burden of Malaria**	43
5.1	Most Common Infectious Diseases in the Peninsula	43
5.2	Knowledge and Perception of the People about Malaria	45
5.3	Magnitude of Malaria Incidence	47
5.4	Economic Impediment of Malaria	54
5.4.1	Cost of Malaria Illness	55
5.4.1.1	Direct Cost	56
5.4.1.2	Indirect Cost	57
5.5	Social Burden of Malaria	60
5.5.1	Impact on a Household Health and on the National Health Budget	61
5.5.1.1	Malaria in Pregnancy	61
5.5.2	Impact of Malaria on Education	63
5.6	Influence of Malaria on Cultural Context	65

Chapter Six

6	**Conclusion and Recommendations**	68
6.1	Conclusion	68
6.2	Recommendations	70
	References	73

Appendices

i. Tables 79

ii. Survey questionnaire 83

iii. FGDs and key informant guide questions 91

iv. Plates 95

v. Names of *kebeles* in the peninsula 98

vi. Laveran and the discovery of malaria parasite 99

Acknowledgement

First and foremost I would like to praise the Almighty God for his guardianship and support me all the time to overcome all the challenges I faced throughout the years and to realize my dream of arriving at this stage.

I am deeply indebted to my research advisor, Ato Getachew Yoseph for his constructive advice and critical comments from the inception of the research that greatly improved and enriched the thesis.

My heartfelt thanks also goes to Ato Abreha Berhanu, Head of Human Resource Department of Addis Ababa University for the influential recommendation forwarding to the respective body so as to pursue my graduate study, which is a life time memory. Addis Ababa University also deserves special thanks for granting scholarship and covering the total cost of study.

My special thanks go to my friend, Ato Admitachew Sebhat for his extreme benevolence by nature, patience and tireless support above the burden of his own office business in the editorial work of the thesis, with out which this thesis would not have been brought to fruition.

My appreciation is also to my wife Bezuayehu Molla and my two kids Ephratha and Rhama who bear with me in times of long absence from home robbing them of the due paternal affection and familial fellowships.

My gratitude also goes to the Regional Office of Anti Malaria Association in Bahir Dar, especially Ato Askebir Gebru. ANRS Health Bureau, Bahir Dar Special Zone Municipality, Bahir Dar Special Zone Health Office, Bahir Dar Zuria Woreda Health Office, Environmental Protection and Land Use Management (Bahir Dar), staff of Zeghie clinic, and Zeghie Emerging Municipality for their generous assistance in providing me the necessary documents related to my study.

It is always difficult to put into words the selfless devotion of people. It is my pleasure to extend my sincere thanks to my ex-colleagues and friends in Bahir Dar, Ato Tilahun Eskeziya, Ato Sileshi Kume, Ato Abebe Chekol, Ato Antneh Gelaye and Ato Mengistu Tsega for their contribution in providing me relevant materials for the completion of the research work.

I remained with special place in may heart as some more lifetime memorial for a Swedish woman, Kicki Nordstom for her openhandedness to provide with me the gift of gifts, laptop, by which all tasks of the paper work easily accomplished.

I would like to acknowledge all staff members of the IDR for their intellectual and kindest support, especially in sponsoring the entire research work. I am also indebted to the head of the library (AAU), Ato Girma Mekonnen and my colleague W/ro Shewaye Yiheyis, for their moral support and took part in reading the first draft of the thesis respectively.

I delight in the help of my fellow classmates Wolde Asfaw, Gashaw Tesfaye, and Tesfaye Tezera. I thank them for the advice and company whenever I needed their encouragement and made the two years of study enjoyable and memorable.

Acronyms

AIDS	-	Acquired Immuno Deficiency Syndrome
AMA	-	Anti Malaria Association
ANRS	-	Amhara National Regional State
CARE	-	Cooperative for Assistance and Relief Everywhere
CMH	-	Commission on Macroeconomics and Health
DDT	-	Dichloro-Diphenyl-Trichloroethane
DPPA	-	Disaster Prevention and Preparedness Agency
ENSO	-	El Nino-Southern Oscillation
MoH	-	Ministry of Health
EPLMA	-	Environment Protection and Land Management Authority
ESRI	-	Economic and Social Research Institute
FGD	-	Focus Group Discussion
HH	-	Household
HIV	-	Human Immunodeficiency Virus
ITN	-	Insecticide-Treated Nets
MASL	-	Meters Above Sea Level
MES	-	Malaria Eradication Service
MVBDCD	-	Malaria and other Vector-Born Disease Control Department
NGO	-	Non Governmental Organization
NOCMVD	-	National Organization for the Control of Malaria and Other Vector-Borne Diseases
PHC	-	Primary Health Care
RBM	-	Roll Back Malaria
UNDP	-	United Nations Development Program
UNEP	-	United Nations Environment Program
UNICEF	-	United Nations Children's Fund
USAID	-	United States Agency for International Development
WB	-	World Bank
WHO	-	World Health Organization

Glossary of Local Terms

Araqi:	Traditionally/home distilled liqueur
Bega:	Dry season in Ethiopia
Belg:	One of the seasons (autumn) of Ethiopia fallen from March – May with slight rain
Comarit;	A woman who makes and sales local alcoholic drinks in the study area
Gesho:	*A* perennial plant (*rhamnus prionides*) grown for its leaf that is used as a catalyst to make local alcoholic drinks,*(tella & araqi).*
Got:	Village in the study area (locality)
Idir:	Voluntary traditional funeral association
Kebeles:	*S*mallest local government's administrative unit
Kiremt:	Ethiopian heavy rainy season
Kuta/Gabi:	Traditionally cotton woven scarf like close
Medeb:	An elevated and leveled board made of soil and stone commonly used as a seat and sleeping ground among households in the rural areas of ANRS
Tanqua:	Small boat/ canoe made of papyrus
Tej:	Yellow color traditional and cultural beverage prepared from *gesho* and honey
Tella:	Traditional alcoholic beverage (beer)
Woreda:	District level administrative unit
Zikre Hig:	Negarit gazette of ANRS
Zone:	Government's administrative structure next to region

List of Tables

		Page
Table 4.1	Population and Household Size of Zeghie Peninsula	34
Table 4.2	Age and Gender Structure of Respondents	35
Table 4.3	Marital Status of Respondents	35
Table 4.4	Educational Background of Respondents	36
Table 4.5	Agricultural Production of Farmers in Zeghie	38
Table 4.6	Estimated Annual Income of Respondents	39
Table 5.1	The Most Serious Health Problems in the Past Five Years in the Study Area	44
Table 5.2	Relationship between Level of Education and Respondents' Perception about Causes of Malaria Illness	45
Table 5.3	Malaria Incidence for the Past Five Years	48
Table 5.4	Number of Deaths due to Malaria	50
Table 5.5	Degree/Severe ness of Malaria Illness since 2001/02	50
Table 5.6	Cost of Malaria Treatment	56
Table 5.7	Compensation of Work Days Lost due to Malaria	59
Table 5.8	Influence of Malaria on Neighbourhoods	60
Table 5.9	Effect of Malaria on Pregnant Women	63
Table 5.10	School Drop-Outs	65
Table 5.11	Violation of Cultural/Religious Value due to Malaria Illness	66

List of Map

		Page
Map. 1	Map of Study Area	31

List of Figures

Figure 2.1	Schematic Representation of Conceptual Framework for Socio-economic Burden of Malaria	11
Figure 5.1	Frequency of Diagnosed Patients for Different Diseases in Zeghie Clinic	43
Figure 5.2	Cases of Malaria Diagnosed in Zeghie between the Years 2001/02 - 2005/06	48
Figure 5.3	Monthly Distribution of Malaria Diagnosis	52
Figure 5.4	Susceptibility of Different Family Group to Malaria	53
Figure 5.5	School Dropouts in Zeghie Due to Malaria	64

Abstract

The objective of this study was to assess the socio-economic burden of malaria in Zeghie peninsula. To do this, a combination of quantitative and qualitative research techniques was employed at two kebeles in the peninsula. One hundred and fifty three household heads of both sexes were interviewed. Data collection tools, like surveying, focus group discussion, key informant interview and filed observations were used in carrying out this study. As common problems in developing countries, various types of infectious diseases were most frequently diagnosed in the clinic in the peninsula. Of all other health problems malaria was found to be the most important parasitic disease in the setting and nearby rural farming communities. The major socio-economic impact of malaria is responsible for the reduction of the labour force of families, obstructing education, disruption of cultural values (indirect costs), and worsening of health condition of the community (direct cost). It was found that the indirect cost of malaria illness accounted as a loss of mean average 365.28 Birr, which is 22.46% of the mean annual income of a household. Besides, the direct cost accounted a mean average of 130.11 Birr (8.68%) of the household's annual income. The aftermath of malaria illness was also envisaged in the study area as low birth weight, still birth, induced abortion, and maternity deaths related to pregnancy. Even after recovery from malaria, the study community encounters anemia, visual and hearing impairments, under nourishment (due to loss of appetite), and gastric problem. The disease has also a negative impact on education performance of students such as school absenteeism and dropout. Under treated malaria patients in the peninsula were forced to disregard their cultural as well as religious values in abstaining fasting seasons and changed their feeding habit. Due to the relatively better literacy rate and level of education among the community, the awareness about malaria has seemingly improved. However, further effort has remained so as to decrease the socio-economic impacts of malaria on the community. In turn, this could be the other side of taking a palliative measure to alleviate poverty in the setting as well as in the country at large.

Chapter One

1. Introduction

1.1 Background

Malaria is a leading public health problem in Ethiopia. About 75% of the area in the country is malarious and 67% of the population is at risk of getting malaria infection. In 2002 and 2003, the disease was the primary cause of morbidity and mortality, accounting for 16% of out patient visit, 20% of hospital admissions and 27% of hospital deaths. In 2003, large-scale epidemics occurred in the country from April to December resulting in two million clinical and confirmed cases and 3,000 deaths, affecting 3,368 localities in 211 districts (WHO and UNICEF, 2005).

In line with this, high morbidity and mortality due to malaria results in reducing productivity and hamper the development process on one hand, and raise school absenteeism among young children on the other (Ibid).

From the entire population of the Amhara region, it was only little proportion that has access to health care facilities. In the year 2003, malaria was the primary cause of morbidity in the region. The Amhara, Oromia and SNNP Region health bureaus have reported widespread malaria outbreaks within the year 2004/05. In the earlier times the transmissions were set to the altitude of 2000m above sea level. However, since recent years, due to anomalous weather conditions, areas with an altitude 2500m above sea level and above have become permissive for vectors breeding and parasite development. In this case, areas where malaria has not been a risk in the past, death rates tend to be higher, since people have not had the chance to build up immunities, and appropriate response strategies are not in place (USAID, 2003 and 2005).

The study area Zeghie, has subtropical type of climate with mean annual temperature of 26°C and mean annual rainfall of 1,521mm. Zeghie and its surroundings are prone to malaria transmission and the people at large have no protective immunity against

malaria infection. As a result, the disease is affecting all age groups indiscriminately. Malaria transmission is usually at its peak from September to November, proceeding the heavy rainfall season. It also becomes worse from mid March to mid June, before and at the beginning of the Ethiopian rainy season (*kiremt)*. Due to large meteorological anomalies and other anthropogenic factors, the area is often associated with high malaria mortality and morbidity rates (Chernet and Gebeyehu, 2000).

Since the study area is located adjacent to the Lake Tana, the degree of vulnerability of the community to malaria set persists throughout the year. During the heavy rain season (*Kiremt*) the surface water body from the lake eventually rises in volume and expands outward covering the nearby areas for about five months. After the *kiremt* has gone, the lakeside areas, which were covered by the out-flowed water, remain the cause for high potential mosquito-breeding sites, followed by water regression due to the dry season.

1.2. Statement of the Problem

At the end of the year 2004, as World Malaria Report revealed, one hundred seven countries and territories at the global level had been at risk of malaria transmission. In view of the fact that 3.2 billion people lived in those areas, it indicates that the disease in this wide domain affects human capital. Aside from being a major human health problem, the disease hinders the development process. It also impedes settlement in lowland fertile areas that are critical in the effort to improve food security and household income (WHO and UNICEF, 2005). Therefore, malaria is not only a health problem, but it has also resulted in social and economic crisis.

As mentioned above, the prevalence of malaria in many productive parts of Ethiopia prevents the movement and settlement of people in resource-rich low-lying areas. In this case, the concentration of population in non-malaria risk highland areas has resulted in a massive environmental and ecological degradation and loss of productivity, exposing a large population of the country to repeated droughts, famine and overall awful poverty. The increased school absenteeism due to illness in general and malaria in particular significantly reduces learning capacity of students. Coping

up with malaria epidemics overwhelms the capacity of the health services in the country, and thus substantially increases public health expenditures (Senay and James, 2005). In addition, repetitive treatment also incurs costs and consumes individual household incomes.

Inadequacy of health facilities at national level in general and in the Amhara National Regional State (ANRS) in particular, debilitated the health status of the people. In the realm of seriousness of multifaceted problems instigated by malaria, an independent preventing and control sector of the disease has not been in place. In this regard, the current endeavor to fight against malaria seems to receive minimal attention. That is, the previous malaria prevention and control sector has been integrated within the overall health system after the restructuring of health facilities at national level.

Amongst the ANRS, Bahir Dar and its surroundings are highly prone to malaria. Likewise, the study site, Zeghie is one of the malaria endemic areas recurrently hit by the disease. According to CARE (2001), in the year 2000 an average of 41 malaria patients per day were visiting the clinic at Afaf, the small rural town in Zeghie.

People living in the study area are highly dependent on the income obtained from a subsistence and cash crop farming, such as, coffee and *gesho* (a plant use to prepare the local beer and liqueur (*tella, areqi* and some times *tej*)). To cope up their livelihood strategies, inhabitants of Zeghie are used to supplementing their household income by collecting and selling firewood in Bahir Dar city, shipping with traditional boat (*tanqua*).

However, since firewood collection is a heavy task, it requires healthy, strong personal fitness and hard working. Thus, of course, it is unmanageable to be engaged in such tiresome job for those who are affected by malaria intermittently. Rather, the effect of the problem mentioned above plays a crucial role to push the people to migrate to Bahir Dar, the nearby town and some other places to search for better treatment. Nevertheless, inevitably, such labor force mobility has adverse consequences in the city/towns, such as population pressure. At the same time it inflicts the immigrants to be exposed to different types of urban social problems

(other health risks, homelessness...etc). In other words, the socio-cultural dimensions of the migrants would also be affected.

Though a number of studies regarding the problem of malaria have been carried out, it is more of medical research. In other words, most studies merely adhered to health aspects. Only a few investigations have been done on the economic cost and the prevalence rate of malaria. These are available in the Community Health Library of the Medical Faculty. Nevertheless, most studies so far, have paid little attention to the socioeconomic impact of malaria in the country in general and in the study area in particular.

Needless to say, the dearth of information on the subject in the MoH resource center (library) was a daunting challenge in spite of the researcher's effort and unrelenting search for a document to consult to. The researcher was trying to consult documents as a secondary source of information in the MoH resource center (library), but in vain. Likewise, an attempt was also made to look for study documents under similar subject in the pertinent department, i.e. Malaria and other Vector Born Disease Control Department of the MoH. However, except the report on economic costs of the epidemic, no any such study in relation to the socio-economic burden of malaria could be available

The recurrences of malaria-prompted epidemic and their often distressing impacts on the social and economic conditions of communities in malaria-prone areas in the country in general and the study area in particular inter alias have time and again raised the concern of the researcher. In view of the visible gap and information limitations on this very subject, it is prudent that this research sparks a timely enquiry to investigate such fundamental and serious issues in order to bridge such knowledge gap.

1.3. Objectives of the Study

1.3.1 General Objective

The general objective of this study is to examine the problem of malaria and its socio-economic impact on communities in Zeghie peninsula.

1.3.2 Specific Objectives

In line with the above general objective, the specific objectives of the research are:

(i) to understand the magnitude of the effect of the disease on each household;

(ii) to investigate the economic, social and cultural burden of malaria illness;

(iii) to identify the cost of malaria illness; and

(iv) to know the perception and knowledge of the people about malaria.

1.4 Research Questions

This research is focused on giving answers for the following research questions:

(i) What is the economic, social and cultural burden of malaria on the community in Zeghie peninsula?

(ii) To what extent does malaria affect the community under study?

(iii) What are costs of malaria illness in Zeghie?

(iv) How the people in the peninsula do perceive about malaria?

1.5 Significance of the Study

Considering the current situation of the problem in the country, the value of a research on this subject in yielding a modest understanding is undeniable. Thus, this research views the devastating effect of malaria from a wider spectrum and draws some conclusions.

Therefore, this study attaches great importance in assessing the degree of the burden of malaria in the proposed locality and people. Presenting possible interventions to avert the pressure of the disease in the light of the findings of the study is additional value. Policy formulation with regard to health facilities, development planning in general and surveillances to speculate factors to instigate outbreak of the epidemic of the disease are benefits anticipated from this research.

This study will also give a worthwhile insight for further study. As the subject is too broad, this small study perhaps may not adequately address the multi-dimensional aspects of the problem of malaria. Nevertheless, the study could pin down clues and identify opportunities for further investigation.

1.6 Scope of the Study

The study of socio-economic burden of malaria is a broad subject matter. It is difficult to address all issues in such a small research project. Therefore, this research is restricted in place and content. The research is conducted in Zeghie, satellite town of Bahir Dar. As far as the content of the study is concerned, this research focuses on the socio-economic burden of malaria by which it could help to identify the cultural, social and economic status of households in that specific locality and the level of contribution of the community to the development process.

1.7 Limitations of the Study

Apparently, this research has not been conducted without any limitations. In this connection, in the course of fieldwork, the researcher has been faced with multifaceted problems, such as absence of adequate research reports in the responsible offices. Even officers could not be available in their offices for unknown reasons. Reluctance and unwillingness of some people to provide pertinent information (avoiding the researcher from using tape recorder while interviewing) that could support the study was another problem.

Since the researcher suffers from chronic respiratory problem (asthma), the environment was not conducive at all. It was thus painful to stay in the study site for the fieldwork. Nevertheless, he managed to withstand all difficulties and finally completed this study albeit a series of the challenging circumstances.

1.8 Organization of the Paper

Following the introduction, chapter two presents a review of related literature, including conceptual frame work. Chapter three is devoted to the methods and materials of the study. The study area description is presented in chapter four. Socio economic burden of malaria is discussed in chapter five. The last part, chapter six contains the conclusion and recommendation of the study.

Chapter Two

2. Review of Related Literature

2.1. Conceptual Framework

Operational definitions of key terms are highlighted and the conceptual framework of the research is presented below:

(i) Health

Health is the extent of an individual's continuing physical, emotional, mental and social ability to cope with his/her environment. Health is freedom from any subjective feelings of discomfort or disability and from any objective disturbances of function or health. (The New Encyclopedia Britannica, 2005 and Gould, 1964).

(ii) Illness

In non-Western, relatively non-industrialized and non-urbanized societies, illness is characteristically perceived, defined, experienced and treated as a condition that is not only biological and psychosomatic, but also socio-somatic in nature. Illness is viewed as a physical, spiritual and psychological state that is significantly influenced and can even be caused by such social and cultural factors (Sills, 1968).

(iii) Malaria

Malaria is an infectious and life threatening public-health problem widespread in many tropical and sub-tropical regions. It infects between 300 and 500 million people every year and causes between one and three million deaths annually, mostly among young children in Sub-Saharan Africa (WHO, 2005; UNEP, 2002 and http://en.wikipedia.org/wiki/malaria).

Malaria is both an acute and a chronic parasitic disease of the tropics and subtropics, caused by one or more of four intracellular protozoa of the genus *Plasmodium:*

Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, and Plasmodium malariae. The effect is significantly underlined by invasion and destruction of red blood cells. The clinical presentation of malaria varies according to the infecting species, and to the genetics, immune status, and age of the infected person. The most severe form of human malaria is caused by P. falciparum, in which variable clinical features include spiking fevers, chills, headache, muscular aching and weakness, vomiting, cough, diarrhoea, and abdominal pain; other symptoms related to organ failure may supervene, such as acute renal failure, generalised convulsions, and circulatory collapse, followed by coma and death. P. falciparum accounts for more than 50% of malaria infections in most East Asian countries, over 90% in sub-Saharan Africa, and almost 100% in Hispaniola (WHO/UNICEF, 2003).

Encyclopedia of Science and Technology explains about the nature of the disease as follows:

> The fever it produces, the abrupt onset of the attack and its sudden termination, the enlargement of the spleen, and the anemia it induces were described in ancient Greek, Hebrew, and Roman writings as well as in Chinese and Indian medical chronicles. The worldwide prevalence of malaria, its great impact upon the health of the population of warm climates (in most cases) and its toll in mortality and morbidity have made it the outstanding single global health problem (McGraw-Hill Encyclopedia of Science and Technology, 1982)

The transmission of the parasite by female anopheles mosquitoes was discovered in 1897 by the British surgeon, Ronald Ross. In his singular accomplishment he disclosed the development of malaria parasite within the body of mosquito and he called that day "Mosquito Day" (Sherman, 1998).

The anopheles (female) mosquito often transmits the disease and spreads the malaria parasite through stinging and drawing up blood from the infected person and injecting into the body of the healthy person. With the bite of infected mosquito, a few hundred slender, needle-shaped parasites are introduced into the human body. These parasites grow within 7-10 days to schizonts (protozoans). From the liver vessels, the released parasites find their way to the bloodstream to start a typical malaria attack in human body (McGraw-Hill, 1982).

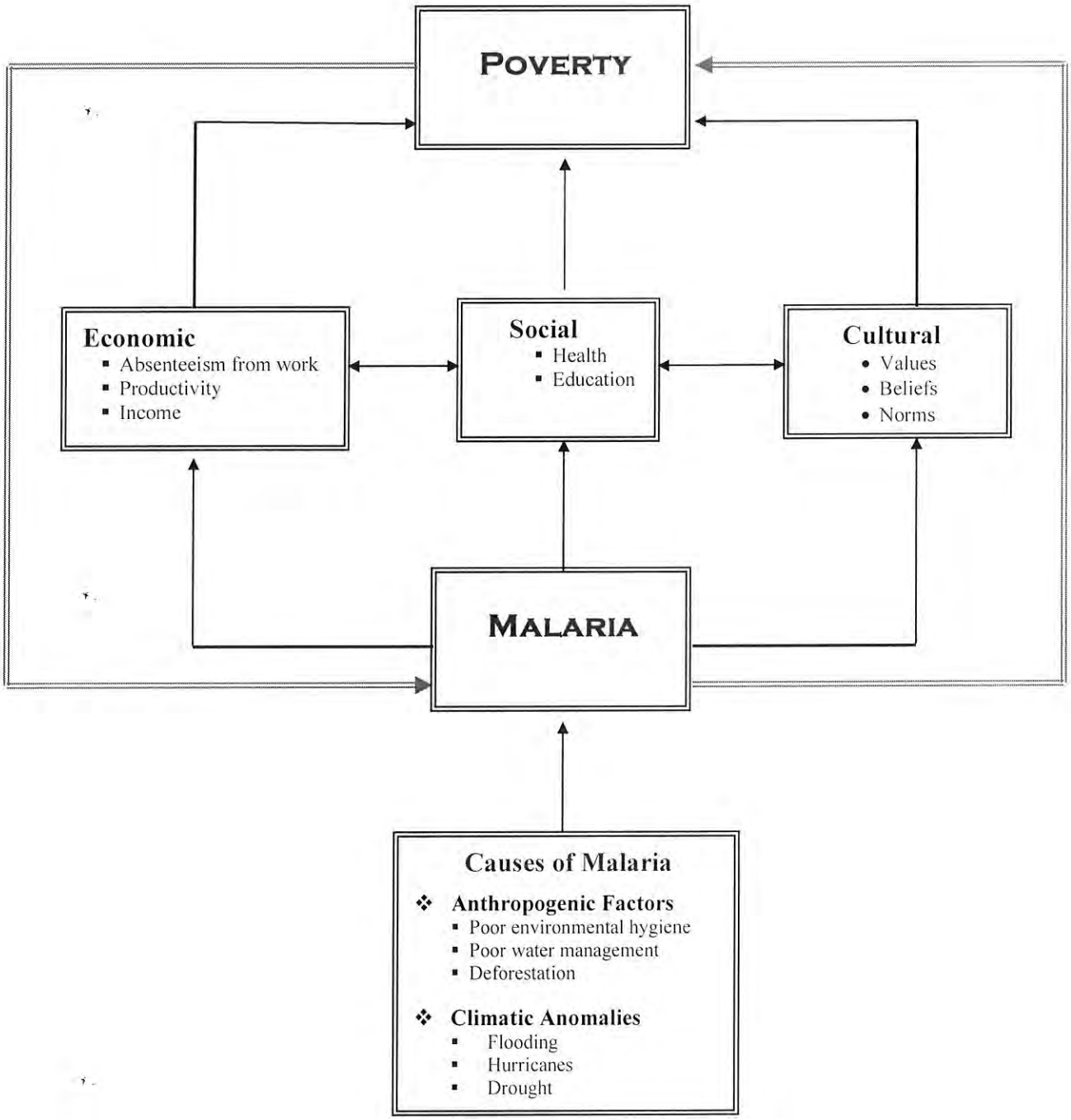
(iv) Epidemic

Epidemic is the high occurrence or outbreak of cases in excess of the expected or above the normal situation in a given place and time period. Endemic malaria shows different kinds of manifestations: (i) **season**: usually determined by rainfall in tropical areas; (ii) **periodic**: cycles of several (often 8-10) years usually determined by rainfall and also temperature; (iii) **sophisticated**: long term trends. When the transmission of malaria is continual, adults develop protective immunity, whereas children suffer great from mortality and morbidity of the disease (MoH_a, 1999).

(v) Socio-economic Burden

Where malaria prospers most, human societies have prospered least. The global distribution of per-capita gross domestic product shows a striking correlation between malaria and poverty, and malaria-endemic countries also have lower rates of economic growth. There are multiple channels by which malaria impedes development, including effects on fertility, population growth, savings and investment, worker productivity, school absenteeism, premature mortality and medical costs (The Economic and Social Burden of Malaria: at http://www.rbm.who.int/cmc)

Figure 2.1: Schematic Representation of Conceptual Framework for Socio-economic Burden of Malaria



Source: Own diagram, 2007

As depicted above in the conceptual framework diagram, malaria has a number of causes of which, anthropogenic factors and climatic anomalies are major aspects. In this regard, poor water management, improper environmental hygiene and environmental degradation and/or deforestation can contribute to the propagation of malaria under the anthropogenic factors. Deforestation can change local climate. It disturbs ecological balance and thereby remains as a cause for the spread of diseases in general and malaria in particular. This is due to reducing moisture held by vegetation and rising of ground temperature. Higher temperature increases the rate at which mosquitoes (anopheles) develop into adults, the frequency of their blood feeding, and the incubation of parasites within mosquitoes (AMA, 2004).

Natural disaster due to inter-annual variations in climatology or climatic anomalies perhaps as the result of meteorologic phenomena such as strong El Niño events that are commonly associated with drought or floods could play additional crucial role for the occurrence or outbreak of malaria. This climatic anomaly, in addition to that of vector born diseases, such as malaria, of course could cause some other water-born diseases like diarrhoea and/or cholera.

Malaria epidemic in the wake of flooding is a well-known global phenomenon in malaria-endemic and even in non-endemic areas. For instance, an earthquake and subsequent flooding in Costa Rica's Atlantic region in 1991 and flooding on the Dominican Republic in 2004 led to malaria outbreaks. Periodic flooding linked to El Nino-Southern Oscillation (ENSO) is associated with malaria epidemics in the dry coastal region of northern Peru and with the resurgence of dengue in the past 10 years throughout the North American continent (WHO, 2006).

All the elements illustrated in the above diagram have a highly interwoven structure. One variable cannot be discussed separately by disregarding the others. Poverty and malaria have the cause and effect relationships. Whenever there is malaria incidence, there is also economic depression, social upset, and cultural disturbance that aggravate the worsening condition of poverty as an effect. The more the prevalence of the disease, the more absenteeism from work, and these results in diminishing of productivity.

On the other hand, the phenomena lead to social and cultural suppressions, which intensify the enormity of poverty. Ill social condition means, ill health, irregularity in schooling or education performance and instability in social interaction. Disruption of social values, beliefs and norms due to unbearable problems like epidemics or pestilence may lead to displacement. This could have negative cultural implication that may draw people into unpromising behaviour at their destination, i.e. people who leave their home all of a sudden could adhere to unexpected social problems like criminality, prostitution, theft...etc. This entire social trauma obstructs the development process in general, which is another manifestation of the pervasiveness of poverty. In other words, the combined effects of all these events elude the existence of the vicious circle of the disease and poverty.

2.2 Historical Background of Malaria

Development would be insured in a full utilization of productive manpower, available resources, as well as appropriate technology. To achieve the proposed objective of development, the work force is anticipated to have healthy and fit personality. Nevertheless, as time goes on, humankind faced serious all rounded challenges. Amongst the confrontations, health problem covers a superior proportion that could hamper his all kinds of deeds, such as economic, social and cultural endeavours.

Next to HIV/AIDS malaria is the most dominant global health problem that afflicts millions of people all over the world of which Sub-Saharan Africa is with greater ratio. The epidemic is recognized as one of the tropical diseases that affect more economically poor countries. In most cases, malaria is argued to be the disease of the poor. Malaria in other words, is ladled as the cause and effect of poverty (Meek, 2001).

Two billion people, or about 40% of the world's population, live in the 90 countries at risk of malaria. Global estimates of the malaria disease burden for 1992 indicated at least 300–500 million clinical cases annually, 90% of them are in sub-Saharan Africa. Moreover, every year, malaria is associated with 1.5–2.7 million deaths from which a devastating proportion live in Africa (Meek, 2001). The trend has not yet shown any

improvement, rather it has been increasing in alarming rate. As Marten (2001) pointed out, people inhabit in malaria prone regions of the world accounts approximately for about 2 million deaths each year.

Malaria is one of the vector-born diseases prevalent most in hot/harsh temperature zones. However, now a days, due to abnormal climatic changes, highlands or highland fringe areas are also frequently affected. The disease impedes economic and social development in many parts of the world. Since the region of Africa (particularly Sub-Saharan) is more prone to the disease than all other parts of the world, especially children and pregnant women are at risk (Abdulhamid, 1995 and Korenromp, 2005). Even though, the main productive population group relatively remain healthy, this in turn, affects the day-to-day or attainable activities of the family or the household. Because, in most cases, the time lost by the care taker would be equal to the time the patient consumes.

According to the information obtained from the World Malaria Report (2005), it is a tragic fact that malaria kills an African child every 30 seconds, despite available methods both to prevent and cure the disease. In addition to loss of lives and productivity, malaria also deprives children from their education and sets back social development of the society.

The problem of malaria has been known since ancient times. Enlarged spleens due to a disease (later known as malaria) have been found in Egyptian mummies more than 3,000 years old, the disease also affected the region between the Tigris and Euphrates Rivers some 4,000 years ago. Writings from *Vedic* (of India) period (1500 to 800 B.C.) referred to autumnal fevers as the "king of diseases". It corroborates that the disease ascribed the symptoms of headache and chills (Sherman, 1998).

The Frenchman, Laveran in the years 1878-80, discovered malaria in his work which reversed the fallacy of long-held belief that miasmas, foul air rising from wet, marshy ground, *mal* = bad; *aria* = air, given the name as, (*mal aria* = bad air) were to be the cause of the disease. The term malaria is Roman in origin, although the disease was not known by its present name until the mid-eighteenth century. While examining

and testing the blood in laboratory from a patient, Laveran saw for the first time certain pigmented bodies, which we now know, are the true cause of malaria fever in man (Prothero, 1965 and Blackie, 1950).

Ill health contributes much to impoverishment followed by household assets depletion and income loss that cause consumption levels to fall below minimum needs. This brings about sharper focus on social and economic impact of the human malaria. The disease globally affects human kind indiscriminately and that has devastating health and economic progress. Since malaria solely contributes to impoverishment, it entails clear understanding that poverty coexists with malaria (Najera, 1998).

2.3 Burden of Malaria

Malaria affects the health and wealth of nations and individuals alike. In general terms, malaria is commonly referred to as a disease of poverty and is mainly found in the poverty-stricken regions of the world.

2.3.1 Economic Burden of Malaria

In Africa today, malaria is understood to be both the cause and effect of poverty. It has significant direct and indirect costs. It has been shown to be a major constraint to development in general. For developing economies, this has meant that the gap in prosperity between countries with malaria and countries without malaria have become wider every single year (Delacollette, 2002).

Socio-economic influence of the disease is associated with the costs of illness, coping strategies, and the economic consequences on individuals as well as at the household level. As mentioned earlier, in the case of this study household is the preferred unit of analysis for assessing the effect of the disease. Decisions about treatment and coping strategies are based on negotiations within the households. Caregivers, as well as the sick incur illness costs, and costs fall on the household budgets. (Wilkes, 1997).

As indicated above, it is obvious that annual economic growth in countries with high malaria transmission has historically been lower than in countries without malaria. The evidence portrayed below supports the influence of malaria on a nation's prosperity:

> Economists believe that malaria is responsible for a 'growth penalty' of up to 1.3% per year in some African countries. When compounded over the years, this penalty leads to substantial differences in GDP between countries with and without malaria and severely restrains the economic growth of the entire region (Wilkes, 1997).

The cost of malaria as indicated above is notably distinguished as direct and indirect costs. The direct costs of malaria include a combination of personal and public expenditures on both prevention and treatment of the disease.

Personal (i.e. formal source of treatment) expenditures include individual or family spending on Insecticide-Treated Nets (ITNs), medical tests and consultation fee, anti-malarial drugs, transport to health facilities or special food, support for the patient and sometimes an accompanying family member during hospital stays; and informal (i.e. ritual & self-treatment) sources of treatment. Whereas, Public expenditures include spending by government on maintaining health facilities and health care infrastructure, publicly managed vector control or vector- targeted intervention, such as diminishing mosquito-breeding areas and for INTs acquisition, education and research. In some countries with a heavy malaria burden, the disease may account for as much as 40% of public health expenditure, 30% to 50% of in-patient admissions, and up to 50% of outpatient visits (Najera, 1998).

On the other hand, the valuation of indirect cost is based on actual loss of income attributable to illness. It includes loss of productivity or income associated with illness or death. This might be expressed as the cost of lost workdays or absenteeism from formal employment and the value of unpaid work done in the home by both men and women, or in the field that could be the result of direct monetary loss. For instance, like the destruction of crops by wild animals as fields were left unattended, or loss of daily wage of a casual laborer, or as a reduction in farm income or production such as

due to being unable to harvest grain or crop at the proper time and hence receiving a lower price (Ibid).

Not only becoming affected by the disease that drags the economic performance, the time spends on burial ceremony and care giving activities for patients are also contributing factors for growth penalty alike illness and death.

In this connection Delacollette (2002) pointed out the following major end results as an example:

- *undeveloped tourist industry due to reluctance of travelers to visit malaria-endemic areas;*
- *undeveloped markets due to traders' unwillingness to travel to and invest in malarious areas; and*
- *preference by individual farmers/households to plant subsistence crops rather than more labour-intensive cash crops because of the impact of malaria on labour during harvest season.*

2.3.2 Social Burden of Malaria

In this regard, the impact of malaria rewind the progress of a community by which health situation and education overlay the avenue of a nation's development. In the context of this study, health and education are central units of social aspect.

2.3.2.1 Impact of Malaria on Health

Health care is one of the crucial components of basic social service that has a direct linkage to the welfare of a society as well as to the growth and development of a country. There is a very high-unmet health care need in rural Ethiopia that needs to be addressed through rapid expansion of Primary Health Care (PHC) services. (MOH. 2005)

Like the definition stated in the previous chapter, health is the sole engine for human as well as national development. In a disrupted health condition, no society would economically be secured, (in fact other elements/components need to be maintained) and attain the proposed goal. Household as a smallest proportion of a setting

constructs the community in a given locality and by far it is a mere footing to the establishment of a nation. In spite of this fact, every individual member of the household and the community at large have to be remained healthy in order to capitalize on the participation in the development process of a nation.

Globally, human malaria indiscriminately affects all man kind. Of course, children and pregnant women are the most susceptible groups of the community. Though adults are rarely affected, the rate of contracting the disease varies between endemic and epidemic regions. In endemic areas generally tropical and subtropical regions – people contract the disease regularly throughout their lives. With very few cases it is resulting in death. On the contrary, in regions where malaria transmission is not stable and occasional epidemics occur, both adults and children are vulnerable because neither builds up resistance (World Economic Forum, 2006).

Malarial infection during pregnancy is a major public health problem in tropical and subtropical regions. In most endemic areas of the world, pregnant women are the main adult group at risk of malaria. The burden of malaria infection during pregnancy is caused chiefly by Plasmodium falciparum, the most common malaria species in Africa, where 90% of the global malaria burden occurs. Every year at least 30 million pregnancies occur among women in malarious areas of Africa, most of whom reside in areas of relatively stable malaria transmission (Steketee, 2001 and WHO/UNICEF, 2003).

Pregnant women reside in areas of unstable malaria transmission are at a two-or threefold higher risk of developing severe disease as a result of malaria infection than are non-pregnant adults living in the same area. In these areas maternal death may result either directly from severe malaria or indirectly from malaria-related severe anemia. In addition, malaria infection of the mother may result in a range of adverse pregnancy outcomes, including intra-uterine growth retardation, premature birth, spontaneous abortion/ miscarriages, neonatal death, and low birth weight which has negative impacts on health later in infancy and childhood (Steketee, 2001 and WHO/UNICEF, 2003).

2.3.2.2 Impact of Malaria on Education

Doubtless to say, education and health status are direct proxies to quality of life. Improving academic excellence makes the community a more attractive place to live. More over, education is fundamental to secure optimal individual income which is vividly manifested on the community's standard of living. As quoted by the World Bank President "All agree that the single most important key to development and to poverty alleviation is education." Of course the out come of education is determined by the level of attainment and quality of education. The social aspect, as well as political situation of the country and conducive health atmosphere play significant role in educational attainment (http://www.dream-ride.org/cause.html).

A fragile health threat not only to individual lives, but also has negative socioeconomic impacts on societies. For example, people's health conditions become worse with the problems caused by a precarious health system. These are lack of access to health services, health education, safe drinking water and adequate sanitary facilities, resulting in the shrinkage of labour force, at the national level. These also considerably increase in the cost of medical care, and loss of the educational opportunities in which gradually result in poverty worsen.

Education enhances health care, improve civic interaction and develop mechanisms for community support. Education in this case is a significant explanatory power for better per capita household income, and over all economic growth of a nation. It is considered that much more investment on education ahead of primary level could be the most important basis to continue into secondary and tertiary education and central key for development endeavor. In circumstances that more challenges are in place, school enrollment inevitably will go down. One of the challenges might be revealed as health condition in general and environmental health problem (such as malaria) in particular. In line with this, the disease is the most crucial impediment of the teaching learning process.

In Sub-Saharan African countries school dropouts due to malaria are more rampant. In one way or another, malaria tends to hinder a child's physical and cognitive

development, and may reduce a child's attendance and performance at school. Based on the study conducted in Kenya (Clarke, 2002), 26 % of School children in holoendemic areas are affected by malaria and adversely affect the school performance in that fiscal year.

2.4 Factors Aggravating the Condition of Malaria

2.4.1 Human Induced Problems

Natural disaster and man made intervention on natural ecosystem brought about changes in life style of organisms including human kind himself. All human activity could generate benefits for his livelihood from natural resource exploitation. In spite of this fact, due to regardless of unanticipated outcomes and miss utilization of resources, ecological disturbance inevitably occurs.

In order to cope up the growth rate of population pressure, food security has to be ensured. Since the Ethiopia's economy is highly dependent on traditional rain fed agriculture, better technology, like irrigation must be adopted. To take this advantage into account, water development projects may help local communities (especially) in arid areas, but may also result in detrimental effects on health, especially vector borne tropical diseases, like malaria. Ghebreyesus (1999) found definite increases in malaria among children as well as adult people near new irrigation dams in northern Ethiopia in different seasons. While access to water is of fundamental human importance, methods of counteracting detrimental effects of water development need further investigation.

An other problem associated with irrigation technology is that, the major malaria epidemic in the Gezira (Sudan) irrigated area attacked the majority of the labour force and a third of cotton crop could not be harvested, leading to a reported loss of US $10 million (Kilman, 1994). This attributes the indirect cost of malaria.

Construction (especially roads) is an other contributing factor for the seriousness of malaria spread. Because, construction works often leave behind plentiful mosquito

breeding sites. Besides to this, environmental degradation, exploitation of nature by mankind resulted in creating good ground for mosquito breeding, particularly anopheles.

2.4.2 Migration and Climatic Anomalies

In most cases, epidemic of malaria is associated with climatic anomalies and weather changes, unplanned movements or sudden migrations due to social turmoil, or migration by a group to an endemic area. Regions that border endemic area, like Southern Africa, the Sahel and Northern India are amongst the most vulnerable areas to epidemics. Malaria epidemics typically have higher fatality rates than endemic malaria: an epidemic resulting from climatic anomalies in Ethiopia in 1958, for example, killed 150,000 of the three million infected individuals (MOH, 1983).

2.4.3 Socio-economic Conditions of the People

Factors influencing the overall risk of malaria include poor or no housing, movement into unused/virgin areas like the case of resettlement, deliberate movement to areas near waterlogged or swampy areas, low socioeconomic status, proximity to cowshed, immune status, and malnutrition. Communities with low socioeconomic status neither prevent nor treat malaria illness. This is typically the characteristics of the rural poor. As far as the Africans as well as Ethiopians living condition of rural people is concerned, livestock are sheltered under the same roof with human beings. Animal's urine and dung is often favors mosquito breeding. Same is true with the case of cattle herders in Vietnam. However, they used to fumigate their houses with smoke to avoid mosquitoes entrance (Marten, 2001).

Political and infrastructural factors that affect the provision of health care services include destruction or overburdening of existing infrastructure, limited availability of health care services, insufficient or poorly trained staff, insufficient coordination among agencies, and donors.

2.4.4 Peoples' Attitude

The solution to the malaria problem lies where it is most keenly felt – at a community level. In this regard, people play a crucial role in participating in the prevention and control of malaria. Of course, in the first place, people's understanding about the cause and effect of malaria must be clear. If it is understood that malaria is a biological stance obviously it is preventable and controllable. On the other hand, as sub-group of people perceived the cause of malaria is spiritual possession or sorcery or witchcraft. This might be difficult to pull down and make it under one's control and so not possible to manage.

To support with evidence, we can look into the Zambians perspective about malaria. According to them, malaria is transmitted through breathing contaminated air – air that has been breathe out by a person with malaria; some believe that it can be caused by bathing in cold water; For some of others it is meant, malaria spreads through sleeping on a bed sharing common blanket and using the same air for breathing with malaria patients. Using the same utensils, same toilet and staying in the same house with some one infected by malaria. These are diverse attitudes African people adhered to (Green, 1999).

The above paragraph implies that, the definite cause of malaria has not been inculcated in minds of the people. Above all, the sole transmitter (vector) of malarial parasite, i.e., mosquito has not taken into consideration. This in turn could cause failure on the effort of prevention and control of malaria as actually transmitted only by the female anopheles mosquito.

2.5 The Emergence, Effect and Control of Malaria in Ethiopia

In eastern Africa, unstable highland malaria affects Ethiopia, Eritrea, Western Kenya, Southwestern Uganda, the highlands of Tanzania, and much of Rwanda and Burundi. Ethiopia historically had the most intensive experience with recurrent malaria epidemics. Localized malaria epidemics occur almost every year in different places of Ethiopia with occasional massive outbreaks affecting most parts of the country. The

densely populated highland fringes and the semi-arid lowlands like Afar and Somali Regions are particularly prone to seasonal and unstable malaria transmission. As in other parts of Africa, malaria epidemicity in Ethiopia is very closely associated with topography (Delacollette, 2002)

As sited by Tebaber (2006) the first report about malaria prevalence in Ethiopia was made in 1915 by the British-East African Army Medical Corps. In the Year 1938-39 an Italian scholar known as Corrodilli described the epidemiology of malaria in Wollo, Jijiga and the Danakil regions. Similarly, in 1942 another scholar called Martin reported the presence of four malaria cases in the country. According to the MoH (1999), the outbreak of the epidemics of malaria has been evidently documented by Italian investigators in the 1930s.

In the year 1952, an eminent malariologist, General Sir Gordon Covall visited Ethiopia and carried out a malaria survey on the Southern Lake Tana in relation to the planning project of Bahir Dar town. Three years back, he also visited some other parts of the country and collected malaria related data (Tebaber, 2006).

The commonest malaria vector in Ethiopia is anopheles Gambiae. Malaria transmission in the country is unstable and characterised by frequent and often large-scale endemics. Natural and man-made disasters and developmental activities such as irrigation schemes have also contributed to worsening the situation (Getnet Mitikie, et. al. 2004).

The episode of malaria in Ethiopia hampers the individual, the community and national prosperity due to its influence on social and economic decisions. The risk of contracting malaria in endemic areas can deter both internal and external investments. In many ways, it has negative cumulative effect on economic growth and productivity. Reports have showed that the number of people affected by malaria has dramatically increased since 1980s. In 1989 – 1990 the number of cases per year was 21 per 1000 people (Getnet Mitikie, et. al. 2004).

As indicated by Lelisa (2005) in Ethiopia, in the recent past an average of 400,000 – 600,000 cases with positive blood film for malaria are treated annually. More over, three to four times of this figure are clinically treated at community level without blood test. This indicates that the disease put up a major barrier to both health and economic development in the country.

According to Lelisa (2005) the average health services of malaria expenditure (direct cost) in the three consecutive years (1998 –2000) was 267.51 million Ethiopian Birr. The distribution in accordance with the three years time, the annual expenditure was registered as 79, 105.34 and 83.17 million Ethiopian Birr respectively. For instance, at the household level, the total annual average cost of malaria in Southwest Oromia zone during the years mentioned above was 158.78 Ethiopian Birr.

The control of malaria in Ethiopia has a history of more than four decades. Since then DDT was applied as insecticide for the first time to eliminate vectors responsible for malaria transmissions. Initially malaria control began as pilot control project in the 1950's and then it was launched a national eradication campaign in the 1960's followed by a control strategy in the 1970's. In 1976 the vertical organization known as the National Organization for the Control of Malaria and Other Vector-borne Diseases (NOCMVD) evolved from the Malaria Eradication Service (MES). Until 1993, this organization was operating in the country with one central office, 17 regional or zonal offices, consisting of 70 sector offices and more than 1,400 malaria detection and treatment posts (http://www.who.int/countries/eth and Biscoe, et. al., 2004).

In this regard relentless worldwide efforts have been made to reduce the pervasiveness of the problem. However, while, few countries showed success, the rest of malaria endemic regions remained constant.

As per the MoH_a (1999), there are four major eco-epidemiological strata of malaria in the country that are portrayed as follows:

- *Malaria free highland areas above 2,500 meter altitude,*
- *Highland fringe areas between 1,500 – 2,500 meter (which are affected by frequent epidemics),*

- *Lowland areas below 1,500 meters (with seasonal pattern of transmission), and*
- *Stable malaria areas (characterized by all year round transmission).*

The recent commitment for malaria control program in Ethiopia has emerged and continues to grow. Signing the Abuja declaration in the African Summit on Roll Back Malaria in April 2000 is a sign of commencing the program. RBM in Ethiopia was officially launched in February 2000. The prevention and control activities comprise: early diagnosis and prompt treatment, epidemic forecasting, prevention, and early detection, selective vector control including ITNs availability and environmental management. Other strategies supporting the program include: human resource development, information, education and communication, operational research, health management information system, and monitoring and evaluation (MOH_a, 1999).

Chapter Three

3. Research Methods

3.1. Study Procedure

In this thesis preparation, the duration of the fieldwork in the study site, Zeghie, was about 60 days. The data collection activities have been carried out in two phases. The first phase of data collection activities included, obtaining official research permission from respective bodies, preparing data collection tools, and selecting and training research assistants. This period spanned from 9 to 31 January 2007.

The second phase included, locating archival materials, carrying out the main part of the study on villages (*got's*) in the study area. That is, employing the prepared data collection tools; administering the questionnaire with informants of selected households, conducting focus group discussion and doing key informant interview. This period stretched from 4 February to 6 March 2007.

This study depended on both quantitative and qualitative data collection techniques. To analyse the quantitative set of data, presenting the data through tabulation is the primary task. Frequency, percentage computation and descriptive statistics, such as mean (average) have employed too. Explanation has also widely used for the qualitative part.

Study site selection, data sources, data collection tools, sampling techniques, data analysis and ethical consideration are the components of the chapter.

3.2 Study Site Selection

In most cases, the communities living in the study area, Zeghie (a place in West Gojjam Zone) are practicing subsistence farming. Their income depends on a single harvesting season. That means, except the *kiremt*, the *Belg* rains are uncommon in the Zone in general and the study site in particular. The people living in and around the

study area are incapable to lead ideal and conventional life. Dependence on a single cropping season of subsistence nature, accompanied by erratic and unreliable pattern of rainfall have exacerbated their situation. These facts have forced the people to descend in to chronic poverty and destitution. In addition, it has left them into a desperate plight to the extent of being unable to cover annual family consumption let alone to cover the costs of treatment whenever a family member falls sick or contract serious infectious diseases. Consequently, the area recurrently suffers from diseases of multiple causes in general and endemic malaria in particular.

Under the semi-humid climatic zone, being enclosed with wetland due to the Lake Tana basin, malarial infection is a serious health problem for the study area. As it is mentioned in the introductory section, during the long rainy season, (*kiremt)* the surface water body from the lake rises in volume and submerges the nearby coastal lands or lake sides. The water logging holes thus created due to the water meadow become an ideal place and safe haven for mosquito breeding as the water recedes in the dry season.

The other challenge is the area located at the western edge of the peninsula which is a wetland covered with brackish water for not less than five months. This provides conducive environment for the breeding of the vector, mosquito. As observed by the researcher, the recurrence of malarial incidence in the study area in general has a direct correlation to the reasons and vivid realities stated above. In view of such circumstances, conducting scientific research and assessments on the incidence of vector-born diseases like malaria would be advisable and supportive in the effort to take palliative measures. Born and raised in a locality adjacent to the study area, the researcher's familiarity with the language, culture and socioeconomic setting of the people, and above all the grim realities of communities who more frequently suffer from endemic malaria prompted this research and to make the study area its focus.

3.3 Data Collection

3.3.1 Primary Source of Information

Open and close-ended questionnaires, focus group discussion, key informant interviews and direct observation are the tools used to gather primary data from each and every household under the sample, communities, respective offices and stakeholders (GOs and NGOs).

(i) Questionnaires:

Due to resource and time constraint, the researcher could not entertain large number of people in case studies, in-depth interviews and wider focus group discussions. Therefore, questionnaires are used to fill the gap and support the representative sample to address as many individuals as possible to help gather relevant first hand information.

(ii) Focus group discussion:

Focus group discussion was employed to collect qualitative data in the field research. This method is suitable to discuss sensitive issues, to acquire detailed and un-addressed information (via questionnaire method) from the groups, who have different level of knowledge. In this case, two groups from the two *kebeles* have been selected from different categories according to sex, and age. Each group (both sexes) consisted of nine members.

(iii) Key informant interview:

When the researcher felt doubt about the reliability of information gathered through other techniques or when there is a need to reinforce the data with basic input, key informant interview is used as best solution as a tool, which offers the opportunity to acquire, information directly from knowledgeable people. Moreover, the tool also has been instrumental to generating recommendations. Accordingly, key informant interview is used to gather more of qualitative data for this research project.

(iv) Observation:

Among the primary data collection techniques, observation is crucial to understand peoples' activity on the basis of how, what and why they are doing something. This allows the researcher to develop confidence to speak and analyze what is being said and what is really going on in the actual setting. In this case, the researcher used to observe the living condition of the people (socio-economic and socio-cultural activities), the current situation of the disease within the villages and the clinic, the distance of the clinic from homesteads and availability of malaria control and prevention sector in the locality.

3.3.2 Secondary Sources of Information

In an effort to make this research more valid and worthy, all relevant secondary sources pertinent to the study were reviewed. These include: published and unpublished materials, such as books, journals, magazines, government and non-government records and archival documents from Amhara National Regional State Health Bureau, Bahir Dar *Zuria Woreda* Health Office, Bahir Dar Special Zone Health Office, Bahir Dar Special Zone Municipality, Regional Environment Protection and Land Use Management Authority, Anti-Malaria Association, Zeghie Elementary and Junior Secondary School, Zeghie emerging municipality and Zeghie Clinic respectively.

3.3.3 Sampling Techniques

The problem of malaria has not been given due attention in the study site (Zeghie peninsula). Above that, the vulnerability of the peninsula being situated on the nearest border of the waterlogged meadow has put the area most affected. In general, since the peninsula is almost enclosed with water, this in turn exposes the area to malarial infection. Besides, the vector (anopheles mosquito) gets favorable environment for breeding.

The study site is selected purposively as a case study. This is due to the fact that almost the entire setting was expected to be at risk of malaria. The peninsula consists of two rural *kebeles* which in turn comprises of fifteen *got's*. For each *got*, lists of households (sampling frame) was obtained from the respective administration. Then, of the total 1533 households in the fifteen *got's*, a sample size of 153 (i.e., 10%) households was taken using proportionate random sampling technique.

3.3.4 Data Analysis

In this study, the main activity to be accomplished in organizing and analyzing the data were: transcribing the information gathered from tape record interview and translating the local language (Amharic) into English. Review of secondary information obtained from archival documents, (government and non-government); tabulating responses, and sorting systematically the data in logical order were all used to organize data. Since the data was gathered from a household survey, it is more of quantitative data. However, to supplement this information, qualitative data was also gathered. For quantitative data analysis, tables, simple frequency, and mean (average) were computed, while for the qualitative ones, descriptive approach is applied to analyze the data.

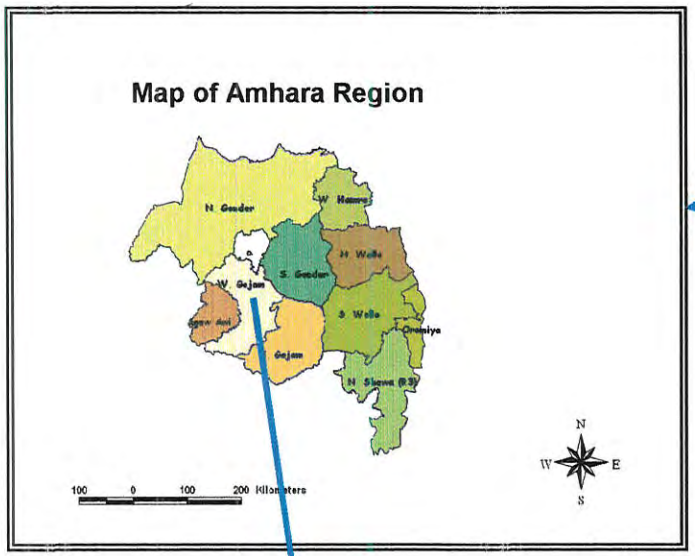
3.3.5 Ethical Consideration

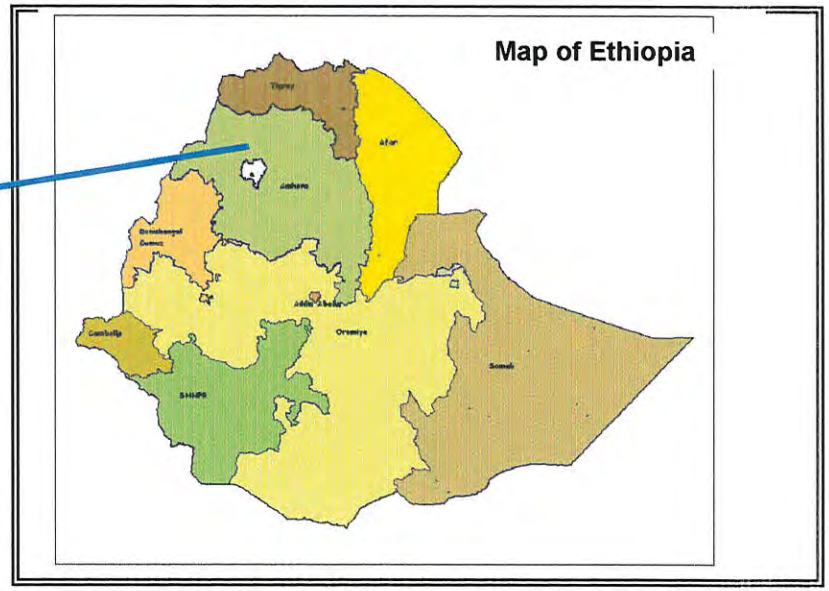
Ethical issues have an impact on the quality of the overall research work. Researchers are required to be genuine and committed to their profession.

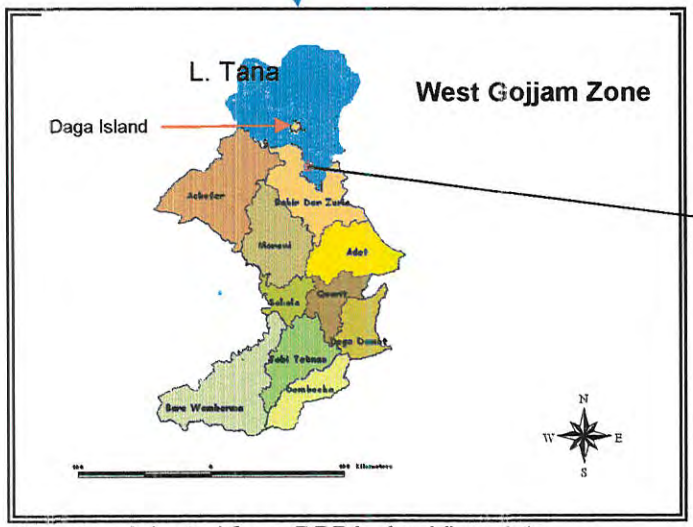
In the whole process of the research, the researcher was dedicated to obey this ethical commitment. The first task is getting permission from the respective or concerned officials and participants of the research. Having obtained consent for the willingness of participants' data was gathered. Respondents were assured that the information collected would be used only for the intended research purpose. All other sources of data and ideas are fully acknowledged.

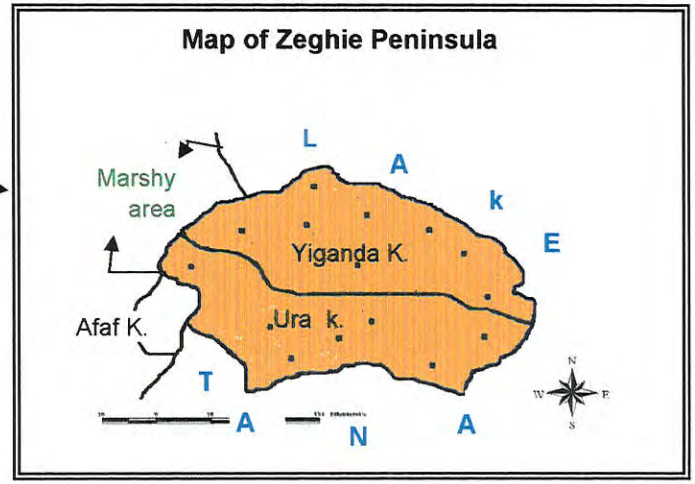
Map. 1

MAP OF STUDY AREA









Source: Adapted from DPPA Arc View data.

Chapter Four

4. Socio-economic Background of the Study Area

This chapter deals with the physical setting of the study area, the people and the land use, demographic structure, the livelihood strategy, occupation and income level, and socio-economic institutions in Zeghie peninsula. Socio-demographic sketch of the households is consisting of age, religion, marital status, family size and level of education.

4.1 The Setting

The study area Zeghie is a peninsula located in North Western part of Ethiopia, Amhara National Regional State, West Gojjam Zone, and 586 km away from Addis Ababa. The peninsula is nearly surrounded by and projected into Lake Tana, specifically situated on the South Western shore of the lake and Northwest of Bahir Dar at the distance of 21 kms inland and 13 kms along the waterway. The peninsula has two rural *kebele*s, Ura and Yiganda *Kebele*s. The two rural *kebeles* are again divided into 15 villages (*got* = smaller unit of residential areas). Afaf is a smaller rural town in Zeghie that serves as a communication and market center for the people of the peninsula and adjacent rural community out side Zeghie.

Previously, the name 'Zeghie' referred to as the inhabitants of coffee farmers of the two *kebeles*, (Ura and Yiganda). However, currently the peninsula along with its rural town (Afaf) is delineated to be satellite town of Bahir Dar city (Berhanu and Shibru, 1993, CARE Bahir Dar, 2001 and *Zikre Hig*, 2003). Zeghie peninsula in the Western direction is connected to the landmass with an open plain, which is a wetland that persists in its quagmire state stretching from June – December in a year.

Lake Tana which is estimated to cover an area of 3600km^2, 70 km long and 60 km wide, and average of 9m depth (CSA, 2005), is the principal source of potable water for the

peninsula. The government marine transportation is running on the lake sailing in different small ports in the peninsula (for tourism activity) and Afaf.

The peninsula has geographic co-ordinations of 37° 19' E and 11° 41' N with an altitude of 1850m above sea level. Based on the climatic zone classification, the area falls within the semi-humid zone representing altitude of 1800-2400m above sea level. The mean maximum temperature is 26.23°C and the mean minimum temperature is 10.36°C. This type of climatic zone is much more conducive for the breed of vectors (mosquitoes) and creates favorable condition for the development of disease causing parasites (plasmodium).

Since the area falls under the climatic zone mentioned above, it has a dry season stretched from November to April. The wet season occurs between May to October (rarely), though the amount of rain in or around May is insignificant. According to CARE Bahir Dar (2001), the peninsula has a mean annual rainfall of 1,521 mm. However, according to the complaint forwarded from farmers, over the past several years, the amount of rainfall has been declining steadily (Berhanu and Shibru, 1993; Selome, 2006 and ANRS, 2004).

Since Zeghie is considered as sacred ground, six famous churches comprise the setting and make the peninsula scenic in giving paramount importance to the attraction of relatively large amount of tourists. Those ancient tourist attracting churches with their great wealth of antiques of the peninsula: Mehal Zeghie Giorgis, Betremariam, Yiganda Tekelehaimanot, Debre Selassie, Azwa mariam, and Ura kidanemihret were founded between 13th and 14th century (ANRS, 2004).

4.2 The People and Land Use

The people of Zeghie peninsula are almost homogeneous in terms of religion and ethnicity. All of them are Orthodox Christians except few Muslims in Afaf *kebele*. All the

people in the peninsula are from Amhara ethnicity. The language they speak is only Amharic. The following table represents the total population size of the peninsula.

Table 4.1: Population and Household size of Zeghie Peninsula

Population Size				Households		
Kebele	Male	Female	Total	Male	Female	Total
Urẓa	1210	1498	2708	336	290	626
Yiganda	1564	2122	3686	542	365	907
Total	2774	3620	6394	878	655	1533

Source: Zeghie Emerging Municipality, 2006

According to the study conducted by the Environmental Protection and Land Use Management Authority of the ANRS and the Emerging Municipality of Zeghie, the two rural *kebeles* of the peninsula have a total population of 6394, of which 2774 are male and 3620 are female.

Because the peninsula was considered as monastery, there is a high concentration of clergymen and significant number of monks and nuns. The peninsula has a total area of 1,304.31 hectares, of which 1,219 is covered by forest including coffee trees. As per the altitude indicated above, the landscape has steep slope (CSA, 2005 and ANRS, 2004).

Though, the peninsula is surrounded by water, irrigation in the peninsula is totally impossible due to the topography of the land. Unless heavy horse power pump is used, it is difficult to utilize the water fully from the lake and capitalize on diversified farming to nourish themselves well. The peninsula is naturally endowed and enclosed by magnificent amount of water resources (Lake Tana), i.e. the widest surface water body in the country. Nevertheless, the only means for the people to secure their water resources is waiting for the annual rain for their farming setup. While the resource is abundant, it is inaccessible for use.

The people in the study area have perennial source of income depending on a single rain season (once a year, no autumn rain). In this case, the people are economically

handicapped and they could not have the capacity to afford different living expenses, including cost of treatment for different types of infectious diseases.

4.3 Demographic Structure

The respondents of age and gender categories are depicted in the following table.

Table 4.2: Age and Gender Structure of Respondents (N = 153)

Male headed HH			Female headed HH	
Age	**Frequency**	**%**	**Frequency**	**%**
25-34	8	5.23	2	1.31
35-44	22	14.38	18	11.76
45-54	26	16.99	22	14.38
55-64	20	13.07	17	11.11
65-74	9	5.88	4	2.61
74+	3	1.96	2	1.31
Total	88	57.52	65	42.48

Source: Survey Data, 2007

Based on the table shown above, from the total sampled respondents male headed households relatively took the upper hand with 88 (57.52%). The remaining proportion is the female-headed household, with 65 (42.48%) respondents. As can be seen from the table, about 135 (88.24%) of the whole sampled family heads are under the economically active age group.

Table: 4.3 : Marital Status of Respondents (N = 153)

Marital Status	Freq.	%
Married	78	50.98
Divorced	15	9.8
Separated	27	17.65
Widowed	33	21.57

Source: Survey Data, 2007

When we look into the respondents' household formation, 78 (50.98%) are married, 15 (9.8%) are divorced, 27 (17.65%) are separated, and 33 (21.57%) are widowed due to different reasons. Average family size of the households is 4.45.

Table 4.4 : Educational Background of Respondents (N = 153)

Level of Education		
	Frequency	%
Illiterate	48	31.4
Church Education	55	35.9
Primary Education	20	13.1
Junior Secondary Education	17	11.1
Secondary Education	13	8.5

Source: Survey Data, 2007

Out of the total respondents shown in the above table, the highest percentage (35.9 %) corresponds to the level of education obtained from informal (church) education, while 20 (13.1%), 17 (11.1%) and 13 (8.5%) represent the level of education of respondents acquired from formal education, i.e. primary, junior secondary and secondary education, respectively. The remaining 48 (31.4%) denote respondents whose level of education is illiterate.

4.4 Livelihood Strategy

The economy of Zeghie peninsula is highly reliant on a small scale cash crop farming, coffee production. To attain other supplementary income generating activity, the people are also growing some different types of fruits, *gesho* and spices, like ginger.

Rearing cattle and tilling the land to grow grains and cereal crops on the peninsula is in fact, prohibited by the clergymen as the peninsula is considered to be a sacred place. According to the prevailing legends, the religious founder of the peninsula, Abune Betremariam in 1307 put anathema for generations to respect for ever (Rahel, 1999).

In a very insignificant level, animal rearing, (only sheep and goats) is also practiced in the area. According to ANRS (2004) each household has an average land holdings 0.85 hectare.

Small-scale poultry, artisanship, traditional beekeeping and traditional fishery also help the people to make additional income for their livelihood. Despite all these income-generating activities, income is barely adequate to cover all their demands. Therefore, to overcome their financial deficiency, as a common practice, those who physically fit are involved in firewood collection and make available in markets, mostly paddling on the lake to Bahir Dar. Since the recent times, the sale of firewood activity is becoming the most important source of livelihood for many people in Zeghie peninsula.

4.5 Occupation and Income

The main occupation of Zeghie inhabitants is farming. According to the information obtained from the survey questionnaire and based on the observation, 100% of the respondents are engaged in farming, through which, residents harvest different types of agricultural productions. However, from the information obtained from focus group discussions, the amount of production harvested every year does not have uniformity in quantity. This is because the farming of Zeghie is mainly rain-fed agriculture which is heavily reliant on the pattern and distribution of the rain. The amount of rainfall has a direct bearing to the amount of the harvest in a year. Therefore, the amount of production varies in the range from 1 Quintal to 15 Quintals in different harvest seasons. The following table shows major products of the farmers of the peninsula.

Table 4.5: Agricultural Production in Zeghie (N = 153)

Types of production	1- 5 Quintal		5-10 Quintal		10-15 Quintal		
	Frequency	%	Frequency	%	Frequency	%	Total HHs
Coffee	103	67.32	35	22.88	15	9.8	153
Gesho	108	70.59	32	20.92	13	8.5	153
Different types of fruits, (citrus fruits, mango papaya,...etc)	133	86.93	20	13.07	0	0	153
Spices (ginger)	148	96.73	5	3.27	0	0	153

Source: Survey Data, 2007

Out of the total sampled households, 103 (67.32%) of them produced an average of 3 quintals, 35 (22.88%) households produce an average of 7.5 quintals, and 15 (9.8%) respondents produce 12.5 quintals of coffee per year. Whereas, for *gesho,* 108 (70.59%) households harvested an average of 3 quintals, 32 (20.92%) of households produced an average of 7.5 quintals, and the remaining 13 (8.5%) of the respondents produced an average of 12.5 quintals of *gesho* per year respectively.

With regard to different types of fruits, from the total respondents interviewed, 133 (86.93%) produced an average of 3 quintals, and 20 (13 .07%) of the respondents produced an average of 7.5 quintals. Finally, while 5 (3.27%) of the respondents produced 7.5 quintals of ginger, the majority, 148 (96.73%) of the respondents harvested only 3 quintals in a year.

In other words, the mean annual productions of a household are presented as: for coffee, 4.96 quintals; for *gesho*, 4.73 quintals; for different fruits, 3.59 quintals; and for ginger 3.15 quintals per year respectively.

Since the peninsula practices rain-fed agriculture, the income generated through such activities is not adequate to feed all mouths in each household in the area. To generate supplementary income, inhabitants of Zeghie are engaged in different types of businesses, such as petty trading, daily labor, selling firewood, artisanship, bee keeping,

poultry, animal raising (i.e. sheep and goats only, in a very minimal scale) while few people depend on remittances.

As far as the name agriculture is concerned, it should relate to a diversified economic activity with crop and animal husbandry incorporated as major activities within it. However, in its existing form, agriculture in Zeghie is far from taking its full context as no animal production is considered and practiced by farmers in the peninsula (see section 4.4). This entails economic impairment, and inhabitants of Zeghie tend to lose the income that had to be secured from the other wing of economic activity (animal husbandry). To compensate this shortfall, the people often need to resort to what they could access, even if it requires hard working, they nonetheless endure the challenge. Therefore, based on the survey result, almost 50% of the respondents are heavily dependant on the income from the sale of firewood.

Though collecting data on income is often difficult, respondents were asked about their estimated amount of annual income at the household level.

Table 4.6: Estimated Annual Income of Respondents (N = 153)

Income Range	Frequency	%
500-1000	31	20.26
1001-1500	49	32.03
1501-2000	38	24.84
2001-2500	14	9.15
2501-3000	9	5.88
3001-3500	8	5.23
3501-4000	3	1.96
4001-4500	1	0.65
Mean annual income of a HH.		**1626.23 Birr**

Source: Survey Data, 2007

As can be seen from the above table, the majority of the respondents about 118(77.13%) fall in the income group ranging from 500 to 2000 Birr per year. Accordingly, the mean annual income of respondents is calculated as 1626.23 Birr/year. The minimum average income is 750.00 Birr and maximum average income is 4250.50 Birr per annum. Such

significant variation, of course, comes from the status of households. No wonder that a household with more economically active family members could employ all available manpower in different activities and earns better. The reverse is true for households with few economically active family members.

To sum up, the community in the peninsula is economically marginalized. According to the information obtained from FGDs, regardless of their age, the people are hard working by nature, and experience diversified economic activities (excluding animal husbandry). Despite the above most important attributes of the community, estimated mean annual income of each household is barely adequate to support their living.

As mentioned earlier, due to the strict condemnation of the first religious leaders in the peninsula, ploughing the land has for long been considered a taboo. This has positively contributed (until the recent past) in maintaining the dense forest and vegetation cover of the peninsula which accounts to more than 75% of its landmass . Nevertheless, there is an open area (considered a common holding) in Ura *kebele* that is commonly used for small scale horticulture cultivation. Interested farmers could work and harvest at least to cover the household consumption during food shortage season in the *kiremt* as well as in spring. However, the local government for fear of deforestation forbids this horticulture activity, since recently. Apart from that, aggression of wild animals never allows them to harvest any foodstuffs. In the peninsula, wild hog, ape and porcupine (a large rodent, families of: *Hystricidae Erethizontidae*) threaten and discourage the people from being engaged in horticultural activities. To uncover and understand the top secret of the living condition of the inhabitants in the peninsula, the researcher decided to take the liberty of eye witnessing to assess their situation on the ground.

Based on the observation the researcher made, almost all inhabitants are leading a miserable life. It was the researcher's intention to do a physical inspection using tallying a certain number of passers-by from the two *kebeles* to the market place. This physical count was taken from two main different streets in two market days.

Two hundred heads (92 male and 108 female) are counted on the first day. On the next market day, tallying was continued and 150 heads (65 male and 85 female) counted. Out of the total 350 physically counted individuals, sadly, only 15 (4.3%) male and 6 (1.7%) female were observed to have been with foot wears (though worn out) respectively. Majority of them put on dirty ragged clothes (*gabi* on shorts for male and *kuta* on traditionally woven cotton dresses for female).

In an effort to explore the fact and authenticate the real causes whether or not it is due to the sanctity, religious obligation and the high regard they have that majority of the people (except few youth) from the peninsula won't put on foot wears, the researcher posed questions to elders and learnt that it was merely for reasons associated with abject poverty that people were compelled to walk bare footed.

The elders further said that the community at large is worst hit by poverty. While substantiating their claim, they stressed, people rely on the cheapest leguminous crop: vetch (*Genus: Vicia*), which is known as *guayya* in Amharic, cereals like maize and millet (*dagusa* in Amharic) as staple food instead of affording a decent and more accustomed foodstuff. This grim reality is a clear manifestation of the poverty situation of the community in the peninsula.

4.6 Socio-economic Institutions in Zeghie Peninsula

Zeghie has a limited number of social service units. Amongst of all, health service is the most indispensable basic institution to address the primary needs of the community whenever they are exposed to different health hazards. In this regard, the Peninsula has one clinic established in 1970 and located in the oldest rural town, Afaf. Recently, in 2003, one health post is also established amidst of the two rural *kebeles* for the sake of providing mainly basic health education to the nearby communities. However, this health post is poorly equipped to render full clinical service to the communities in dire need. Therefore, in most cases people prefer to walk to the clinic at Afaf for relatively better service.

According to the information obtained from the clinic (Afaf), the health service rendered to the community was inadequate due to an increasing pressure over the service from people not only in Zeghie, but also from the residents of Afaf, farmers from the surrounding adjacent rural *kebeles* and from people living in far away farming settings.

With regard to education service, one primary and junior secondary school (from grade 1 – grade 8) and one primary school (from grade 1 – 4) were established in 1945 and later in 2004 respectively. These schools give service not only for the people of Zeghie, rather it includes the community of Afaf and other adjacent rural *kebeles* outside of the peninsula.

Hydroelectric power, telephone (radio-based) and postal services are also available at Afaf for the community of Zeghie and neighboring farming villages. However, due to lack of economic capacity, except the residents of Afaf, the rural *kebele* households are incapable of benefiting from the hydroelectric power and telecommunication services. To support the formerly established waterway transportation, a seasonal road also connects Zeghie to Bahir Dar. The peninsula has a market place for commercial transactions on two different days (Tuesday and Saturday) in a week.

The market is frequently visited by the community of the peninsula and adjacent farming communities even far away from Zeghie. Petty traders from Bahir Dar often come on market days and enjoy doing bussiness.

Chapter Five

5. Socio-economic Burden of Malaria

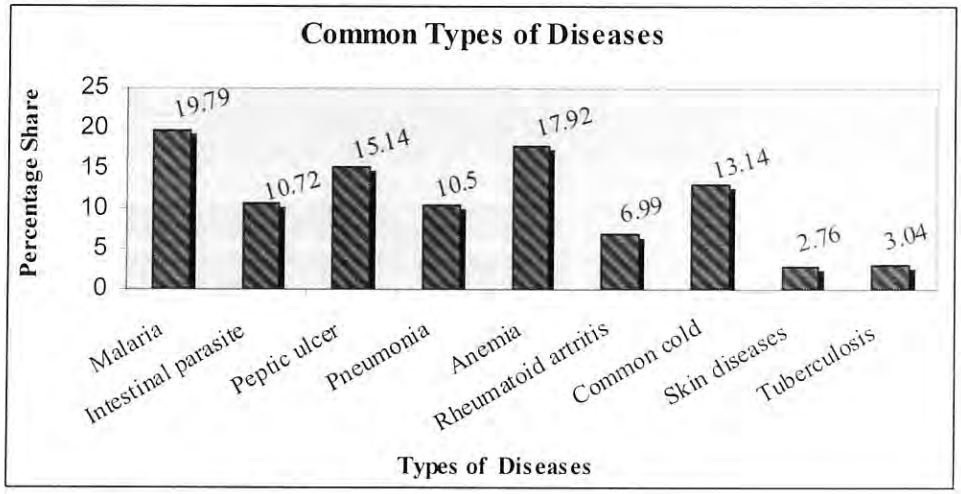
This chapter examines the broadest aspect of socioeconomic burden of malaria in Zeghie peninsula. The most common infectious diseases; perception and attitude of the people towards illness and mode of transmission of malaria; magnitude of the incidence of malaria; and economic, social and cultural burden of malaria are major issues briefly discussed in the chapter.

5.1 Most Common Infectious Diseases in the Peninsula

The community in the study area, Zeghie peninsula is seriously affected by a number of infectious diseases. According to the data obtained from Zeghie clinic, malaria, intestinal parasite (water born diseases), anemia, peptic ulcer, rheumatoid arthritis, common cold, pneumonia, tuberculosis, and skin diseases are among the top nine and most frequent diseases diagnosed in the clinic. The clinical statistics also reveals malaria, anemia, peptic ulcer, common cold and intestinal parasites, (like bilharzias and amoeba), are the upper most severe health problems in Zeghie and adjacent rural *kebele*s.

The following graph shows the frequency of diagnosed people in Zeghie clinic for different types of diseases in the year 2003/04.

Figure 5.1: Frequency of Diagnosed Patients for Different Diseases



Source: Zighie Clinic, 2007

As can be inferred from the above figure, the most important illness was caused by malaria with a total of 2,777 (19.79%) patients who visited the clinic. Indeed, the other diseases like anaemia, peptic ulcer and common cold were also serious health problems following malaria.

On the other hand, according to the information collected from the survey, the prevalence rate of the five most deadly diseases in the past five years in the area were malaria 61 (39.87%) and water-born diseases 35 (22.88%) [see the table below]. Although no treatment and/or assessment has ever been carried out to support and verify the claims with an official data from the clinic, however, 21 (13.73%) informants responded that a large number of people among the community are suspected to be affected with HIV/AIDS. Despite this, the case of HIV/AIDS is not openly regarded as a serious problem within the community except paying lip service and flatter saying "*ya neger eko naw*" (in Amharic it means 'it is that thing') whenever a person physically deteriorates from contracting the virus or passes away due to the disease. This is the most common form of naming HIV/AIDS among peers, neighbours and families where silence dominates to name and shame the cause of the disease by calling it in its real name while no one doubts it is still a serious killer threatening every family in the community.

Table 5.1: The Most Serious Health Problems in the Past Five Years in the Study Area (N = 153)

Is/was there any health problem repeatedly affect the community in your village in the past five years?	Respondents	
Diseases	Frequency	%
Malaria	61	39.87
Waterborne disease	35	22.88
HIV/AIDS	21	13.73
Common cold	27	17.65
Tuberculosis	9	5.88
Total	153	100.00

Source: Survey data, 2007

5.2 Knowledge and Perception of the People about Malaria

The community in the peninsula designates malaria illness as convulsion, fever (*nidad*), evil spirit (*yebereha Zar),* and shivering (*enqitiqit*). Amongst the majority of the communities, the disease is referred as *nidad* in the local term, meaning 'a state of being febrile'.

While stressing the seriousness of the disease and its effect on the livelihood of the people in the study area, Delacollette (2002), associated malaria to be a bottleneck of development in general. It influences all sort of socioeconomic activity in the society. According to the informants' understanding, malaria is a life threatening disease, and obstructing the day-to-day business of every individual. As pointed out in the FGDs the disease is a principal agent responsible for the worsening of the peoples' living conditions which in fact has exhausted their possession of assets.

For the question raised in the survey about the potential cause of malaria illness, the result shows the following profile.

Table 5.2: Relationship between Level of Education and Respondents' Perception about Causes of Malaria Illness (N = 153)

Level of education	Perceived Causes of Malaria							S. Total
	Mosquito	Bad spirit/ Sorcery/ Witchcraft	Hot tempe-rature, (like sitting on hot objects)	Drinking Dirty water	Chewing sugarcane stem/stalk of corn	Cold tempera ture	Bathing with pond water	
Illiterate	6 (3.92)	10 (6.54)	6 (3.92)	6 (3.92)	14 (9.2)	6 (3.92)	0	**48 (31.37)**
Church Education and /or Read and write	30 (19.61)	1 (0.65)	0	0	13 (8.497)	6 (3.92)	5 (3.27)	**55 (35.95)**
Primary Education	1 (0.65)	1 (0.65)	0	3 (1.96)	12 (7.843)	0	3 (1.96)	**20 (13.07)**
Junior Sec. Education	9 (5.88)	7 (4.58)	1 (0.65)	0	0	0	0	**17 (11.11)**
Secondary Education	13 (8.50)	0	0	0	0	0	0	**13 (8.50)**
Total	**39 (38.56)**	**19 (12.42)**	**7 (4.57)**	**9 (5.88)**	**39 (25.49)**	**12 (7.84)**	**8 (5.23)**	**153 (100)**

Source: Survey Data, 2007 **Note:** Numbers in parenthesis () are in percentage

From the above table we can understand the direct relationship between level of education and the perception of the people about the cause of malaria. The better education level an individual has the greater awareness about the cause of illness. In other words, as the level of education increases, level of perception in turn increases.

Accordingly, from the total (153) respondents, 48 (31.37%) of them whose level of education is illiterate, only 6 (3.92%) accepted that mosquitoes are potential cause of malaria, whereas 10 (6.54%) believed malaria could be caused by bad spirit/ sorcery/ witchcraft.

Hot temperature, (like sitting on hot objects), drinking dirty water, and cold temperature have been perceived as the causes of malaria for each of the 6 (3.92%) respondents. Finally, from this same literacy level, 14 (9.2%) respondents believe that chewing sugarcane and/or stem/stalk of corn is another important cause of malaria illness. It could be safely argued that poor educational background curtails peoples' understanding and perception to view the cause of malarial diseases from logical or scientific perspective.

As indicated above, education, be it formal or informal, plays pivotal role to direct or redirect people's attitude and help to have firm stand of rational mentality. From respondents whose level of education is both formal and informal, 53 (34.64%) believed that mosquitoes as biological entities serve as a means to transmit malaria. While relatively smaller proportion of respondents from the same educational background believed that malaria is transmitted due to unscientific way of thinking.

Of course, it does not mean that all educated people could have equal level of thinking. In this case, we can see disparity of level of understandings among people in the same category. Accordingly, 52 (33.97%) respondents, whose level of education is formal (primary and junior secondary education) or informal (of church education) adhered to perceive malaria illness could be erupted by: bad spirit/sorcery/witchcraft, hot temperature, drinking dirty water, chewing sugarcane and/or stem/stalk of corn, cold temperature, and bathing with stagnant/ pond water.

Perception of the people even about prevention is yet under question. From the total respondents, 96.08% of them heard about the use of bed-net. How ever, from those informed respondents, 61.51% were failed to use bed net due to their wrong perception they had for. According to them, in the course of probing the reasons behind the rejection of bed nets was that as the name implies, people in the localities assumed that it could only be used by those who own and sleep on beds and found of little importance to their situation. In view of the fact that, most of them are regularly accustomed to sleeping on the ground and/or *medeb*. In the discussion, it was argued that bed net was worthless for those who did not have bed and mattress (see table 5.12 and 5.13, in appendix I).

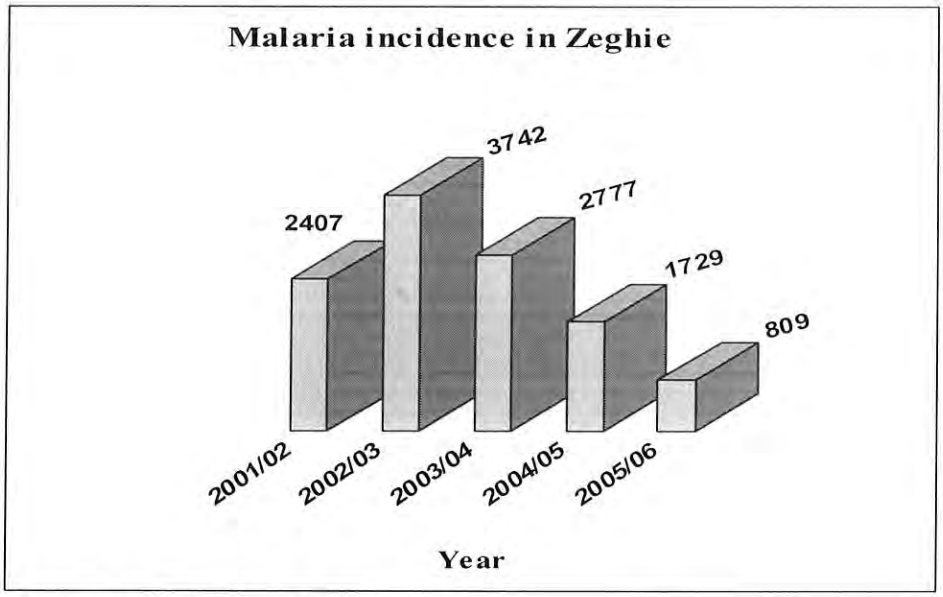
Therefore, this indicates that the attitude of part of the community in Zeghie peninsula yet remains unchanged. In order to bring about changes in perception and attitude, community-based participation in basic health education is of paramount importance and doubtlessly is required to be carried out in a well organized and more sustainable way than before.

5.3 Magnitude of Malaria Incidence

According to the report of the Amhara National Regional State Health Bureau (2007), malaria until the recent years was a very serious health problem in the region. The largest proportion of the area in the region is malaria prone, and majority of the population is indiscriminately at risk of the pandemic. It was indicated that out of the total population (19,611,233) of the ANRS, 15,343,341 are at risk of malaria.

At the local level, the disease has been recognized in the past five years of investigation, out of which especially the first three years were relatively epidemic periods for the study area. The record obtained from Zeghie clinic (in the following graph) authenticates the validity of this argument.

Figure 5.2: Cases of Malaria Diagnosed in Zeghie between the Years 2001/02 - 2005/06



Source: Zeghie Clinic, 2007

As discussed earlier, malaria is the upper most health problem in the community of Zeghie peninsula. With regard to the magnitude of the effect of malaria, different enquiries were explored through the survey. Accordingly, different reactions from respondents were gathered and reviewed in the following tables.

Table 5.3: Malaria Incidence for the Past Five Years (N = 153)

Is there any family member of the family ever been infected by malaria within the past five years and/or currently? How many of them were /are infected? Multiple answers are possible.	Within the past 5 years.		In the current year	
	Freq.	%	Freq.	%
One	41	26.8	32	20.92
Two	26	16.99	9	5.88
Three	31	20.26	3	1.96
Four	24	15.69	0	0
Five +	19	12.42	0	0
Total	141	92.16	44	28.76

Source: Survey Data, 2007

Out of the 153 sample respondents, the total of 141 households were affected by malaria. Anchored in the prevailing fact, within the past five years, at least one family member of the 41 (26.80%) households has been infected with malaria. In the other group, 26 (16.99%) of the respondents were also disturbed by the disease, in which two of the family members in each household have been contracted by malaria.

This shows that the incidence has become tough and serious amongst households. Along with the 31 (20.26%) households surveyed, the report shows that there were three malaria cases in their family. Similarly, out of the 24 (15.69%) households reported, there were four malaria cases recorded in their family. The remaining 19 (12.42%) of the respondents were severely affected by the disease among which more than four family members have been reported to have suffered from the illness. From this picture one can understand that, the immensity of the plague within the past five years was varying from household to household. From the FGDs, it was learnt that the issue was unspeakable challenge for a large number of households during the outbreak of the epidemic. The incidence was severe, until the funeral association (members of *Idir*) exhausted to carry out funeral ceremony (see section 5.4).

On the other hand, even though there are reports indicating that morbidity due to malaria is on the decline in area, however, the incidence is far from over and it still prevails in the peninsula and the nearby localities. Based on the observation during the field visit by the researcher and as the survey results revealed, 32 (20.92%), 9 (5.88%) and 3 (1.96%) of the households currently have one, two and three infected family members respectively suffering from malaria.

In the past five years, the incidence that has struck households of the respective sample is presented as follows. From 141 malarial victim households, 56 (39.72%) of the respondents have caught malaria with a frequency of once a year. While, 66 (46.81%) households suffered from the disease for two episodes in a year, some 19 (13.48%) households endured the relapsed illness three episodes in a year (see table 5.14, appendix I).

* 141 is a number of malaria inflicted households from the total 153 sample size. So the discussion about the effect of malaria was made interims of this figure through out the thesis.

To arrive at the convincing remark about mortality of malaria in the study area in the past five years, a question was addressed to respondents about whether or not the effect of malaria has been fatal on households. The following table describes the response forwarded by different informants.

Table 5.4: Number of Deaths due to Malaria (N = 141)

Is there any member of the family died of malaria? How many?	Yes		No	
	Frequency	%	Frequency	Total
One	30	21.28	111	141
Two	12	8.51	129	141

Source: Survey Data, 2007

A closer look at the above data indicates 30 (21.28%) respondents replied that at least a member of the family had died of malarial illness. Some 12 (8.51%) households regrettably replied that two of their family members had died of the disease.

In what follows, a summary of the feedback from respondents on the trend of severity of malaria in the past five years and the current year is summarized below.

Table 5.5: Degree/Severeness of Malaria Illness since 2001/02 (N = 153)

How is the influence of malaria and how sever it is/was in your family or nearby areas currently and/or in the past 5 years?	Degree of severity	Years of investigation											
		Current Year (2006/07)		2005/06		2004/05		2003/04		2002/03		2001/02.	
		Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
	very sever	0	0	9	5.88	45	29.41	94	61.44	153	100	147	96.1
	sever	3	1.96	53	34.64	84	54.9	56	36.6	0		6	3.9
	rare	61	39.87	88	57.52	24	15.69	3	1.961	0		0	
	not revealed	89	58.17	3	1.96	0	0	0	0	0		0	

Source: Survey Data, 2007

As the table shows, illness due to malaria was very harsh in the years 2001/02 and 2002/03. Above 96% of the respondents assert it was widely rampant in the peninsula as well as the adjacent areas. In deed the incidence remained similar in the succeeding years 2003/04 and 2004/05 in which 94 (61.44%) and 45 (29.41%) respondents also

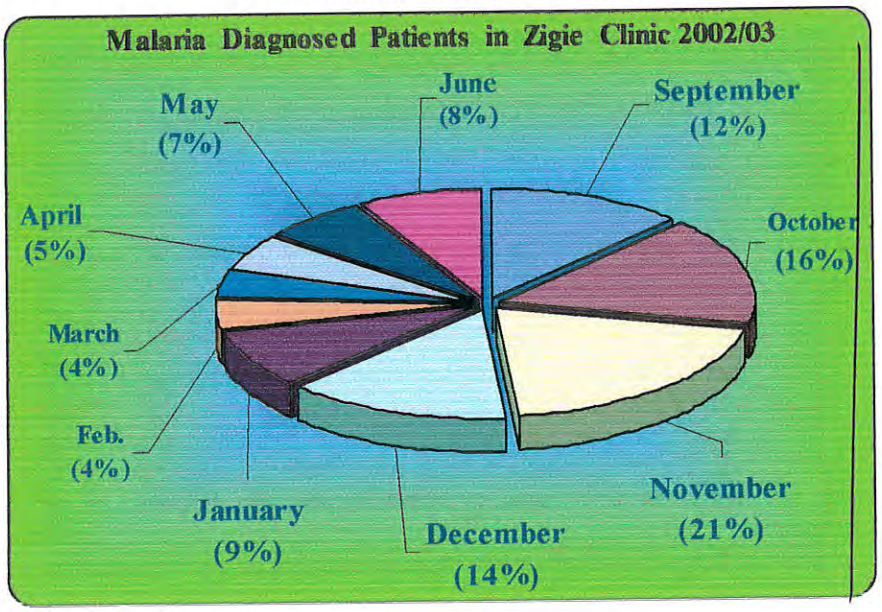
reported as it was very severe. On the other hand, more than half of the respondents, i.e., 84 (54.9 %) of them reported that malaria was severe (in a lesser degree) in the year 2004/05. This shows yet the case has gone down slightly.

Whereas, in the year 2005/06 the highest proportion 88 (57.52%) of the respondents replied the case of malaria remained less severe (rare). To the contrary, 89 (58.17%) of the informants responded that the year 2006/07 was generally malaria free. However, from the above data, it is not debatable that 61 (39.87%) and 3 (1.96%) respondents have responded that the degree of severity of the disease has been rare to severe respectively in the current year. Therefore, it does not mean that the study area and vicinity localities experience malaria free environment at present though the case exhibits a declining trend.

The incidence of malaria in a given locality or region varies from time to time. For malaria endemic areas, the incidence persists almost throughout the year. However, in the case of epidemic, the incidence may occur depending on the favorableness of the season. This means, the more conducive the environment for the breeding of the vector, the higher the chance for malaria outbreak and resulting in plague.

Table 5.15 (in appendix I) shows the seasonal variation and the condition of malaria in Zeghie peninsula. As Chernet and Gebeyehu (2002) assert, the most peak time for malaria transmission is between September and November. Similarly, according to the information obtained from the survey, the peak season in the area was approved to be during spring (as soon as the rainy season ends), which was confirmed by 67 (43.79%) of respondents. Likewise, all other seasons to a lesser or greater extent have a share in favoring the prevalence of the disease. As shown in the following figure, the empirical data from Zeghie clinic also supports the validity of the above argument with an increased number of malaria diagnosed patients during the peak period . This Data illustrates the actual quantitative values registered between months of September and June.

Figure 5.3: Monthly Distribution of Malaria Diagnosis



Source: Zeghie Clinic, 2007

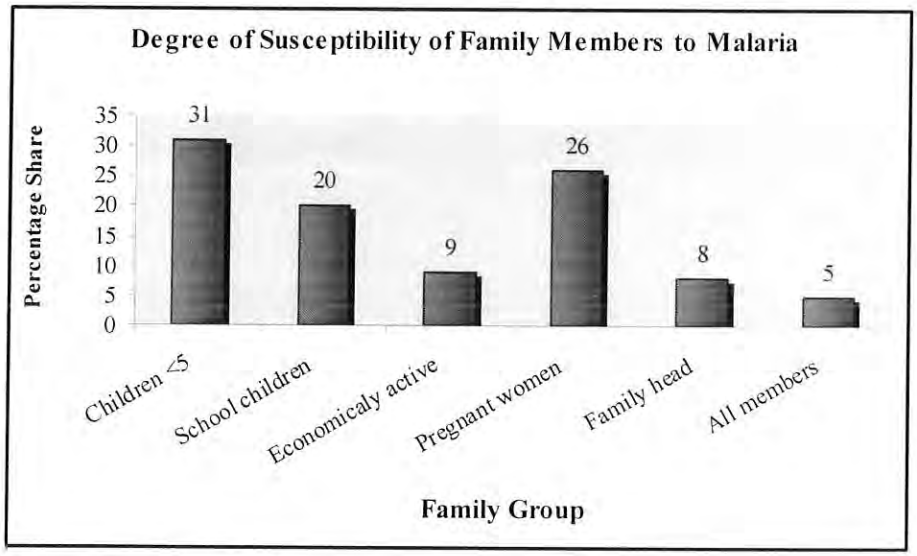
From the above figure, one can easily notice that the area had never been free of malaria incidence throughout the years in the past five years. This implies farmers as well as the community at large have suffered a lot from the effects of malaria and have been traumatized to run their regular and routine activities.

Among the periods considered in this study, 2002/03 could be cited as the worst in malaria transmission. As the informants and results of the in-depth discussions reveal, this specific year has been proved to manifest a highest peak for reasons associated with climatic change. As most of the participants emphasized, the year was a time that great evaporation from the lake has taken place beyond the usual threshold level. The water was reported to have receded for about 13-15 meters from the cost and with its depth decreasing to its lowest ever level to the extent of blocking sailing activities for a limited number of months. While sharing his experiences of the grim realities of the situation by then, one of the elders in the discussion said no one has ever witnessed as worse period as those days. Although recorded temperature data could not be found to support the harsh heat and weather condition experienced during those days, from the discussions made it was learnt that the temperature was extremely high. In addition, the air was said to be incredibly humid which was best environment for the vector to breed more rapidly and incubate

the malaria parasite. As has been elucidated by AMA (2004), the above situation was considered to be the basic reason for the epidemic to reach an intolerable stage.

In the course of the assessment of the extent of the impact of malaria, the degree of vulnerability of the community has been considered. The following graph illustrates the most susceptible members of the family to the disease among the sampled households.

Figure 5.4: Susceptibility of Different Family Group to Malaria



Source: Survey Data, 2007

As shown on the graph, the figures commensurate the claims made by World Economic Forum (2006) which states "the most susceptible group of the family to malaria were children and pregnant women". As it is verified in this study, the general premise held by the World Economic Forum applies and directly corresponds to the situation in the study area.

So, in line with the above grounds, the data shows that 31% of the effect was on children under five. In this regard, such groups of family members are the first vulnerable group exposed to the disease. The second susceptible group was pregnant women accounting for 26%. The third vulnerable family members were school children constituting 20%. Nevertheless, though the degree of vulnerability varies, the disease affected all family members indiscriminately as it is clearly presented on

the graph. This fact in other words signifies that almost the community and its livelihood has been in jeopardy as a result of the disease.

5.4 Economic Impediment of Malaria

The economy of Zeghie peninsula is dominated by agriculture. Hundred percent of residents of the peninsula are farmers by occupation and rely on agriculture as a principal source of income. Indeed, coffee (the well-known cash crop, from Zeghie) is highly dominant in the local market. However, the income from coffee production alone is deficient to cover all living costs due to inconsistent yield from time to time. This is because, agriculture in the peninsula is highly dependent on rain. There is no other means when the rain is erratic. In such cases, farmers would find it difficult and fail to produce enough to cover annual family consumption. Though some additional horticulture productions like *gesho*, different fruits (lemon) and cereal crops (maize, in a very small scale) are grown, still the peninsula suffers from food insecurity at the household level.

Fetching firewood for sell is the major source of financial support to the people in the peninsula thanks to the abundant forest cover which offers a good opportunity for those who enjoy hard working and with the stamina to do it.

Indeed, fire wood collection has detrimental effect on the forest ecosystem and could result in deforestation, which of course could exasperate many environmentalists and other scientists. The potential effect of deforestation obviously is associated with climatic disturbance which entails environmental health problem, like malaria.

On top of that, the villages in the peninsula and its vicinity are malaria-prone areas in which every type of economic and social development is often affected by the pandemic. The inherent problem of malaria is creating barrier for economic progress. Loss of labor, which is the main component of economic development, would inevitably be affected in this case. Loss of labor entails loss of income, which results in loss of assets and savings. It is clear that as health problem increases medical expenses increase and adversely affect household food consumption. Therefore, the people remain poor and vulnerable.

Whenever ill health is inflicted on the society, undoubtedly it requires money to treat the disease. Developing countries in this regard (particularly in Sub-Saharan Africa) are much more affected by a number of infectious diseases in general. As different evidences assert, repetitive endurance of diseases in a given community is a manifestation of poverty since financial constraint restrains prevention and treatment capacity. Besides, malaria and poverty exist in a cause and effect relationship as indicated in chapter two. Given that Ethiopia is one of the developing countries under Sub-Saharan Africa, it is also affected most by infectious diseases, dominantly by malaria.

5.4.1 Cost of Malaria Illness

As mentioned earlier in section 2.3.1 cost of illness is of two types, direct and indirect. Direct cost involves both public and personal expenditure on prevention, vector control, maintaining health facilities, vector-targeted interventions and diagnosis for both parties respectively. The personal cost includes treatment and care associated with the person contracting the illness. Such expenditures are spending on bed nets, insecticides, mosquito repellent lotions, anti malarial drugs, transportation to health care facilities and the necessary supportive cost for the patient and caretakers.

Indirect cost refers to productivity losses associated with morbidity and mortality. In the case of morbidity, it engrosses the wage loss or value of out put associated with lost workdays for each case, panic sale of assets, school absenteeism and delayed investment opportunities. Whereas, in the case of mortality, foregone income is estimated by calculating the capitalized value of future lifetime earnings that would have been earned by those who died of malaria prematurely.

The effect of the disease is not only limited to bedridden households due to illness, but also leads to a complete paralysis of the household economy. If any member of the family gets infected with malaria, it automatically affects the whole household activities. The time spent to take care of a patient is almost equal to the time lost by the patient. This would be a huge and unbearable economic cost to the already depleted economic base of the family and contributes to further destitution.

In the case of the study area therefore, infectious diseases in general and malaria in particular remained cost incurring problem for the community.

5.4.1.1 Direct Cost

With regard to cost of treatment for malaria, (particularly the private/household expenditure) the question about the annual expense of malaria and malaria related treatment was included in the survey questionnaire and data has been collected accordingly. As the result clearly indicates in the following table, the mean annual expenditure for malaria treatment accounted to 130.11 Birr, i.e., 8.68% of the annual income of a household. In the case of indirect cost, it is discussed under section 5.4.1.2 that has been explained inclusively along with the general scheme of workdays lost due to malarial morbidity.

Table 5.6: Cost of Malaria Treatment (N = 141)

How much was the annual expenditure of the household for malaria/ malaria related treatment?	Freq.	%
Birr 1.00 - 50.00	30	21.28
Birr 51.00 - 100.00	21	14.89
Birr 101.00 - 150.00	25	17.73
Birr 151.00 - 200.00	36	25.53
Birr 201.00 - 250.00 +	29	20.57
Mean annual expenditure for malaria treatment was 130.11 Birr per household		

Source: Survey Data, 2007

The summed up individual and/or household cost of malaria illness is a basis to incur cost of treatment at a national level. This fact was manifested on the government's activities in combating the pandemic.

As per the information obtained from the MVBDCD in the MoH the Federal Government through Ministry of Health, has located an amount of US$ 105,764,000.00 for malaria prevention and control activities since the year 2003. This amount of money was donated from the Global Fund. Other sources of budget could not be available in the pertinent department at MoH. On the other hand, according to the UN: Humanitarian News and Analysis (2006), Ministry of Health revealed that

Ethiopia has launched a five-year malaria treatment and prevention plan at a cost of US $447 million in an effort to lessen the burden of malaria. The plan was to provide early diagnosis and treatment services and implement mosquito control measures, including the provision of ITNs and indoor residual spraying. The funds would come from the government budget, the donor community and other partners in the health sector.

When we recognized institutional or government cost allotted for malaria treatment, prevention and control activities, so far is a curious amount if it has to be endorsed for investment.

Therefore, it is sad to comprehend that the cumulative effect of the burden of malaria could jeopardize the future prospect of development endeavors of the nation. It is not difficult to speculate that the country could better prosper if it ought have made significant stride in reallocating the above enormous amount of money spent for the treatment of malaria had there been mechanisms developed to contain the effects of the disease much earlier.

5.4.1.2 Indirect Cost

According to the information obtained from the survey, though fathers, mothers and/or elder son/daughter have relatively equivalent responsibility to provide care and support to the whole members of the family, indeed greater share is shouldered on the head of the household. By the same token, household heads have the added responsibility to carry the brunt of the major economic activities in the family. (See table 5.16, appendix I). The degree of dependability of the household is corroborated by the survey result that 71 (46.41%) respondents replied the decision of majority of economic activities and financial management of a household are geared to husbands. Where as, the remaining percentage is distributed among wives, elder sons/daughters and other members of the family.

An interview with regard to the degree of absenteeism from a day-to-day activity is conducted in order to assess the workdays lost in the households due to malaria illness. Accordingly the result presented in table 5.12 (in appendix I) reveals that

household are forced to lose 2.10 weeks per year on the average give care and support to their under five infected children. The degree of absenteeism in household heads slightly increased to an average of 2.26 weeks in a year when a school aged children fall sick. Furthermore, mean average of 1.99 and 2.00 weeks per year have also been lost to give care and support for malaria infected economically active family members and pregnant women respectively.

In addition, owing to illness of malaria, the family heads themselves, encountered a mean annual loss of 2.15 weeks. In general, it is vividly evidenced that the mean period of time that each household lost due to the pandemic was 11.68 weeks per year.

To calculate the amount of income loss

Mean Annual income of a HH	= 1626.23 Birr
Mean annual loss/absent of labor	= 11.68 weeks
1 year	= 52 weeks

When this loss of labor (which in other words is the indirect cost of malaria illness) is computed into monetary terms, a household fails to earn mean annual income of 365.28 Birr (i.e., 22.46% of the mean annual income) due to malaria illness. Therefore, this is one of the visible burdens of illness that impedes economic improvement at a household level, which at large could contribute to development impairment of a nation. The idea of Wilkes (1997) serves to accentuate the fact from the findings, in which cost of treatment and cost to accompany the caregiver have fallen on the household budget.

As an example, loss of unanticipated capital and/or failure to harvest the entire intended yield to be collected from the field or farm plot is another encumbrance of malaria illness. The mechanisms of labor substitution for the workdays lost due to malaria illness were incorporated in the questionnaire. According to the result shown in the table below, out of 141 respondents who were more vulnerable to the disease, 95 (67.38%) were forced to hire daily laborer for farming activity as well as during the harvest season and 31 (21.99%) respondents used sharecropping.

Table 5.7: Compensation of Work Days Lost Due to Malaria (N = 141)

How do you cover/compensate the work days lost due to malaria?	Freq.	%
Hiring daily laborer	95	67.38
Share coping	31	21.99
Postponing the intended job	15	10.64

Source: Survey Data, 2007

The remaining 15 (10.64%) of the respondents preferred to postpone the intended job rather than using the above options as remedial solution to their situation. Despite the above practice being used, the FGDs were to the opinion that pending agricultural activities until the patients could recover and do it by themselves proved to be inefficient. As mentioned earlier, coffee is the dominant cash crop produced in the peninsula on which the very livelihood of the people heavily relies. Unless this indispensable crop is either harvested on time or left unattended, it is more likely that it would end up in the hands of looters and robbers. Some members of the FGDs have witnessed that the same was true for their supplementary crops like ripened ginger which was due to be harvested. Hence, from the foregoing discussion, no doubt, every one agrees that these inconveniences are the cumulative effects and indirect costs of households attributed to malarial disease.

Respondents were also asked to examine the causative effect of malaria from different angles through whether or not the disease inflicted on the livelihood of the entire community and to know the extent of strain the people have suffered from. In this regard, comparisons have been made between the incidence of malaria and other diseases in table 5.8 below.

According to the result, within the past five years, loss of workdays due to visiting patients was greater by 15.04% for malaria incidence than other diseases. Workdays lost to attend funeral ceremony was also greater by 7.18 % for malaria than other diseases. In addition to the response from the survey questionnaire, explanations from FGDs provided evidence that people dying of malaria was much more substantial than those who died of some other diseases. For instance, the discussion held with people living in Gami *village* revealed that during the peak period of malaria transmission, in the months of November 2002/03, more than three persons were dying per day in the

kebele. The epidemic was so serious and showed no signs of abating to the extent that people were pending burial ceremonies to the next day due to the high rate of deaths per day and time constraints to accommodate funeral procession.

The recurrence of malaria-prompted death and often its distressing impact has time and again raised the concerns of members of the executive committee of *Idir*. These conditions have left them with no option but to grumble about the cost of funeral as the asset of the *Idir* has been exhaustively consumed. As can be seen from the table below, the cost of funeral for malaria alone was almost equivalent to the cost of other cases brought together. The degree of exasperation among respondents over malaria disease and its effect was found to be more or less similar to that of the distress accounted to all other cases. For instance, respondents who were exasperated by the funeral cost of malaria accounted 76 (49.67%), where as the response to other cases all together was 77 (50.33%).

Table 5.8: Influence of malaria on Neighborhoods (N = 153)

Have you ever been faced a problem from neighbors and relatives as a causative effect of diseases in the past 5 years and currently? To what extent?	Malaria		Other diseases	
	Frequency	%	Frequency.	%
Loss of work days to visit the patients	88	57.52	65	42.48
Loss of work days due to funeral Ceremony	82	53.59	71	46.41
Loss of money to cover funeral cost	76	49.67	77	50.33

Source: Survey Data, 2007

5.5 Social Burden of Malaria

The social burden of malaria remains an elusive concept. It is an intangible entity that lacks universal consent to be measurable and quantifiable. It is, however, a process that can be understood and linked to outcomes of health problem such as morbidity and mortality. The effect of the burden could be seen from cost of treatment as well as cost of deaths either directly or indirectly. Education performance which is a major social element was also affected by malaria. Hence, this sub-section presents the

consequence of malaria illness to education and impact on household health in particular and national health budget in general.

5.5.1 Impact on a Household Health and on the National Health Budget

In many instances, illness could end up (even after cure) retaining some veiled consequences. For this sake, respondents were asked if there was any health problem inflicted on the community as aftermath of malaria infection. The result showed that out of the 141 respondents, only 12 households did not experience any consequence after recovery from malarial infection, while the majority (129 households) confirmed that they have suffered from varieties of consequences due to malarial infection.

As one of the health staff confirmed, 20 (14.18%) of the inflicted households have experienced anemia, 24 (17.02%) households unfortunately endured visual impairment and greater proportion of the respective respondents 26 (18.44%) have developed hearing impairment. Under nourishment (due to loss of appetite), gastric problems, partial body damages and epilepsy were also among the end result the recovered patients sustained due to malarial infection (see table 5.18, appendix I).

5.5.1.1 Malaria in Pregnancy

As it is pointed out in sub-section 5.3, although malaria affects all community members indiscriminately, the degree of the effect on children and pregnant women is relatively more acute. Pregnancy compromises women's immune systems and makes them more vulnerable to malaria infection and therefore increases their need for adequate malaria prevention and treatment.

Why does malaria remain severe in pregnant women? According to the mentality and belief among the community, fever (the most frequent symptom to malarial infection) is perceived as a normal sign of pregnancy and if subjected to chloroquine treatment it could provoke abortion. In addition, economic factors within the household where the power to make economic decisions entirely is dominated by the male, women are

deprived of cash or any asset that could be spent on treatment thus further compounds the problem. (see Table 5.16, appendix I). Inadequacy of the formal health system to provide and the women's reluctance or inconsistent behavior to visit clinics for antenatal care in the course of pregnancy could also be cited as additional reasons.

On the basis of the above experience, another concomitant problem of malaria illness often resulted in complicating pregnancy. In this condition, respondents were asked if the problem endured the respondents' family and/or their neighbors. According to the response obtained from the survey (see Table 5.9), the majority of the interviewees, 62 (40.52%) replied that in most cases low birth weight has been reported as the most outstanding effect of malaria on pregnant women.

The effect of malaria is remarkably blamed for its life threatening reputation alike HIV/AIDS, and it is principally responsible for the loss of considerable lives in developing world, particularly in Sub-Saharan Africa. Likewise, Ethiopia in general, Bahir Dar Special Zone of the Amhara National Regional State in particular has been experiencing severe malarial epidemic since the recent past. As respondents in Zeghie confirmed, 16 (10.46%) reported the occurrence of maternity deaths, while 26 (16.99%) of the interviewees replied the incident of prenatal deaths. Whereas, the remaining respondents 41 (26.80%) comprehended that the effect of malaria has resulted in induced abortion. Thus, the finding vividly supports that infants, children and pregnant women were more susceptible to the disease more than any other person.

In this regard, key informant interview played crucial role to assert that all the above effects were directly correlated to malaria.

Table 5.9: Effect of Malaria on Pregnant Women (N = 153)

Do you remember any malarial effect imposed on a pregnant woman in your family and/or the near by neighbors? What were the incidences/effect?	yes		No	
	Freq.	%	Freq.	%
Having low birth weight	62	40.52	3	
Having still birth	26	16.99	2	
Induced abortion	41	26.80	1	
Maternity death	16	10.46	2	
Others:	0	0.00		

Source: Survey Data, 2007

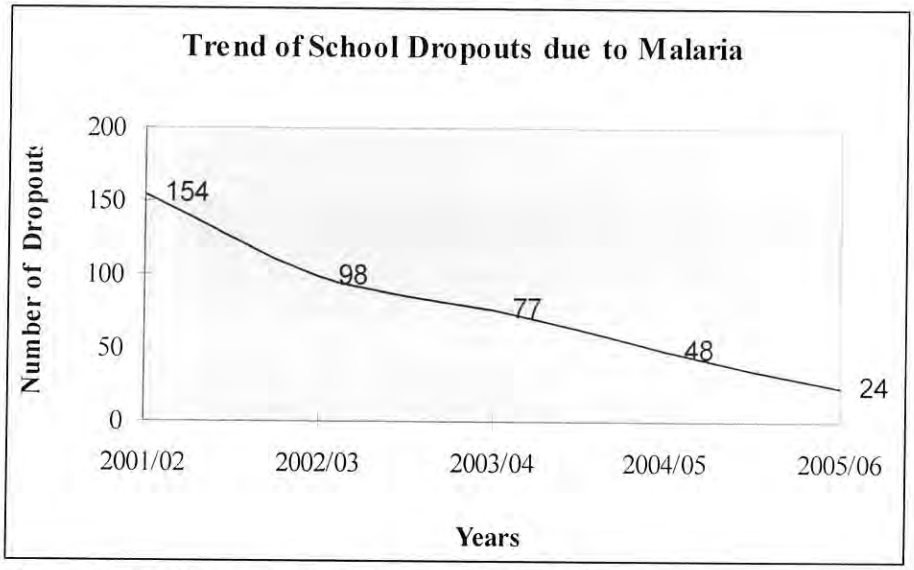
5.5.2 Impact of Malaria on Education

Young children bear a considerable burden in terms of malaria morbidity and mortality more than adults do. Although this morbidity is mostly concentrated among pre-school children, school-aged children also suffer from the effects resulting in school absenteeism. Indeed, not only health problems like malaria worsen school performance. The economic as well as educational background of a family also has significant stake and contributes a lot to school performance.

The adverse effects of the disease on schooling are likely to go far beyond the number of days lost per year. As absenteeism increases, the probability of repetition and dropout also increases. Intervention of the disease on education is contended with obstructive phenomena for development in its long-term effect as education plays a pivotal role in any sort of development endeavors.

In this connection, secondary data was reviewed to reveal the real effect of malaria on education performance in the study area. As we can see from the figure below, school dropouts due to malaria incidence were recorded for the past five years in Zighie junior secondary school. Though, the figure shows a declining trend of the disease, indeed the incidence has inflicted devastating school performance in the recent past.

Figure 5.5: School Dropouts in Zeghie Due to Malaria



Source: Zeghie Elementary & Junior Secondary School, 2007

Respondents were also asked about how the problem of malaria inflicts school performances (absenteeism and drop outs). However, regarding to dropouts, the question was administered to see comparatively the effects of the two variables (malaria on one hand, and financial and other problems on the other) as factors affecting school dropouts.

From 141 households who were affected by different malaria episodes, 105 households confirmed that school children of their family members had experienced school absenteeism. According to the information provided by 105 households, schoolchildren of the 26 (24.80%) respondents suffered from 2-3 weeks of school absenteeism, which is almost equal to that of the mean average week of absenteeism. Even though, it is difficult to get accurate data about school absenteeism of the past five consecutive years, from what the respondents could remember, the researcher attempted to roughly gather information which is presented on table 5.19 (appendix I).

Following to school absenteeism, school dropouts were also reported in the table below. Seventy-five households reported that their children were dropped out for various reasons. The extent of malaria did not show significant differences when

compared to some other factors. Out of the total school dropouts assessed by the survey, about 56% attributed to the effect of financial and some other problems, while the remaining 44% were associated with malaria. From this, we can deduce that the effect of malaria on school performances in the study area is considerable.

Table 5.10: School Drop-Outs (N = 75)

Is there any school drop out(s) from the family member due to malaria related problems and other factors? How many are they? Multiple answers are possible	Malaria		Financial and other Problems	
	Freq.	%	Freq.	%
	33	44.00	42	56.00

Source: Survey Data, 2007

5.6. Influence of Malaria on Cultural Context

Since the study area has a rural set up, variety of diseases are rampant. Seasonal and/or stable diseases could result in economic insecurity and social dissatisfaction. In line with this, respondents were asked about the influence of different diseases in deepening poverty in the longer term and up setting the community for a short-term food shortage. The feedback is summarized in table 5. 20 (appendix I).

As a result of different health problems, like HIV/AIDS, TB, malaria, water-borne diseases and rabbis (less rampant), the people were facing challenges and have been put into persistent poverty. Out of 153 respondents, 52 (33.99%) replied malaria was found to be the most serious health problem aggravating poverty and increasing people's vulnerability in the area. Again, according to the interviewees, HIV/AIDS was blamed by 46 (30.07%) of the respondents. In the case of HIV/AIDS, though it is incomparable with any other disease in its lethal power, it is not an open issue alike malaria in the area. But it was reported that it stands as the second potentially fatal disease next to malaria (see table 5.20, appendix I).

Taking into account the above premises, out of the 153 interviewed households, 73 (47.71%) anathematized malaria as a pushing factor for the workforces to leave their home and migrate to some other places. Again out of the 73 households, 56 (76.71%)

of them responded that economically active family members migrate to search for better treatment (see Table 5. 21 & 5. 22, appendix I).

When these 56 households were asked, whether they have information about the out migrant family members, how and where they live, 13 (23.21%) of the respondents reported as their family members were working as bar ladies far away from Zeghie, but were not able to trace and/or could hardly say any thing about their current situation. The other 19 (33.93%) of the respondents replied, their out-migrant families were daily laborers in Bahir Dar town and the remaining 24 (42.86%) responded that they had no clue on the whereabouts of their out-migrant family members.

As mentioned above, since the work force of the community in the study area has been traumatized by the influence of diseases in general and malaria in particular, the value that the society adhered to has been disrupted. Since, the people in the study area have strong ties with spiritual values, strict religious practices are the persistent norm of the setting. In view of this, respondents were asked if any religious or cultural taboos have been violated due to the influence of the disease. According to the result shown in Table 5.11, out of the total 153 respondents, 95 (62.09%) violated and avoided fasting days/seasons.

According to the FGDs, the reason for the observed deviation from the norm (violating religious practice) was attributed to withstanding the infection that could ultimately help the patient to developing resistance against the disease. Such effort was highly recommended. This is indeed helpful as a preventive mechanism. Whereas, for those who were under treatment, since they had to feed themselves early in the morning, they were forced to avoid fasting and at the same time it is understood that well nourishing is part of self-treatment.

Table 5.11: Violation of Cultural/Religious Value due to Malaria Illness (N = 153)

Is there any cultural/religious taboos violated by the member of the community due to the influence of the disease malaria (like worsening poverty)?	Freq.	%
Disrespecting fast days/seasons	95	62.09
Changing food culture like feeding on pork. etc. which entails cultural/religious restriction	24	15.69
Becoming commercial sex worker	34	22.22

Source: Survey Data, 2007

On the other hand, 24 (15.69%) of the respondents provided their witness that though on a few occasion, during severe economic crisis in the past, cultural as well as religious restrictions have been violated by hunting the wild pig and feeding the pork. However, in the FGDs, a group of few people did not agree to attribute this act to the influence of malaria and some other diseases, but rather considered it as the work of deviant youth. The remaining portion of 34 (22.22%) of the respondents replied the result was to be engaged in the making and selling of local brewer (*comarit*) and a complete shift in livelihood involving commercial sex in the small rural town, Afaf.

Repeated episode of any type of disease intervenes in the normal course of any type of activity. Doubtlessly, social and cultural as well as economic crisis would be the result of ill health atmosphere. This event is actually happened in the study area due to the encumbrance of malaria posited on the community. So, malaria is a responsible factor for the cultural setback of the Zeghie community. Provided that a shift from a settled type living to commercial sex worker in particular and eviction of people to some other places in general have been transpired due to malaria illness. Violation of religious restriction is also additional manifestation for the influence of malaria in the setting.

From the above findings, the researcher recapped that economic, social and cultural development of a given nation is determined by the healthy atmosphere to manipulate all available resources. Even in the presence of other fertile ground, economic performance may be affected if health situation failed to be maintained. In the prevalence of diseases, remedial measure is obvious so as to get ride off the obstruction. This in one-way or another incurs cost. Population movement to escape from the encountered health problem at home may end unanticipated social and/or cultural complication at the destination of the migrant.

Chapter Six

6. Conclusion and Recommendations

6.1 Conclusion

This research work has intended to reveal the burden of malaria in terms of economic, social and cultural aspects on the communities of Zeghie peninsula and the near by rural residential areas. To study the impact of malaria on the setting, both quantitative and qualitative methods were employed to generate data for the study. Primary data were gathered through household survey, focus group discussions, key informant interviews, and field observation. In order to support the data from the primary sources, both published and unpublished documents as a secondary source of information were reviewed.

Although various infectious diseases are more rampant in the study area, malaria is found to be one of the most serious diseases which cause morbidity and mortality. Many households endured the relapsed illness and suffered from frequent episodes in a year. Especially, during the peak epidemic year, households missed their family members due to the illness.

There are multiple channels by which malaria impedes development, including effects on fertility, worker productivity, medical costs, premature mortality, and absenteeism. Though the community had chance to see better days about the trend of the incidence, yet the effect persists in the area to some extent. The burden contributed for the worsening of poverty in which it affects the economic, social and cultural development in the settings.

The burden of malaria incurred costs directly expend for prevention as well as treatment to malaria related problems. Significant periods of time that has lost due to morbidity either by the patient him/herself or care takers were also accountable for the indirect cost of illness. Social burden of malaria exerts pressure on education performance and health

of the people indiscriminately. The effect of malaria on school performance has envisaged in *Zeghie* primary and junior secondary school. Despite the fact that, the influence showed a declining trend, a number of students have suffered from absence frequently and were forced to drop their schooling.

Low birth weight, still birth, induced abortion, and maternity deaths were other major social burden of malaria illness. Besides, many people in the peninsula experienced anemia, visual and hearing impairments, under nourishment, gastric problem, partial body damage and epilepsy.

Malaria is denounced for its responsibility to break the people's cultural construct and religious value. To escape from the trap of the illness and to get better treatment, respective number of people in the study area has migrated to the nearby city, Bahir Dar and some other places, which in turn, exposes them to unanticipated different social problems at their destination. This traumatizing effect of the disease imposed on the community has basically disrupted their cultural as well as religious values.

On the other hand, inaccessibility and unavailability of health facilities and inadequacy of health service exacerbate the influence of the disease on the communities in the peninsula and the nearby localities. The distance of the health facility from homesteads determines to instigate or encourage the needy people to visit health facilities. What ever the case revealed serious, people who live far away from the clinic refrain to travel frequently for treatment, rather they preferred home based therapy and looking for traditional healers. Another major problem in which people still complain is the absence of the vertical/independent sector for prevention and control of malaria. While the area is well known in its malaria proneness, it has given little attention which creates grievance in minds of many. Having said all the above points, the author hoped that this thesis can stimulate further research under this field.

6.2 Recommendations

On the basis of these research findings, the following recommendations are forwarded for future intervention in reducing the socio-economic burden of malaria:

(i) Although malaria challenges the health of all communities, the rural people are the most vulnerable groups of the society. This is due to inaccessibility of rural poor to adequate/affordable health service delivery as well as lack of well equipped health facilities and effective basic health education. For instance, the health staffs of the clinic in the study area are not proportional to the community who potentially needs service. Malaria prevention strategy was not community participatory based, i.e., ITNs were not distributed in accordance with peoples' capacity to afford. Indoor residual spray was not undertaken regularly by committed technicians ahead of the peak epidemic year, and basic health education is conducted without incentives. Therefore, these require reconsideration in:

- improving the health staff - service recipient ratio,
- making bed nets and anti-malarial drugs available with affordable costs,
- a way of early detection and regular basis as need arises, and
- providing basic health education using incentives, because due to the level of awareness of the rural community reward stimulates their participation

(ii) Costal areas often are prone to malaria infection. In the realm of this situation location of the peninsula play a part to put the people at risk of malaria, especially the Western border of swampy land mass that persists for a number of months in its quagmire state. This was discovered to be the most potential mosquito breeding site and made the area malaria endemic. At the same time due to the peninsula considered as sacred ground, no even horticultural

activities are allowed and being able at least to harvest seasonal food staff. Therefore, it requires designing a strategy to facilitate the marshy land for farm land from which the community of the peninsula could cultivate different crops. This in turn has double purposes. On the one hand, source reduction of vector breeding would be in place, on the other hand the community of the peninsula can benefit from the horticulture production.

(iii) The people of Zeghie are subsistence farmers in which the yield often is insufficient to cover all necessary expenses of a family. To support this prevailed deficit, most of the residents are engaged in fire wood collection for sale. Cultivating the land is completely forbidden by the local authorities for fear of deforestation, but lops of trees for sale is paradoxically exempted. Of course, cultivation and cutting down trees for firewood (disregarding the consequence) with no substitution contributes much for deforestation, which in turn causes ecological disturbance (in-put for global warming) and environmental health crisis, such as malaria. Thus, effort must be done to save the forest, maintain the balance of the ecology, and to keep the people beneficiary in the following suggestions:

- capacitating the community to exploit the water from the lake using water pump and irrigating the coffee trees to harvest adequately, rather than waiting for the annual rain water only.
- facilitating off-farm income generating activities, like organizing the community in modern fishing scheme; since Lake Tana has good potential fish resources.

(iv) Distance of residence areas from health facilities affects malaria transmission. From the finding it was noted that people who reside far away from the clinic preferred home based treatment and resorted to traditional healers. Therefore, well equipped health posts need to be established at the nearest possible proximity. Other wise, mobile out reach health service program must be

introduced, so that distant areas could benefit from the service which makes the service closer to the client.

(v) In the peninsula, the knowledge about prevention and control of malaria is not uniformly disseminated. Even there are people who do not know what bed net means. As to the information gap encountered in the area, 'bed net was perceived as a material necessarily accompanied with 'sleeping on bed'; with out bed it had nothing to do to protect mosquito contact'. Thus, such groups of people have failed to use the net for several years. Therefore, basic health education must be provided more vigorously than has been done before to the entire community. In addition, school health program need to be promoted and be offered to students to at least enable them to inculcate the basics of health education in the minds of their parents.

(vi) Since health and poverty are closely linked, reducing the burden of malaria contribute in improving the economic, social and cultural well-being of communities. Malaria and vector-born diseases control program need to recognize these links and identify mechanisms for ensuring that the poorest segment of the population calls for to have access to essential health interventions

Nonetheless, these days, as a result of a relatively increase in the level of awareness of the community about the prevention and timely treatment measure to intervene the pandemic, the effect of malaria seemed to be decreasing. However, there is still a need for further intervention towards minimizing the risks associated with the disease.

Finally, controlling malaria is therefore, one way of improving human development and fighting poverty in the study area in particular as well as in the country in general. Hence, the issue of malaria as a development problem must receive a considerable attention.

References

Abdulhamid B. Kello (1995) "The Effects of Malaria on Peasant Production: a case study from Two Ethiopian Villages". *Ethiopian Journal of Development Research, Vol. 17, No. 2.* Addis Ababa: Addis Ababa University.

AMA (2004) *Five year Strategic Plan of Anti Malaria Association.* Addis Ababa. AMA.

ANRS (2004) *A Preliminary Study of the Problems and Suggested Solutions about the Natural Forest Degradation of Zeghie Peninsula (unpublished Amharic version).* Bahir Dar: ANRS.

ANRS (2007) *Annual Malaria Review.* Presented in the Workshop, Nazareth, January, 2007. (Unpublished). Bahir Dar: ANRS.

Berhanu Erko and Shibru Tedlla (1993) Intestinal Helminth infections at Zeghie, Ethiopia, with emphasis on schistosomiasis mansoni. *Ethiopian Journal of Health Development, Vol.7, No.1.* Addis Ababa: Addis Ababa University.

Biscoe, M. L. et.al. (2004) *Current Policy and Status of DDT Use for Malaria Control in Ethiopia, Uganda, Kenya and South Africa.* Working Paper 95. Durham, North Carolina: Duke University.

Blackie, W. K. (1950) *Child Health in Warm Climates.* London: Longmans.

Briggs, P. (1995) *Guide to Ethiopia.* Old Saybrook, CT: Globe Pequot Press.

CARE Bahir Dar (2001) *Zeghie Peninsula Baseline Survey: Final Report.* [Unpublished]. Bahir Dar: Care Bahir Dar

Chernte Tilahun and Gebeyehu Wegayehu. (2000) *Data on the Short History of Bahir Dar and Development*. Bahir Dar: The Bahir Dar Special Zone Office.

Clarke, S.E., et. al. (2002) *Malaria Morbidity Among School Children Living In Two Areas of Contrasting Transmission In Western Kenya.* [Unpublished]. Nairobi: MoH.

CSA (2005) *Statistical Abstract*. Addis Ababa: CSA

Delacollette, C. (2002) *Prevention and control of malaria epidemics*. Geneva: WHO.

The Economic and Social Burden of Malaria; retrieved at: http://www.rbm.who.int/cmc_upload/0/000/015/330/415680a_r.pdf.

Encyclopaedia of Public Health: at http://www.answers.com/topic/theories-of-health-and-illness

Getnet Mitikie, et.al. (2004) *Module on Malaria for the Ethiopian Health Center Team*. Gondar: University of Gondar

Ghebreyesus, et. al. (1999) *Incidence of Malaria among Children Living Near Dams in Northern Ethiopia: Community Based Incidence Survey*. [Unpublished].[n.p].

Gould, J. and Kolbo, W. L. (1964) *Dictionary of Social Sciences*. New York: The Free Press of Glencoe.

Green, E.C. (1999) *Indigenous Theories of Contagious Disease*. New York: Altamira Press.

Helman, C. (2000) *Culture, Health and Illness*. 4th ed. New York: Hodder Arnold.

Kilman,W. (1994) *The War Against Mosquitoes and Mosquito Born Diseases in Tanzania.* Dar es Salaam: Dar es Salaam University Press.

Korenromp, E. (2005) *Malaria Incidence Estimates at Country Level for the Year 2004: Proposed Estimates and Draft Report.* (For the RBM Monitoring and Evaluation Reference Group & MERG Task Force on Malaria Morbidity). Geneva: WHO.

Lelisa Senay. (2005) *Economic Cost of Malaria in Kerssa District. Jimma Zone, South West Ethiopia.* Addis Ababa: Addis Ababa University

Meek, S. et.al. (2001) "The evidence base for interventions to Reduce Malaria Mortality in Low and Middle-Income Countries". *CMH Working paper Series: Paper No. WG5: 6.*[n.p.]: CMH.

MoH (2005) *Health and Health Related Indicators, 1997 E.C. 2004/05.* [Unpublished]. [n.p.]: Planning and Programming Department

MoH (1999) *Malaria Prevention and Control in Pregnancy.* Addis Ababa: MoH.

McGraw-Hill (1982) *McGraw-Hill Encyclopedia of Science and Technology. Vol. 8.* New York: McGraw-Hill Book Comp.

Marten, G. (2001) *Human Ecology.* Glasgow: Bell & Bein Ltd.

MoH (1983) *Guidelines to Malaria Control Program in Ethiopia.* Addis Ababa: MoH.

MoH (1999) *Guideline for Malaria Epidemic Prevention and Control in Ethiopia.* Addis Ababa : MoH

Najera, T. et. al. (1998) *Malaria epidemics: detection and control for casting and prevention.* Geneva: WHO.

Prothero, R. M. (1965) *Migrants and Malaria.* London: Longmans.

Rahel Mesfin (1999) *Zege and its Coffee Local Livelihoods and Natural Resource Utilization in Northwest Ethiopia: the case of Zege Peninsula.* [Unpublished MA Thesis]. Addis Ababa: Addis Ababa University.

Senay Gabriel and James, V. (2005) *Developing a Malaria Early Warning System for Ethiopia in Twenty-Fifth Annual ESRI International User Conference Paper No. UC2409.* San Diego: ESRI.

Selome Mekonnen. (2006) *Hydrological Variations due to Land Use Change Using Remote Sensing/GIS: A Case Study of Lake Tana Basine.* (MA Thesis). Stockholm: KTH - Royal Institute of Technology.

Sherman, I. W. (1998) *Malaria: Parasite Biology, Pathogenesis, and Protection.* Washington, D.C.: ASM Press.

Sills, D. L. (1968) *International Encyclopedia of the Social Sciences.* New York: The Macmillan Company.

Steketee, R.W. et. al. (2001) "The Burden of Malaria in Pregnancy in Malaria-endemic Areas". *American Journal of Tropical Medicine and Hygiene. Vol. 64, No.1.*

Tebaber Chane. (2006) *A Socio-cultural Study of the Cause, Transmission, Prevention, and Treatment of Malaria: The Case of Debre Elias Woreda, East Gojjam Zone, Amahara National Regional State.* [Unpublished MA Thesis]. Addis Ababa: Addis Ababa University.

_____ (2005) *The New Encyclopedia Britanica. Vol. 5.* London: Encyclopedia Britanica Inc

UNEP (2002) *Africa Environment Outlook: Past, Present and Future Perspective.* Nairobi: UNEP.

USAID (2003) *Ethiopia – Complex Health/Food Insecurity Emergency: Fact Sheet for the Fiscal Year 2004.* Washnigton, DC.: USAID.

USAID (2005) *Ethiopia Food Security Update. Famine Early Warning System Network Newsletter.* Washington, DC.: USAID.

Wilkes, et.al. (1997) *Coping With the Costs of Severe Illness in Rural China. Institute of Development Studies Working Paper No. 58.* Brighton: Institute of Development Studies.

WHO (1998) *Press Release, /77.* Geneva: WHO.

WHO (2006) *Flooding and Communicable Diseases: Risk Assessment and Preventive Measures.* Retrieved on: ttp://www.who.int/hac/techguidance/ems

WHO (2003) *International Travel and Health.* Geneva: WHO

WHO/UNICEF (2003) *The Africa Malaria Report 2003.* [n.p.]: World Health Organization/ UNICEF.

WHO and UNICEF (2005) *World Malaria Report.* Geneva: WHO and UNICEF.

World Economic Forum. 2006. *Business and Malaria: A Neglected Threat*? Geneva: World Economic Forum.

World Bank (2005) *Rolling Back Malaria: Global Strategy and Booster Program.* Washington, D.C.: The World Bank.

http://en.wikipedia.org/wiki/Malaria

http://www.who.int/countries/eth

http://www.dream.ride.org/cause.html

Appendices

Tables

Table 5.12: Bed Net Usage (N = 147)

If you heard about the importance of mosquito/bed net, did you use it regularly and effectively for the past 5 years?	Yes	%	No	%
	43	29.25	104	70.75

Source: Survey Data, 2007

Table 5.13: Reason Not to Use Bed Net (n = 104)

If you do not use bed net what is your reason?	Freq.	%
Un affordability of the cost of the bed net	40	38.46
Inadequate perception we had for the net (not-user-friendly)	64	61.54
Total	104	100

Source: Survey Data, 2007

Table 5.14: Frequency of malaria episodes in households (N = 141)

What was the frequency of the incidence of malaria in your household?	Frequency	%
Once a year	56	39.72
Twice year	66	46.81
More than twice a year	19	13.48

Source: Survey Data, 2007

Table 5.15: Seasonal Variation of malaria Occurrence (N = 153)

Which season is peak time to spread malaria in your localities or the nearby areas and by which the community suffers a lot?	Frequency	%
During *bega*	22	14.38
At the beginning of *kiremt (autumn)*	26	16.99
During *kiremt*	20	13.07
As soon as the *kiremt* season is over (in spring)	67	43.79
Others, specify: (throughout the year)	18	11.76

Source: Survey Data, 2007

Table 5.16: Economic Decision in the Family (N = 153)

Who has a decisive role in economic activities and financial management in the household?	Frequency	%
Husband	71	46.41
Wife	28	18.30
Elder son/daughter	23	15.03
Husband and wife	31	20.26

Source: Survey Data, 2007

Table 5.17: Malaria Infection of the Family and Absenteeism from Day-To-Day Activity

When ever the family member gets sick with malaria how many weeks in average per year were you off/absent from your formal activity/ business in order to provide care and support to them and if you might have got infected? Multiple answers are possible.

(* female headed households and a households that do not have children under 5 are excluded for this particular enquiry)

Infected family members	Periods stayed off/absent from day-to-day activities												Remark
	0-1 weeks		1-2 weeks		2-3 weeks		3-4 weeks		4-5 weeks		5-6 weeks		
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	(No. of hhs.)
Children < 5 *	21	27.6	17	25	10	13.16	12	15.79	11	14.47	5	6.58	76 (2.36)
School age children	44	28.76	29	20.3	35	25.5	22	15.03	13	8.50	10	6.54	153 (2.25)
Economically active	39	29.4	31	25.5	30	19.6	28	16.99	17	8.5	8	5.23	153 (2.35)
Pregnant women *	28	21.3	33	26.5	26	20.6	24	17.65	19	13.97	6	4.41	136 (2.43)
the household head him/her self hindered from day-to-day activities													
The family head	41	24.2	37	15.03	26	7.84	22	18.95	16	9.8	11	7.19	153 (2.29)

Source: Survey Data, 2007

Numbers in parenthesis ( ) are the mean work days lost according to each family category

Mean annual workdays lost is 11.68 weeks

Table 5.18: Another Health Consequences of Malaria (N = 141)

Is there any health problem inflicted on a member of your household as a result of /or consequence to malaria illness? which of the disease?	Yes		No	
	Freq.	%	Freq.	%
Anemia	20	14.18	4	
Visually impairment	24	17.02	2	
Hearing impairment	26	18.44	3	
Epilepsy	16	11.35	0	
Partial body damage	7	4.965	1	
Others, specify:				
(gastric problem)	17	12.06	1	
(malnutrition/loss of appetite)	19	13.48	1	

Source: Survey Data, 2007

Table 5.19: School absenteeism (N = 105)

School aged children absent from school due to malaria illness	0-1 weeks		1-2 weeks		2-3 weeks		3-4 weeks		4-5 weeks		5-6 weeks		Total No. of hhs. with absent student family members
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
	9	8.57	19	18.1	26	24.8	22	21	15	14.3	14	13.33	105
						Mean annual weeks of absenteeism = 3.04							

Source: Survey Data, 2007

Table 5.20: Poverty and the Effects of Different Diseases (N = 153)

Do you believe different types of disease in general, increase vulnerability of the people to hunger/poverty?	Freq.	%
HIV/AIDS	46	30.07
TB	16	10.46
Malaria	52	33.99
Water borne disease	30	19.61
Others: (Rabbis)	9	5.88

Source: Survey Data, 2007

Table 5.21 Out Migration of Work Forces (N = 153)

		Freq.	%
Do you think the problem of malaria challenges the capacity of the work forces in your localities and forced to migrate to some other places?	Yes	73	47.71
	No	80	52.29

Source: Survey Data, 2007

Table 5.22: Out Migration of Work Forces (N = 73)

		Freq.	%
.If yes, is there any family member who migrated from home to some other places to search for employment?	Yes	56	76.71
	No	17	23.28

Source: Survey Data, 2007

Household Survey Questionaire

Date: _____
Name of interviewer: _____

Part I. Basic information regarding households

1) Residential Kebele/village: _____

2) Age & Gender of family head /____/ 1. Male ☐ 2. Female ☐

3) Number & gender of family members

		1. Male	2. Female
3.1	Children under year 5	_____	_____
3.2	Students	_____	_____
3.3	Relatives & others	_____	_____
3.4	Economically active/non stud.	_____	_____
		_____	_____

4) Religion: 1. Orthodox ☐ 2. Mouslim ☐ 3. Protestant ☐ 4. Other ☐

5) Educational background

1. Illiterate ☐
2. Read & write ☐
3. Primary educ. ☐
4. Junior sec. Educ ☐
5. Secondary educ. ☐
6. Church educ. ☐
7. Quran ☐

6) Marital status

1. Single ☐
2. Married ☐
3. Divorced ☐
4. Widowed ☐
5. Separated ☐

Part II. Community perception about the disease,malaria

7) Is/was there any health problem repetitively affects the community in your village for the past 5 years? Multiple answers are possible.

Discription of disease(s)	1. Yes 2. No	Rank order
Water born diseas		1st
HIV/AIDS		2nd
Malaria		3rd
TB		.
Cold & influenza		
Others, specify:_____		.

8) How do you or the coummunity in your locality percieve malaria? And what is its effect? _____

_____

9) What do you think about the cause of malaria? Multiple answers are possible.

1. Mosquitoes ☐
2. Bad spirit or witchcraft ☐
3. Hot temprature like sitting on hot stone ☐
4. Drinking dirty water ☐

5. Chewing sugarcane or stem/stalk of corn ☐
6. Cold temprature ☐
7. Bathing with pond water ☐
8. Others, Specify: _____

10) How is the influence of malaria and how sever it is/was in your locality or nearby areas currently and/or in the past 5 years ?

In the following years	Degree of severity	
Current year		
Last year		
Before last year		In rank order
Before 2 years		1. very severe
Before 3 years		2. severs
Before 4 years		3. rare
		4. not revealed

11) What might be the reason for the out break of the epidemic of malaria?
1. Climatic change ☐
2. Anthropogenic problem ☐
3. Both 1 & 2 ☐
4. others, specify:_____

Part III: Socioeconomic factors affecting malaria epidemics

12) Occupation (s) as a main and supplimentary source of income

First	Second	Third	Fourth
1. Farming ☐	1. Farming ☐	1. Farming ☐	1. Farming ☐
2. Civil servant ☐	2. Civil servant ☐	2. Civil servant ☐	2. Civil servant ☐
3. Pety Trading ☐	3. Pety Trading ☐	3. Pety Trading ☐	3. Pety Trading ☐
4. Daily laborer ☐	4. Daily laborer ☐	4. Daily laborer ☐	4. Daily laborer ☐
5. Selling firewood ☐	5. Selling firewood ☐	5. Selling firewood ☐	5. Selling firewood ☐
6. Artisanship ☐	6. Artisanship ☐	6. Artisanship ☐	6. Artisanship ☐
7. Donation ☐	7. Donation ☐	7. Donation ☐	7. Donation ☐
8. Remitance ☐	8. Remitance ☐	8. Remitance ☐	8. Remitance ☐
Income level in Birr: (1) < 1500.00 ☐ (2) 1500.00 - 3000.00 ☐ (3) 3001.00 - 4500.00 ☐			
(4) 4501.00 - 6000.00 ☐ (5) 6001.00 - 7500.00 ☐ (6) 7501.00 and above ☐			

13) If you are employed in farmin/gagriculture as a source of income, what types of crops do you produce? With what amount/ Multiple answers are possible

Types of crop	In quintal/*madabria*
Coffee	
Gesho	
Different types of fruits	
Others, specify: _____	
	(1) < 5, (2) 5-10, (2) 10-15, 3) 15-20 (4) 20-25 (5) 25 +

14) Are you engaged in animal Husbandry? And does it have bad consequence in creating conducive atmosphere for the breeding of mosquiteos and exposing to get infected by malaria? How?

Activity	(1) Yes (2) No
livestockes are atracting mosquiteos into the house b/c we all are staying the nifhts	

under the sam shaltor	
we do roaming around bushes and graizing fileds to search grasses and water for the cattles	
Others, specify:_____	

15) What source of water do you use for agricultural purpose and household consumption? Multiple answers are possible.

Uses	During *bega* dry season	During *kiremt*
Garden /crop		
H.hold consumption		
(1) Irrigation from Lake Tana		
(2) Stream		
(3) Pumping with engine from the lake (4) Ground/well water (5) Fetching from the Lake (5) Only depending on the rain water (6) Others, specify:_____		

16) How much minutes/times does it take to fetch water for household consumption?

Tiem comsumed	(1) Yes (2) No
Less than half an hour	
Up to an hour	
up to two hours	
Others, specify:_____	

17) Is there any problem the household and the community in general encountered with regard to water usage for agricultural purpose as well as household consumption? _____

18) Is there any member of the family ever been infected by malaria, within the last five years or currently? How many of them are/were infected? And if any dying of malaria?

Affected fam. members	within the past 5 yrs.	Currently	If any dying of malaria?
One			
Two			
Three			
Four			
More than four			
	(1) yes	(2) no	

19) If yes, what was the frequency of the incidence of malaria in your household?

1. Once a year ☐
2. Twice a year ☐
3. More than towice a Year ☐

20) How much was the annual expenditure of the household for malaria /malaria related treatment?

1. Up to Birr 50.00 ☐
2. Birr 51.00 - 100.00 ☐
3. Birr 101.00 - 150.00 ☐
4. Birr 151.00 - 200.00 ☐
5. Birr 201 and above ☐

21) Who is more susceptible to the malaria from the members of the family? Put in its rank order. (1st, 2nd,...

1. Children below year 5 ☐

2. Children above year 5 and/or students ☐
3. Economically active/ adult non-student ☐
4. Pregnant woman ☐
5. Head of the family ☐
6. All members of the family indescreminatelly ☐

22) Which season is peak time to spread malaria in your localities or the nearby areas?

1. In *bega* / dry season ☐
2. At the beginning of rain season ☐
3. In *kiremt* / rain season ☐
4. as soon as the *kiremt* / rain season is over ☐
5. Others, specify: _____

23) When ever the famly member gets sick with malaria how many weeks in average per year were you off/absent from your formal activity/ business in order to provide care and suport to them? Multiple answers are possible.

Family members	Absent from day-to-day activity	Absent from school
Children below year 5		
Children above year 5 and/or students		
Economically active/ adult non-student		
Pregnant woman		
Head of the family (himself)		
weeks: (1) < a week (2) 1-2 weeks (3) 3-4 weeks (4) 5-6 weeks (5) 6-7weeks (6) 7 weeks & above		

24) How do you cover/compensate the work days lost due to malaria? Do you use thefollowing mechanism?

Work days loss compensation	1. Yes 2. No
Hiring daily laborer	
Posponing the intended job	
Share coping	
Others, specify: _____	

25) Is there any school drop out(s) from the family member due to malaria or malaria related problems and other factors? How many are they?

No. of drop outs	Malaria	financial & other related problem
One		
Two		
Three		
Four & above		
	(1) Yes (2) No	

26) Whenever member of the family get sick (with malaria), how fast you react to take to clinic or health center for treatment? Multiple answers are possible

1. Very urgent ☐
2. Not very urgent ☐
3. We do not take to clinic at all ☐
4. Other, specify: _____

27) If your answer for the above question is either or item "2" or "3" what is the reason?
1. Financial constraint ☐
2. The mentality that modern medicines do not cure such disease ☐
3. Seeking home based care/treatment ☐
4. Others, specify: _____

28) How often the distance of the clinic from your home affects your follow up or travel interval for treatment? How much minute it takes?

Hours	When ever we are injured/infected & feel pain	If only we have severe pain
< 0.5		
0.5-1:00		
1:00 -1:30		
1:30 - 2:00		
2:00+		

0.5-1:00 hrs 0.5-1:00 hrs

29) Have you ever been faced a problem from neighbours and relatives as a causative effect of diseases? To what extent?

Causative effect	Malaria	Some other diseases
Loss of work days to visit the patients		
Loss of work days due to funeral ceremony		
Loss of money to cover Funeral cost		
Others, specify: _____		
	(1) Yes (2) No	

30) Is there any health problem inflicted on a member of the household as a result of or consequence to malaria illness? What are the consequences?

Effects	(1) Yes (2) No
Anemia	
Visually impairment	
Hearing impairment	
Eplepsy	
Partial body damage	
Others, specify: ___	

31) Do you remember any malarial effect imposed on a pregnant women in your family and/or the near by neighbours? What are the incidences/effect?

Consequences	(1) Yes (2) No
Having low birthweight	
Having still birth	
Induced abortion	
Maternity death	
others , specify: _____	

32) Are the community in your localities organized in a form of *Idir* and could this social organization exhaustively treat victims and the deceased famly due to malaria and/or other diseases ?
Please clarify: _____
_____

33) Is there any malarial control agency running its activity in Zeghie (adjacent to your village)?
1. Yes ☐ 2. No ☐

34) If yes, does the agency provide basic health education how to protect and control the epidemics of malaria? Multiple answers are possible.

Where/how	(1) Yes, (2) No
On market days	
On public gatherings	
In Kebel meeting	
In church	
In mosque	
Others, specify:_____	

35) Do, the community obtain adequate health care service from the nearby clinic particularly for the health problem related to malaria?
1. Yes ☐ 2. No ☐

36) If no, what will be the reason?
1. High cost of medications ☐
2. Lack of skilled man power ☐
3. Shortage of pharmaceuticals supply ☐
4. Low level of the community's knowledge about the cause and treatment of malaria ☐
5. Others, specify:_____
_____

37) If there is no Malaria Control Agency in Zeghie or nearby your locality, the people may have to travel to Bahir Dar to search for treatment, so how is the availability of transport service? Is it affordable the cost of tansportation and cost of stay in Bahir Dar? Please elaborate in this regard. _____
_____

IV. Cultural context and treatment-seeking behaviour of the community

38) Who is most responsible in providing care for the intire member of the family?
1. Father ☐
2. Mmother ☐
3. Hasband & wife ☐
3. Elder child
4. Others, specify: _____

39) Who has a decisive role on financial amanagment in the household? Multiple answers are possible.
1. husband ☐
2. wife ☐
3. elder son/daughter ☐
4. husband and wife ☐
5. Others, specify:_____

40) If the answer is item "2", does she often avail certain amount of money to cover treatment cost or to expend for the immediate need of health related problems? What source of income does she use? Please discuss?_____

41) Do you allow your wife to participate in a public gatherings? For instance could she be allowed to participate in the basic health education?
1. Yes ☐ 2. No ☐

42) Do you believe different types of disease in general, increase vulnerability of the people to

hunger/ poverty?

Types of diseases	1. Yes 2. No
HIV/AIDS	
TB	
Mlaria	
water born disease	
Others, specify:____	

43) Do you think the problem of malaria challenges the capacity of the work forces in your localities and forced to migrate to some other places?
1. Yes ☐ 2. No ☐

44) If yes, is there any family member who migrated from home to some other places to search for employment?
1. Yes ☐ 2. No ☐

45) Do you have information about their living condition over there? _____
_____

46) Is there any culrutral/religious taboos violeted by the community due to the influence of the disease (malaria) ?

Practices	1. Yes 2. No
Disrespecting fast days/seasons	
Changing food culture like feeding on pork.. etc, which have cultural/religious restriction	
Becoming commercial sex worker	
Others, specify:_____	

47) When some one of the member of the Idir (funeral society) may passed, how do the community in your locality offer a condolence to the deceased family?
1. Staying with a mourner sleeping out side of the house (in a tent/temporary shelter) for certain days continuously ☐
2. Visiting the deceased family frequently ☐
3. No staying a night with them after funeral ☐
4. Others specify: _____

48) How do you also celebrate a wedding ceremony?
1. Staying for certain nights in the wedding house in a temporary shelter ☐
2. Staying a night with them only on the ceremony day ☐
3. No staying a night with them ☐
4. Others, specify:_____

V. Questions in relation to prevention and control of malaria

49) Do you believe malaria is preventable, controllable or curable?
1. Yes ☐ 2. No ☐

50) If your answer is yes, how do we prevent, control and treat malaria?
Please discuss_____

51) What type of house you are accommodated in?

1. Mud-walled and thatched roof
   (Traditional type of construction with one floor, in Amharic= esate-kela) ☐
2. Brick (mud) -walled and thatched-roof ☐
3. Mud-walled and iron-roof ☐
4. Concrete-walled and iron-roof ☐
5. Others, specify: _____

52) Which type of house is relatively better protective of mosquito? Put in its rank order.

1. Mud-walled and thatched roof ☐
2. Brick (mud) -walled and thatched-roof ☐
3. Mud-walled and iron-roof ☐
4. Concrete-walled and iron-roof ☐

53) Do you accept DDT as a remedial solution and to be sprayed in your house to control anopheles mosquito and respect the effective date of the white residue of DDT to be left over the sprayed wall with out any intervening on the applied incectiside?

Value given for DDT	(1) Yes (2) No
Accept	
Respect	
Others, specify ____	

54) These days, mosquito/bed net as an alternative approach to prevent malaria is being used in every malaria endemic areas. Have you heard about it?

1. Yes ☐ 2. No ☐

55) If yes, do you use it regularly and effectively for the past five years?

1. Yes ☐ 2. No ☐

56) If no, why? Is it due to:

1. Unaffordability of the cost of the net ☐
2. not-use-friendly ☐
3. Inadequate perception we have for the net ☐
4. Others, specify: _____

57) Do you think anthropogenic factor contribute a lot for the spread of malaria?

1. Yes ☐ 2. No ☐

58) If yes, what are those problems and does the community start managing them and protecting the disease? _____

59) Is there any other endeginious knowledge and /or traditional mechanisms to prevent malaria in controlling of the vector/mosquito? Please, give us your opinion. _____

_____

_____

I thank you all again!

Date: _____

Time/duration: _____

Guide questions for focus group discussion (FGD)

This questionnaire is designed to collect data for the preparation of MA thesis on the study of socio-economic burden of malaria in Zeghie peninsula, West Gojjam, Amhara National Regional State. This study is part of the requirement for the fulfillment of the degree of masters in Development Studies, Environment and Development. The study aims at investigating socio-economic impact of malaria in the selected localities and selected sample households. In this study economic, social and cultural traits will thoroughly considered. In addition, the respondents' attitude towards the disease would also be addressed. This may help respective bodies to plan for the prevention and control effort, enabling to taking appropriate measures to tackle or challenge the epidemic.

So as to meet the intended objective of this study your contribution is believed to be a fundamental input. Therefore, you are kindly requested to discuss freely with the researcher on every probed questions. I, the researcher, confirm that the data to be collected will be kept confidential and will use just only for the purpose of the proposed study.

I. Socioeconomic factors intensifying the situation of malaria

1. Malaria is the second killer of man kind next to HIV/AIDS in our country in particular and globally in general. So does this have been the case in your locality within the past 5 years?
2. Does the influence of the incidence of malaria affects the day-to-day activity of the household when ever any family member enfected with the disease?
3. How sever the incidence was with in the past five years as well as currently?
4. Do you think early diagnosis for malaria or even for other diseases has advantage?

- If yes, do you practice it and what benefit did you incurred? Please share your previous experience with me.
- If no, why? What were the problems you encountered while you (the community) were seeking treatment?

5. How do you cover the work days lost due to malaria sickness, especially during harvesting season? (Hiring daily laborer, Postponing the intended work for some other time, (share cropping))

6. Do you have some income generating mechanisms you often run side-by-side to your farming activity? [Fishing, beekeeping, poultry, and animal husbandry]

II. Cultural aspect: peoples' attitude about the cause of malaria and mode of transmission of the disease

6. When some one of the member of the *Idir* (community) may passed, how do the community offer a condolence to the deceased family after the funeral ceremony is over?

   a) Staying with a mourner continuously for a certain days

   b) Visiting the deceased family frequently

7. If your answer for the above question is item "a" how do the people (you) spent the nights there?

   a) Every day sleep on the ground out side the house or..?.

8. So does this increase exposure to mosquitoes bite? How do you avoid the risk of being caught by malaria as long as you spent couples of nights outside?

9. Do you use bed net if you have access to it?

10. How do you celebrate wedding ceremony? For how long does the occasion extends?

11. Do you stay out side the house in a temporary shelter without thinking about biting by mosquitoes?

12. Malnutrition often weakened the capacity of the people in deteriorating resistances against variety of diseases, so what is the feeding habit of the community in your locality?

13. What do you think about the mode of transmission of malaria from the infected to the healthy person?

a) Using utensils commonly with malaria infected person

b) Sharing the same bed with affected person

c) Using same air for breathing

14. There is an aphorism that 'education female is education the whole family', so, if women are not allowed to take part in public gatherings in your cultural context and may not have chance to get basic health education, doesn't this contribute for the worsening of health related problem?

III. Questions in relation to prevention and control of malaria

16. Do you think malaria is preventable, controllable or curable?

    a) If your answer is yes for the above question, how do we prevent, control and treat malaria? Please discuss.

18. How DDT is persistently being applicable in your locality to minimize risk of malaria? Does it regularly sprayed in every house?

19. Do you know about preventing malaria using bed/mosquito net? Could the community in your locality and nearby areas easily access the net?

20. Apart from the above prevention and control mechanisms of malaria, do you think there are more measures to be done? Like working on environmental management to fight against mosquito breeding sites/habitats?

21. When is the peak time to spread malaria in your localities?

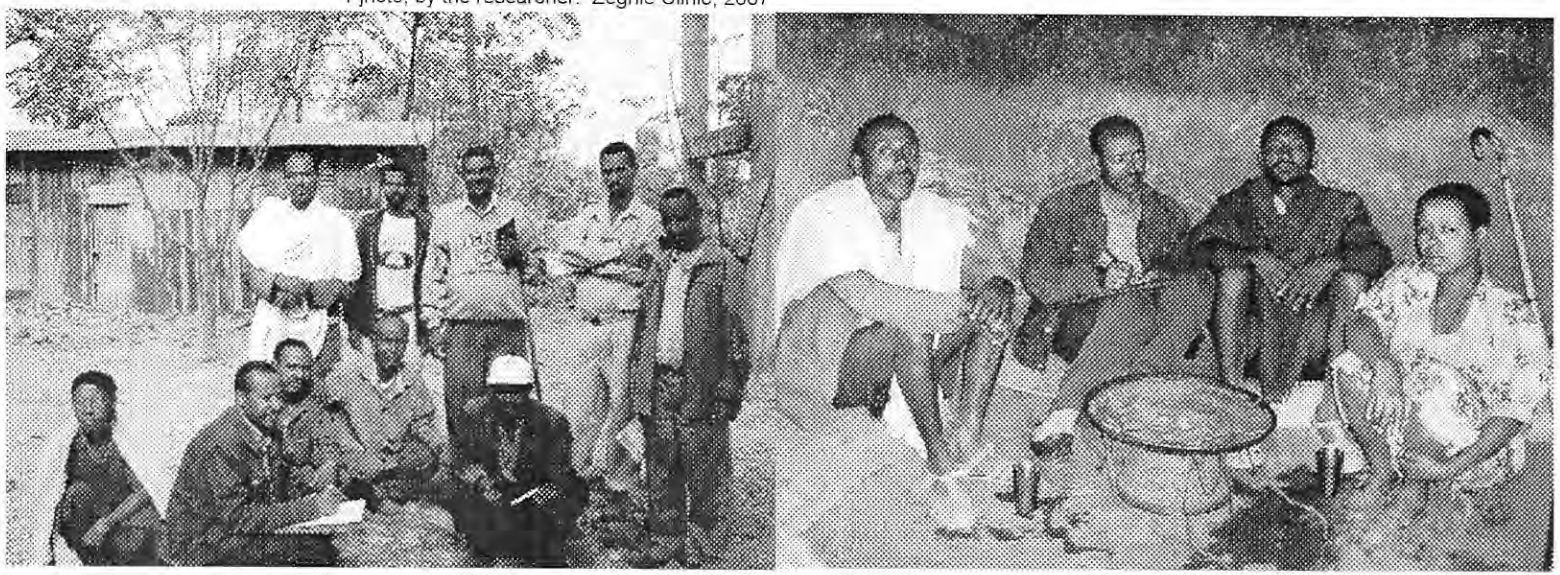
21. If you depend on farming solely you may have your own farm land, and when you cut off trees for different purposes do you think about substituting seedlings in order to maintain/balance the ecosystem?

Questions for key informant interview

1. How severe is malaria and the frequency of the episode for the past 5 years?
2. What is the attitude of the community about the disease, in terms of the cause and mode of transmission?
3. What is the enthusiastic nature of the community with regard to accepting basic health education, particularly about prevention, control and treatment of malaria, if your office made an effort to do so?

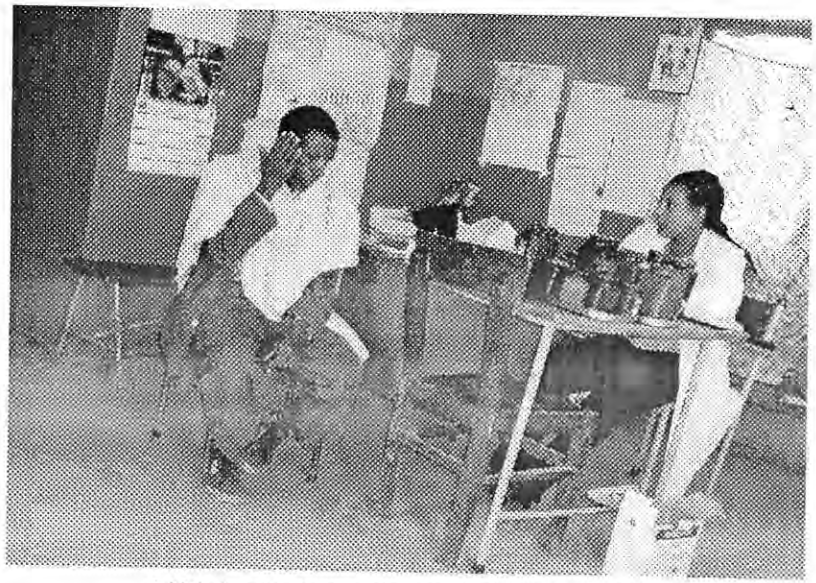
4. What is the attitude of the people with regard to the application of insecticide chemicals like DDT.
5. Ethiopia is one of the most malaria endemic countries in Sub-Saharan Africa, which needs huge amount of money to treat the disease. So, could it be possible to estimate how much the country in general and the Amhara National Regional State in particular expend each year (for the past 5 years) for prevention, control and treatment the disease?
6. Do you think the overall task of the treatment, control and prevention of malaria is adequate (in relation to the availability anti-malarials, skilled man power and intervention strategies, even initiatives for malaria related research)?
7. How many school dropouts have been registered in the school within the past five Years?

Pjhoto, by the researcher: Zeghie Clinic, 2007

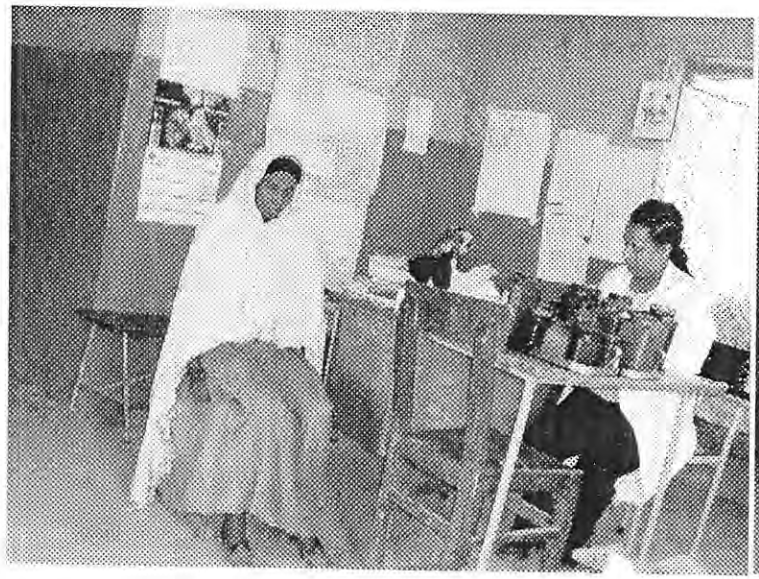


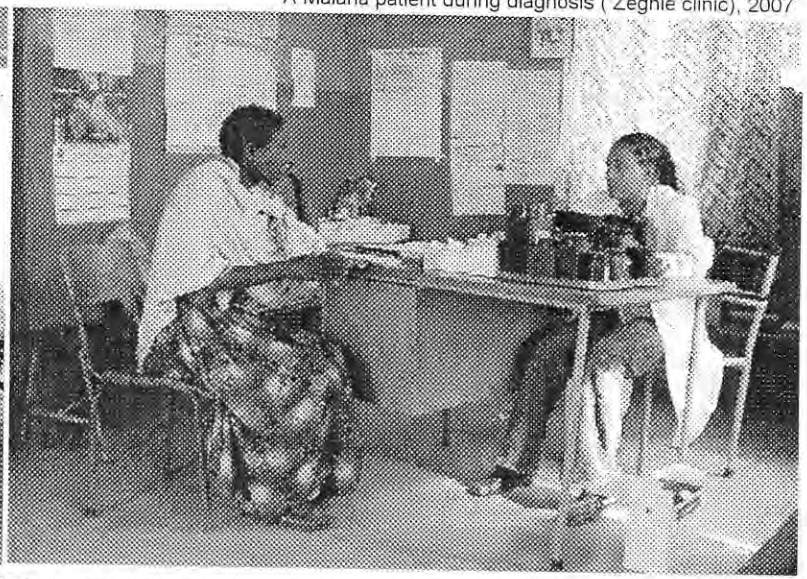
Focus group discussion with people (Zeghie). 2007

The researcher and Informants (Zeghie Clinic), 2007

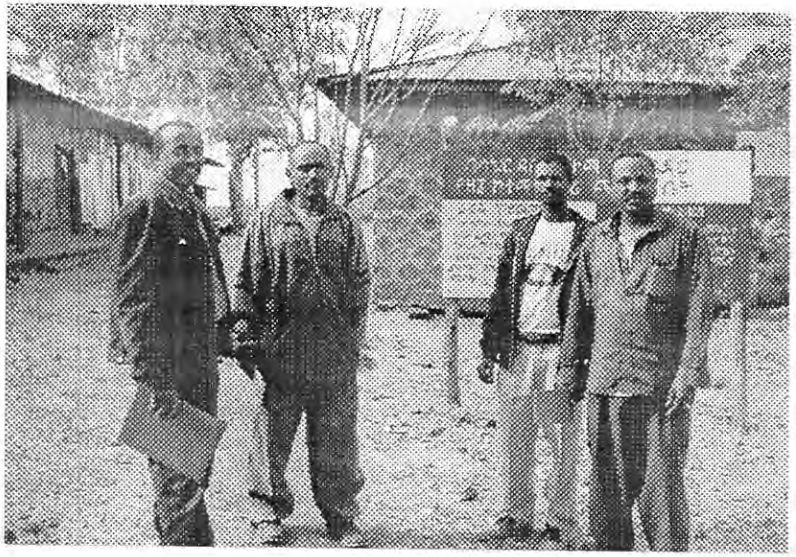


A Malaria patient during diagnosis (Zeghie clinic), 2007





Photo, by the researcher: Malaria patients during diagnosis (Zeghie Clinic), 2007



The researcher with other group of informants (Zeghie), 2007

Photo, by the researcher: a malaria patient with stretcher, 2007

No. of HHs and People in the Two *Kebeles* of Zeghie Peninsula

Yiganda Kebele

No.	Name of village	No. of HHs			No. Family			Average
		Male	Female	Total	Male	Female	Total	
1	Sarwodeb	55	44	99	159	262	421	4.25
2	Dbirdesh	54	37	91	96	226	322	3.5
3	Agerbet	68	43	111	125	257	382	3.4
4	Mehalzeghie/ Yiganda	77	47	124	277	299	576	4.6
5	Yiganda 1	79	61	140	158	261	419	3
6	Yiganda 2	61	32	93	231	271	502	5.39
7	Kamgedel	71	46	117	226	275	501	4.28
8	Kokel	77	55	132	292	271	563	4.26
	Total	542	365	907	1564	2122	3686	4.06

Ura Kebele

No.	Name of Villages	No. of HHs			No. Family			Average
		Male	Female	Total	Male	Female	Total	
9	Brorami	45	36	81	127	178	305	3.7
10	Mekelami	52	33	85	163	184	347	4
11	Sarwodeb	37	25	62	137	150	287	4.6
12	Washa	35	46	81	150	233	383	4.7
13	Ura	61	60	121	239	287	526	4.3
14	Gami	79	62	141	293	346	639	4.5
15	Gubi/Atati	27	28	55	101	120	221	4
	Total	336	290	626	1210	1498	2708	4.3
	G. Total	878	655	1533	2774	3620	6394	4.2

Source: *Zeghie* emerging municipality, 2006

Laveran and the Discovery of the Malaria Parasite

Alphonse Laveran was born in Paris on June 18, 1845. Like his father, he embraced the career of a military doctor. In 1874, at age 29, after a competitive examination ("aggrégation") he was appointed professor of military diseases and epidemics at the School of Military Medicine of Val-de-Grâce in Paris. While carrying out his duties in this position, he also acquired expertise in anatomic pathology. By age 34, he was already the author of a "Treatise on Military Diseases and Epidemics" and 62 other scientific communications.

In 1878, he was posted in Algeria (then a French territory), first at the military hospital in Bône, then in the military hospital in Constantine. Malaria was then a serious problem in the army, and this untiring worker meticulously studied the disease's clinical aspects and its anatomic pathology – providing, for example, an excellent histologic description of cerebral malaria. His ultimate objective was to identify the causal agent of the disease.

Dr. Alphonse Laveran, a military doctor in France's Service de Santé des Armées (Health Service of the Armed Forces).

The military hospital in Constantine (Algeria), where Laveran discovered the malaria parasite in 1880. The hospital (long building in the front, closest to the cliff) was built by the French in 1841 (Algeria was then a French territory). In 1913, the hospital was named after Laveran. It closed in 1963.

Earlier theories were that malaria was caused by bad air ("mala aria" in Italian) from marshlands. However, following the discoveries of Louis Pasteur that most infectious diseases are caused by microbial germs (the "germ theory"), the hypothesis of a bacterial origin of malaria became increasingly attractive. As related in Laveran's "Treatise On Marsh Fevers" (1884), numerous studies, mostly in Italy but also in the United States, had searched for an infectious agent in marshland soil and incriminated various algae, aquatic protozoa, and bacteria such as *Bacillus malariae* in Italy. (Protozoa are micro-organisms that are single-celled, with a well-defined nucleus, and without cell walls.)

Laveran, for his part, used observations from his work in anatomic pathology – deaths due to malaria were frequent – to guide his search for the causal agent of malaria. By studying the lesions in organs and in blood in two very different clinical situations, severe attacks and chronic malaria, Laveran found that the only constant element was the presence of granules of black pigment in the blood. These pigmented granules occurred at very different frequencies depending on the cases. Laveran concluded that these pigmented granules were specific to malaria, and that they originated in the blood. He

patiently performed many examinations of freshly collected blood specimens, without the benefit of staining techniques (these were not yet available).

At the hospital in Bône, Laveran noticed spherical bodies, free or adherent to red blood cells. Some of these bodies were glassy ("hyaline") and difficult to see; others contained dark granules of pigment exhibiting ameboid movements. He also noticed pigmented bodies that were crescent shaped. He was able to clearly differentiate all these elements from pigment-carrying ("melaniferous") leukocytes, which had been known for 30 years (Risori, 1846).

But the revelation came at the military hospital in Constantine, in the early morning hours of November 6, 1880. Examining the blood of a patient who had been febrile for 15 days, he saw "...on the edges of a pigmented spherical body, filiform elements which move with great vivacity, displacing the neighboring red blood cells." By chance, but also thanks to his tenacity and patience, he had seen the exflagellation of a male gametocyte, a phase in the life cycle of malaria parasites which usually occurs in the stomach of the *Anopheles* mosquito. The motility of these elements immediately convinced Laveran that he had discovered the agent causing malaria and that it was a protozoan parasite. After observing these motile elements again, some adhering to the spherical bodies and others free, Laveran sent two notes to the Academy of Medicine, in November and December 1880 on this "New Parasite Found in the Blood of Several Patients Suffering from Marsh Fever."

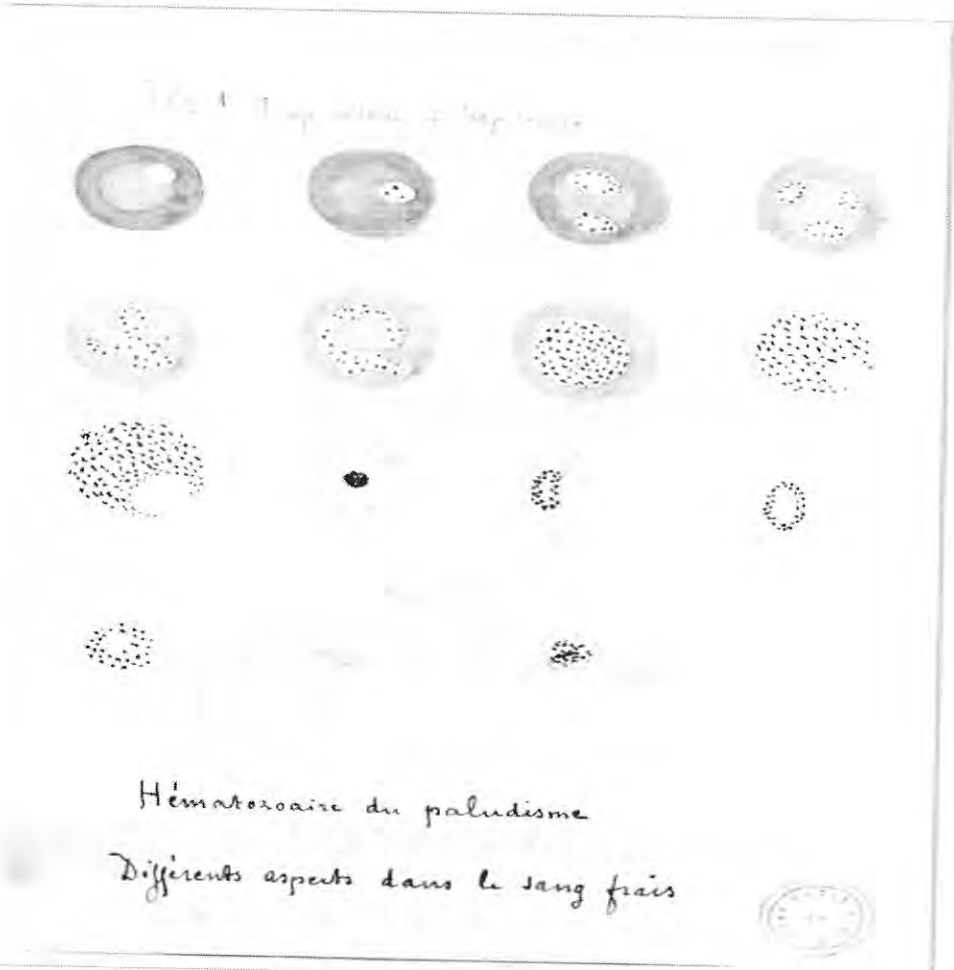
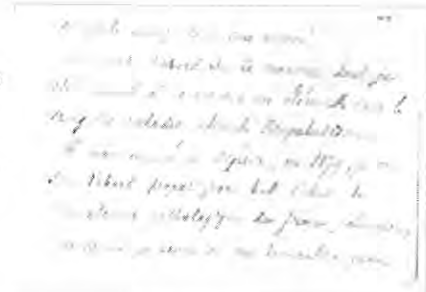


Illustration drawn by Laveran of various stages of malaria parasites as seen on fresh blood. Dark pigment granules are present in most stages. The bottom row shows an exflagellating male gametocyte, which produces "...filiform elements which move with great vivacity..."

During the following years, Laveran continued his work in Algeria. He also visited Italy in 1882, where he looked for the parasite in the air, the water, and the soil of marshlands. That search proved negative, making him suspect that the parasite could be in the body of mosquitoes, which were abundant in that environment. He put forward this hypothesis in his "Treatise on Marsh Fevers" of 1884 and defended it at the International Congress of Hygiene in Budapest (1894). In his 1891 treatise "On Malaria And Its Hematozoon," he wrote, without giving a reference, that "King, in America, had the idea that mosquitoes played a role in malaria."



Manuscript by Laveran (fragment) for a communication to the Medical Society of Hospitals (Societe Médicale des Hôpitaux) on April 28, 1882.

Laveran's publications were generally met with skepticism, especially among the Italians and the disciples of Louis Pasteur (except Elie Metchnikoff), who were in favor of a bacterial cause. Later, following his return in 1884 to the Val-de-Grâce School of Military Medicine, Laveran invited Pasteur to visit and see under his microscope the motile, flagellated bodies. Pasteur was immediately convinced (Roux, 1915). It was not until the years 1885-1890 that the parasitic origin of malaria was accepted.

After the development of stains with methylene blue (Ehrlich, 1899), doubt was not possible anymore, and the various species of malaria parasites were identified. (Laveran had until then been in favor of a single species.)

Inauguration of the Laveran square. This square, in front of the church of the Val-de-Grâce military hospital in Paris, was named after Laveran on November 6, 1930.

In 1884, Laveran left Algeria and returned to the Val-de-Grâce School of Military Medicine, where he was professor of military hygiene. He continued his research on malaria, both at the Val-de-Grâce Hospital and in the field in the Camargue (in southern France) and on the French island of Corsica. He left the Army in 1896 to work as a volunteer at the Pasteur Institute. There he devoted himself to the study of protozoal infections of animals and humans, especially trypanosomiasis. He was awarded the Nobel Prize in 1907 in recognition of his discovery of the malaria parasite and for his overall work on protozoa as causes of diseases. He gave the proceeds of his prize to the Pasteur Institute for the creation of a laboratory devoted to tropical diseases.

The church of Val-de-Grâce (Paris) in 2004. The church dates from 1645. The Val-de-Grace complex currently includes, in addition to the church, a military hospital, a military medical school, and a museum of military medicine

Laveran died in Paris on May 18, 1922. He was a patient and persistent observer, remarkable for the rigor with which he drew conclusions from observed facts. He wrote more than 600 scientific communications and 6 books. He was a solitary worker whose only interest was science, to which he dedicated 45 years of his life.

Text contributed by Prof. Guy Charmot, Service de Santé des Armées (Ret.) (Health Service of the Armed Forces), France.

Images contributed by the Service de Santé des Armées (Health Services of the Armed Forces), France.

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

Declared by:

Samuel N.

Candidate

Confirmed by:

Getachew Yoseph

Advisor