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The Economic Burden of Diabetes Mellitus among Clients attending Health Facilities in Hawassa City, South, Ethiopia

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**A thesis submitted to Department of Health Economics, Management and
Policy in Partial Fulfillment for the Requirement of Master of Science Degree
in Health Economics**

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**Oct, 2018
Jimma, Ethiopia**

Abstract

Background: The state of persistent hyperglycemia and associated complications of diabetes demand lifelong visits to health facilities and recurrent absenteeism from work. In a low income country like Ethiopia the economic impact of diabetes is likely to be catastrophic and appalling. Massive out of pocket expenditure and productivity loss associated with diabetes result in immense economic burden to the individual patients and their families. However, the issue is relatively unexplored in Ethiopia by policy actors as compared to communicable disease like HIV/AIDS, TB and malaria.

Objective: This study tended to measure the magnitude of economic burden borne by diabetes mellitus to individual's patient and their families attending health facilities in Hawassa city, South, Ethiopia.

Methods: Facility based cross sectional study design was conducted using a consecutively selected sample of 403 diabetic clients. The study used face to face interview with diabetic clients from 5 health facilities to extract direct medical and non-medical costs and indirect cost related to diabetes. Both descriptive and inferential statistics was applied to disclose the finding of the study during data analysis. Generalized linear model (GLM) gamma with log link function and binary logistic regression at 95% confidence interval were used to assess any significant association between independent variables and dependent variable.

Result: The total cost of diabetes per patient per year estimated to be birr 8,256.72 (USD 300) of which birr 6,488 (USD 235.75) is direct cost and birr 920 (USD 33.43) indirect costs. Medical cost accounted for 86.3% of direct cost and the major contributor of medical cost was made by medication cost (42.59%). The average non-medical cost is valued to be birr 1,202.29 (USD 43.68) per patient per annum. Over all monthly average direct cost is birr 733.36 (USD 26.64) per patient. About 52% of diabetic patients had catastrophic medical expenditure. Furthermore, 17.5% of non-poor households become poor (impoverished) after making catastrophic out of pocket medical expenditure. Presence of medical complication (OR:7.86;CI:2.69-22.9), longevity with diabetes (OR:1.16;CI:1.07-1.25), Household income level (3,000-6,000) (OR:3.2; CI:1.2-8.5), and type1 diabetes (OR:2.68;CI:1.3-5.3) are major associated factors for catastrophic medical expenditure.

Conclusion: Diabetes mellitus is costly disease in Ethiopian healthcare system. Majority of diabetic patients were suffering from catastrophic health expenditure. In order to minimize the economic impact of the disease Federal Ministry of Health should have to design financial risk reduction mechanism through Community based health insurance (CBHI) and Social health insurance (SHI) schemes.

Key words: *Direct cost, Indirect cost, Medical cost and Non-Medical cost, Catastrophic, expenditure, Medical impoverishment*

Acknowledgments

Primarily, I would like to forward my deepest appreciation to Jimma University obviously, my under graduate and post graduate university, providing me this research opportunity. I also have sincere gratitude to my first adviser Associate Professor Shimeles Ololo and second adviser Dr Teferi Daba (PhD) for their critical remarks, guidance and suggestions starting from proposal preparation phase.

My special thanks go to the members of Jimma University, Health Economics, Management and Policy department for their assistances throughout course time and research process. I also have kind gratitude to individual staffs and data collectors from selected health facilities in Hawassa city for providing me necessary support. Lastly but not least, I feel very fortunate to have ever loving family, without their unconditional emotional and spiritual support it would be very difficult to reach at this stage.

#	Table of Content	Page
	Abstract	i
	Acknowledgement	ii
	Table of Content	iii
	List of Figures	v
	List of tables	vi
	Acronyms	vii
1	CHAPTER ONE: INTRODUCTION	
1.1	Background	1
1.2	Statement of the problem	2
1.3	Significance of the study	2
2	CHAPTER TWO: LITERATURE REVIEW	3
3	CHAPTER THREE: OBJECTIVE	7
3.1	General Objective	7
3.2	Specific objectives	7
4	CHAPTER FOUR: METHODS AND MATERIALS	8
4.1	Study Area and Period	8
4.2	Study design	8
4.3	Population	9
4.4	Sample Size and Sampling Technique	10
4.5	Data collection procedures	12
4.6	Study variables	13
4.7	Operational definition	13
4.8	Data analysis plan	14
4.9	Data quality management	16
4.10	Ethical consideration	16
4.11	Dissemination plan	16
5	CHAPTER FIVE: RESULT	17
5.1	Socio-demographic and Economic Characteristics	17
5.2	Clinical Characteristics and Burden of Diabetes Mellitus	19

5.3	Cost of diabetes mellitus and its components	20
5.3.1	Direct cost	20
5.3.2	Indirect Cost	20
5.4	Diabetic cost with Socio Economic and Clinical Characteristics	23
5.5	Incidence of Catastrophic Expenditure and Medical Impoverishment	26
5.6	Model Estimation Result	27
5.6.1	Model Estimation for Total Economic Cost of Diabetes	27
5.6.2	Model Estimation for Catastrophic Medical Expenditure	27
6	CHAPTER SIX: DISCUSSION	31
6.1	Estimation of diabetic costs	31
6.2	Incidence of Catastrophic Health Expenditure	33
6.3	Burden of medical impoverishment	34
6.4	Limitation of the study	35
7	CHAPTER SEVEN: CONCLUSION AND RECOMMENDATION	36
7.1	Conclusion	36
7.2	Recommendation	37
	References	38
	Annexes	43
	Tools	43
	Declaration	60

List of Figures

	Page #	
Figure 1	The conceptual framework of economic burden of diabetes mellitus research among clients attending health facilities in Hawassa city	6
Figure 2	Schematic presentation of sampling procedure of the study on the economic burden of diabetes among clients among health facilities in Hawassa city	11
Figure 3	The share of direct cost and indirect cost of diabetes from the total cost for the study participants, in 2017	20
Figure 4	The total cost of diabetes by age categories of the study participants from health facilities in Hawassa city, in 2017	22
Figure 5	Patient duration with diabetes and direct and indirect cost for the study participant from health facilities in Hawassa city, in 2017	24
Figure 6	Median total cost of the diabetes mellitus by income categories for the study participant from health facilities in Hawassa city, in 2017	25

List of Tables

		Page #
Table 1	Socio economic characteristics of the study participants attending health facilities in Hawassa city, in 2017	17
Table 2	Type of diabetes and First time witness of the study participants attending health facilities in Hawassa city, in 2017	18
Table 3	Duration, Frequency of visit and waiting and treatment hour of the study participant attending health facilities in Hawassa city, in 2017	18
Table 4	Number of working hour absenteeism of the study participant due to diabetic related illness for patient and companions in 2017	19
Table 5	Direct cost and indirect cost borne by diabetes mellitus to the study participant, in 2017	21
Table 6	Direct cost by type of diabetes of the study participant from health facilities in Hawassa city, in 2017	22
Table 7	Cost of diabetes by type of health institution of the study participant from health facilities in Hawassa city, in 2017	23
Table 8	Average total cost of diabetes by frequency of visit of the study participant from health facilities in Hawassa city, in 2017	23
Table 9	The average total cost of diabetes by patient income categories for the study participant from health facilities in Hawassa city, in 2017	24
Table 10	Incidence of catastrophic out of pocket medical expenditure (COOPE) by household income categories in Hawassa city, 2017	33
Table 11	Catastrophic out of pocket health expenditure with Crud Odds Ratio (COR) at 95% confidence interval in Hawassa city, 2017	35
Table 12	Summery statistics from GLM for factors affecting economic cost of diabetes mellitus (Gamma with log link)	36
Table 13	Driving factors of catastrophic out of pocket medical expenditure (Natural log)	37

Acronyms

COI	Cost Of Illness
CSA	Central Statistics Authority
DM	Diabetic Mellitus
FMEA	Failure Mode and Effect Analysis
HCA	Human Capital Approach
HIV	Human Immunodeficiency Virus
IDF	International Diabetic Federation
INR	Indian Rupees
MDGs	Millennium Development Goals
NCDs	Non Communicable Diseases
NGO	Non-Government Organization
OOP	Out of Pocket
SD	Standard Deviation
SNNPR	South nation, Nationality and People Region
SSHE	Social Security Expenditure on Health
SSA	Sub-Saran Africa
T1D	Type 1 Diabetes
T2D	Type 2 Diabetes
TB	Tuberculosis
USD	United State Dollar
WHO	World Health Organization

CHAPTER ONE: INTRODUCTION

1.1 Background

Non communicable diseases are becoming the leading cause of morbidity and mortality both in developing and developed countries. Globally, about 68 percent of all deaths account for non-communicable chronic diseases. Diabetes mellitus (DM) is a group of chronic medical conditions in which the body's metabolism is disturbed either by absence or insufficient production of insulin or the body does not properly respond to insulin which results in persistent hyperglycemic state. This persistent hyperglycemia and associated complications demand lifelong care and frequent visits to health facilities. Hence, the economic impacts of the diseases are often catastrophic and appalling [1].

According to WHO diabetes prevalence has doubled since 1980(4.7%) to 2014(8.5%) and 422 million people in the world had diabetes in 2014. In low and middle income countries lack of access to affordable medicine and technology give rise to complication and premature mortality. Premature mortality (death under the age of 70) due to diabetes brings about sustainable economic impact especially to developing countries like Ethiopia [1].

Diabetes has a multiplier effect on public health status. Besides diabetes specific morbidity and mortality, diabetes complication contributes to the burden of other non-communicable diseases like renal disorder, cardiovascular and eye disease as well as communicable diseases like pneumonia and tuberculosis [2].

The International Diabetes Federation estimates that 78% of those with DM in Sub Sharan Africa (SSA) remain undiagnosed. Again consequence of limited access to trained health workers and diagnostic testing and imaging as well as limited awareness of DM and its risk factors further aggravate the impact of the disease in most developing countries [3].

American Diabetes Association also found that the annual cost of treatment a person with diabetes is over 5 times more than for a person without diabetes [4].The overall cost of treating diabetes is alarmingly increasing year after year. According to the Canadian Diabetes Association report, the economic burden of diabetes in Canada nearly doubled between the years 2000 (CA \$6.3 billion) and 2010 (CA \$12.2 billion) [5].

Recent African study estimates that the total economic loss due to diabetes was \$ 25.5 billion (PPP) for WHO region, of which 32% was direct medical cost like medication, travel and meal cost and the remaining 68% accounted for indirect cost caused by premature disability, absenteeism(income loss)and other cost factors [6].

1.2 Statement of the problem

According to WHO sentiment, Universal Health Coverage could not be achieved only by improving health care access without removing financial barriers [23]. Ethiopian Health sector transformation plan (2015/16 - 2019/20) also proposed that CBHI and SHI should be fully implemented in addition to providing exempted services and fee waiver for the people living under poverty line in order to minimize catastrophic medical expenditure that hold back the health service utilization of the people living in the country [26].

People with diabetes have a greater chance of suffering catastrophic health expenditure compared to similar individuals without diabetes. The incidence of medical complication, patient age, type of diabetes, household income level and other social, economic and demographic status were likely to be factors associated with the economic burden of diabetes toward patients and their family [1,27,36,37,60]. Unfortunately, the economic burden of the diabetes mellitus treatment and its determinant factors to the patients and their household in the study area was not well cognized as far as my knowledge. Diabetic Patients with lowest income level were highly affected by the economic burden of the disease through catastrophic out of pocket medical expenditures and medical impoverishment [36,60]. Despite, prevention and control programs of diabetes mellitus got less attention and underfunded in most developing counties [1,3,7].

Due to the lack of understanding toward the economic burden of diabetes on patients and their family by policy and decision makers, diabetes is not receiving sufficient political attention and financial investment [62]. Policy makers and program managers' lack vibrant information on the economic burden of the diseases to design indispensable financial strategies. Therefore, this study address the economic burden of diabetes mellitus by estimating the direct and indirect cost of the diseases and analyzing for catastrophic medical expenditure, medical impoverishment and factors associated with diabetic costs in the study area.

1.3 Significance of the study

The attention provided toward the economic burden of diabetes mellitus by Ethiopian health system is inadequate. In order to influence the view of policy and decision makers this study will estimate and determine the economic burden of diabetes through measuring the incidence of catastrophic out of pocket medical expenditure and medical impoverishment.

The findings of this study deliver tangible evidence for policy actors and public health activists in order to design sound advocacy strategies. This study provides information on major costs and cost contributors/factors for public health activist during policy negotiation as well as financial advocacy. In addition to that the result of the study can be used for International and domestic resource mobilization purpose by FMOH and regional health bureaus. The study also serves as initial information by estimating the direct and indirect cost of the diabetes for financial planner and budget allocators. Different stakeholders working on prevention and treatment of DM can empirically understand the economic consequence of the disease.

CHAPTER TWO: LITERATURE REVIEW

2.1 Epidemiological burden of Diabetes Mellitus

2.1.1 Worldwide

Global prevalence of diabetes has doubled escalating from 4.7 percent in 1980 to 8.5 in 2014 in adult population. Currently 422 million adult are living with diabetes [1]. Dr. Kent (2016) from university of Oregon presented that the pandemic of diabetes are spreading remarkably for the last 50 years, in 1960 one person out of one hundred was diabetic, in 1995 one person of 50 was diabetic, in 2015 one person of 8 was diabetic and likewise it is predicted in 2050 one person of 3 will be diabetic.

About 3.7 million Diabetic related deaths was reported in 2012 and 43 percent of death occur before the age of 70 year, economically productive age group. The percentage is far higher in low and middle income countries. Diabetes prevalence estimate for type 1 and type 2 do not exist globally. However, it is known that majority of people with diabetes are affected by type 2 diabetes used to occur among adults. Currently, type 2 diabetes also occurs in very young children. [1]

2.1.2 Low and middle income counties and Africa

The International Diabetes Federation estimates that 90 percent of diabetes patients live in low or middle-income countries [3]. Information from WHO also disclose that the prevalence of diabetes in low and middle income counties has been steadily increasing for the last three decades. Estimated diabetes mellitus prevalence as of 2014 in Africa was 7.1% and within about twenty years the prevalence becomes more than double from 3.1% in 1980 [1].

Recently, Africa is experiencing double burden of diseases both communicable and non-communicable. Along with high prevalence of TB, HIV and malaria major communicable diseases, the burden of non-communicable disease like diabetes mellitus become the future challenges for the continent. About 24 million people expected to live with diabetes by 2030 [6]. The prevalence of diabetes in Ethiopia is also estimated to be 3.8% and males (4%) are more prevalent than female (3.6%) according to WHO [1]. However, considerable higher variation was observed across different regions of the country, the lowest 0.3% and the highest 7.0% [6].

2.2 Economic Burden

National Health account studies in Ethiopia showed that total health expenditure has been growing gradually. Per capital Health expenditure in Ethiopia increases from USD 16.1 in 2007/8 to USD 20.77 in 2010/11. NHA also discovers that household out of pocket health expenditure is the main source of finance in Ethiopian health sector (34%) [9]. Diabetes Mellitus imposes considerable costs of treatment on patient and their family's income and frequently result in catastrophic expenditure [15].

Diabetes and its complications bring about substantial economic crisis to people with diabetes and their families and to health systems and national economies through direct medical costs and loss of productivity [1]. With limited national funding, individual patients and their families may have to spend significant proportions of their income on treatment for diabetes, a level of expenditure that may not be affordable. The Sudanese study found that families spend an average of US\$ 283 per year caring for their diabetic child, which amounted to 65% of the family's annual expenditure on health. It hinders their ability to pay for treatment through loss of income of the diabetic patients and their families [10].

The American Diabetes Association estimates that the yearly cost for treating a person with diabetes is over 5 times more than for a person without diabetes. Due to its chronic nature with severe complications, diabetes requests costly prolonged treatment and care. The implication is very clear diseases have high substantial socio-economic burden [4]. Similar study in Germany reported that diabetes patient had 1.8 (USD 4,229 vs 2,351) times higher direct cost and 2.07(USD 5,218 vs 2519) times higher indirect cost than people without diabetes annually [5].

Blindness-retinopathy, kidney failure- nephropathy, cardiovascular complication, lower limb amputation, neuropathy and several other chronic and acute consequences impact significantly the family income of the patient [1]. About 70% of the DM related costs are attributed to its complications. Diabetes is an expensive disease its complications further magnify the economic impact on patients and their family. Direct cost of diabetes care required 65% of the health expenditure. High expenditure was incurred on direct medical cost [11].

Study in India discloses that 37.5% of the hospitalized patient incurred catastrophic expenditure. Most of the hospitalizations occurred due to the complications the disease; Patients who were hospitalized due to diabetes mellitus incurred a much higher economic loss than non-hospitalized diabetic patients. Out of total expenditure incurred on diabetes, 47.3% expenditure was incurred on medication itself. In this study 80.5% of the respondents use private health facilities to get treatment. Direct cost per visit was found to be 289% higher in private sector outpatient clinics than in public sector [11]. Patient preference of private health facility rather than public health facility further aggravates the economic burden of treatment.

Study conducted in Morocco find out that the per capita direct cost of diabetes is between US \$259 and US \$830 per year. The total economic cost of diabetes in Morocco was estimated to be between US \$2.5 billion and US \$3.5 billion with indirect cost accounting for 57% to 81%. In Morocco the indirect cost of DM is higher than the direct cost. Unlike Morocco studies in Nepal with regards to the cost variables, the direct cost figures were found to be higher than the indirect cost figures [14].

In Nigeria the economic burden and catastrophic expenditure among DM patients found to be high. The mean monthly direct cost of US \$ 356 per patient is considered so high. The disproportionate and catastrophe expenditure is towards lower socioeconomic groups. The poor

is not protected from high impact of out of pocket spending and increasing care cost (inequity). Re-visitation of the present health care financing policy to accommodate pro-poor policies that will make DM care free at the delivery point and subsidize costs or provide a wider coverage of National Health Insurance should be momentous [15].

Patients with longer duration of treatment with diabetes complication and co morbidities bear high cost in Pakistan. Some kind of result has achieved from other studies perform in developed and developing nations recommended that complication is the key reason for increasing cost of treatment to diabetic patients which will influence the healthcare system. Medicinal costs made up 80% of the total direct cost per visit (US\$ 11), followed by doctor's fee (35%) and laboratory investigation (33%) [16].

Study from Sweden come up with estimation of annual per patient direct medical costs was USD 2,840.73(SEK 25,000). The largest share of this cost was hospital inpatient care. Moreover, medicals costs increased with duration diabetes and also the cost was higher for patients treated with insulin compared to those treated with oral hypoglycemic drugs. This Swedish based study analyzed that Patients with both macro and micro vascular complications had more than three times higher costs compared with patients without such complications [44].

Recent study in USA releases people with diagnosed diabetes suffer average medical cost of \$16,750 per year, of which about \$9,600 (57%) is directly connected to diabetes. People with diagnosed diabetes have a medical cost of 2.3 times higher than people in the absence of diabetes [46].

Total cost per visit, direct cost per month, total cost per month and total direct and indirect cost per annum were found to be higher for diabetic patients visiting private sector outpatient clinics. The costly nature of the disease could be better described by the fact that people with DM have recurrent and intensive visitor of health facilities and are heavy lifelong users of health resources. People with DM have higher use of hospital inpatient care, outpatient and physician office visits, emergency visits, nursing facility stays, home health visits, visits to other health professionals, and prescription drug and medical supply use more than their peers without Diabetes mellitus [13]. The burden is really need strong shoulder to live with the disease. However, what about the poor patient? The policy maker should have to provide due emphasis for this silent killer.

Time series data from china showed the annual diabetes cost averagely accounted for 70% of the total cost in 2009 and 2010 and elevated from 1,655 to 1,857 USD in the study period. While, it reduced to 67.2% in the 2011. In china only 30% of the total costs were paid by patients and the value of this out of pocket payment was shrinking from 29.8% in 2009 to 27.7% in 2011. But, the proportion of patients with hospitalizations increased from 17.2% to 20.2%. The economic burden diabetes was much heavier for Patients with frequent hospitalization. The average annual cost per patient with at least one hospitalization in a year (6,301 USD in 2009) was more than four-fold the costs per patient with only outpatient visits (1,568 USD in 2009). This accounted

for more than 50% of annual total cost. Patients needing hospitalization had a higher percentage of out of pocket payment comparing to their equivalents without hospitalizations.

Based on the above literatures review and theoretical background the following conceptual framework had been designed (Figure 1).

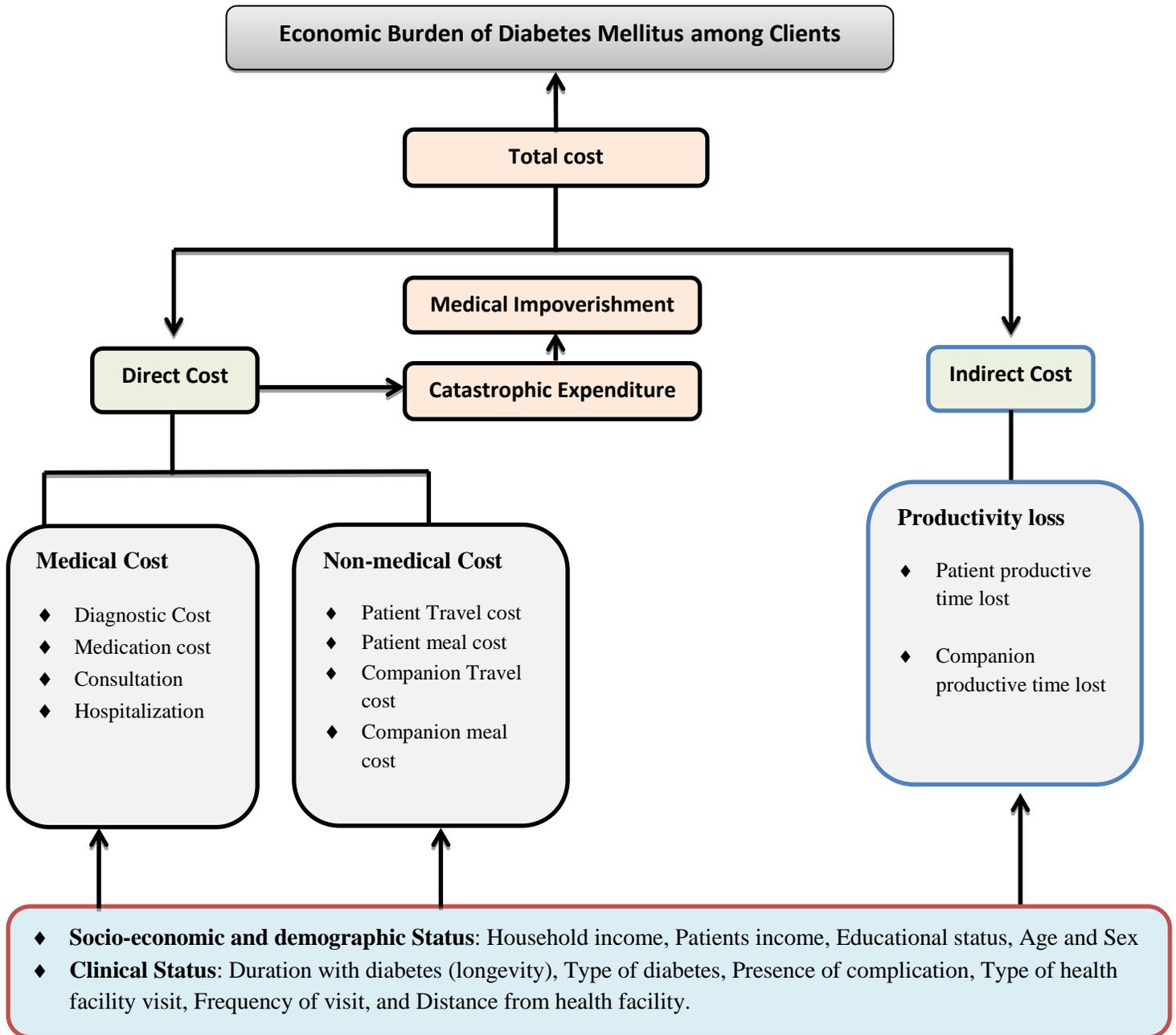


Figure 1: Conceptual Framework of Economic Burden of Diabetes Mellitus among clients

CHAPTER THREE: OBJECTIVES

3.1 General Objective

The general objective of the study is to measure the magnitude of economic burden of diabetes mellitus by estimating the total cost of care and treatment, catastrophic medical expenditure and medical impoverishment borne to individual patients and their families attending health facilities in Hawassa city, south Ethiopia.

3.2 Specific objectives

- To measure the direct and indirect cost of diabetes mellitus care and treatments.
- To determine the proportion of diabetic patient households suffering from catastrophic medical expenditure.
- To determine the proportion of medical impoverishment among diabetic households due to catastrophic health expenditure.
- To determine factors associated with total cost of diabetes mellitus.
- To determine factors associated with catastrophic medical expenditure.

CHAPTER FOUR: METHODS AND MATERIALS

4.1 Study Area and Period

The study was conducted in health facilities found in Hawassa city from January to December 2017. Hawassa is one of the fastest growing cities in the country and the center and capital of political, economic and cultural festive of Southern Nations Nationalities and Peoples Regional State. The city is located about 270 km from Addis Ababa via Bishoftu road [17].

In Hawassa city there are six hospitals providing diabetes mellitus care and treatment. Two governmental and four private hospitals and eleven health centers as well as twenty six private higher clinics are currently providing the services.

4.2. Study Design

This study employed cross sectional study design from patient perspective. Direct and indirect costs associated with care and treatment of diabetic patient and their families was collected and analyzed. Micro costing/bottom up approach was used to measure the magnitude of direct cost of diabetes. The Indirect cost of the diseases was estimated employing human capital approach.

4.3 Population

4.3.1 Source Population:

The source populations of the study was all diabetic patient of type 1 and type 2 who started routine care and follow up at health facilities in Hawassa city, South Ethiopia.

4.3.2 Study Population:

Diabetic patients who received routine care and follow up in selected health facilities with large number of cases for at least one year. Patients having regular visit for glycemc control, complication screening, regular laboratory test and medication were the study population.

4.3.3 Inclusion and Exclusion Criteria

4.3.3.1 Inclusion Criteria's

- Diabetic Patients who have been receiving routine follow up in health facilities at least for more than 12 months.
- Both type 1 and type 2 Diabetic patients were included in this study.

4.3.3.2 Exclusion Criteria's

- Gestational diabetic patients or pregnancy related diabetic patients was excluded
- Diabetes patients using inpatient services during survey time was excluded. That was because; the cost of treatment was not completed.

4.4 Sample size and Sampling Technique

4.4.1 Sample size determination

Single population proportion formula was used to determine the number of DM patients participating in the study. For quantitative study like this one the formula used proportion and standard deviation:

$$n = \frac{(Z_{1-\alpha/2})^2 \cdot p \cdot (1 - p)}{d^2}$$

n= Sample size

$Z_{1-\alpha/2}$ = is standard normal variate at 5% type 1 error ($p < 0.05$) it is 1.96

p= maximum variability of the population at 50%. i.e. (0.5)

d = Marginal error or precision

Due to lack of similar study in the country standard deviation of diabetic cost of illness assumed to be 50% then 5% precision (d) and 95% confidence interval. In majority of studies p considered to below 5% hence $Z_{1-\alpha/2} = 1.96$ used in the formula.

$$n \approx 384$$

Based on the above formula the sample size (n) was 384 diabetic patients with routine follow up for the last one year and more. Expected non-response rate (nrr) was 5% then $n \cdot nrr = 384 \cdot 5\% \approx 19$, Therefore, the total sample size including non-respondent was 403. However, we don't have non respondents during data collection process. This might be due the data collection process was taken placed using face to face interview to minimize recall bias by employing clinicians from outpatient and inpatient department who knew the history of the patients very well. Adequate Sample size for study factors also considered.

4.4.2 Sampling Technique

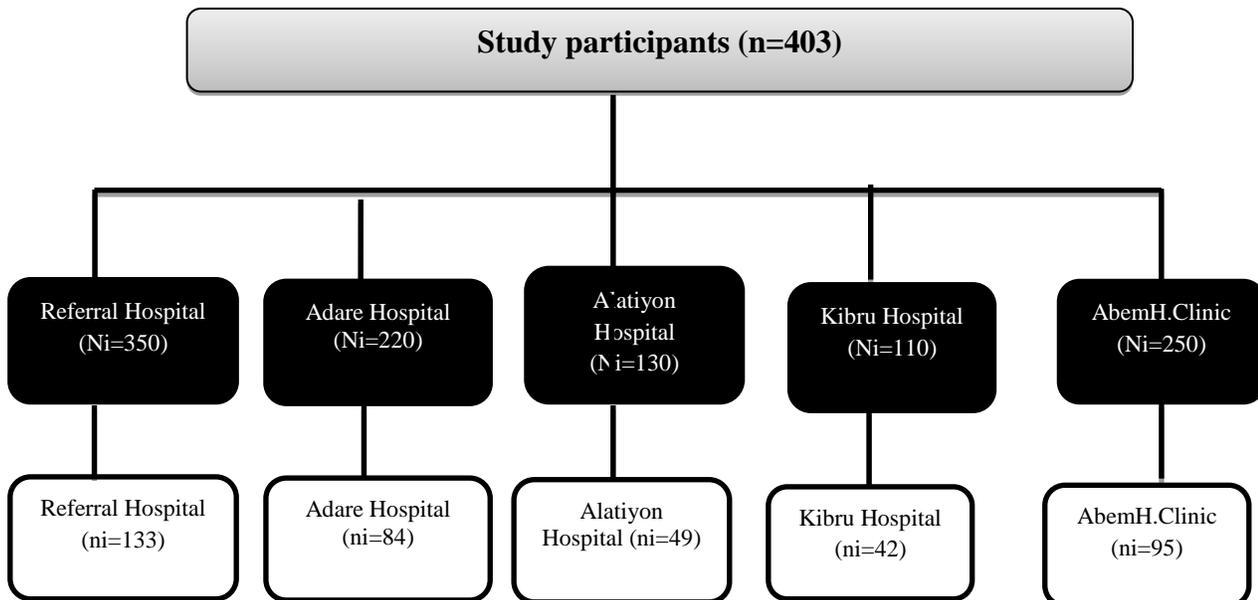
A stratified consecutive sampling method was employed during survey time. To produce representative target sample the study population was stratified in to five strata of hospitals. That is due to the study have factors determined by the strata and in order to insure sufficient sample size. The study subject was recruited consecutively from each stratum in the course of survey time until the total allocated sample size reached.

In order to make sure sufficient sample size recruited for each strata proportional allocation formula was used.

$$n_i = n \cdot \frac{N_i}{N}$$

Where n_i is required sample size in each strata, n is for total sample size, N_i stand for number of patient in each subgroup and N total number of patients/clients who have follow up in all identified strata.

Figure 2: Schematic Presentation of sampling Procedure



4.5 Data Collection Procedure

Semi structured questionnaire was used to measure direct and indirect costs and cost factors of managing diabetic mellitus in the study area. The questionnaire was prepared by reviewing literatures of similar studies and guidelines organized to capture medical and non-medical cost of care and treatment. Before the actual data collection process begins to run, the questionnaire was tested in Dore primary hospitals on 30 diabetic patients to see the validity of the tools.

Face to face exit interview was conducted by experienced seven BSC and diploma nurses who knew the history of the respondent in outpatient and inpatient department. The data collectors were trained and employed by principal researcher and there was continuous follow-up and supervision throughout the data collection period. Very old patients and children age less than 18 years of age their caretakers was co interviewed. Data quality/completeness was checked after each data collection process settled by the assigned supervisors.

4.6 Study Variables

Dependent variable: Total cost of diabetes mellitus management and catastrophic medical expenditure toward patients and their families.

Independent Variables: Socio-economic and demographic status: Patient Income, family income, educational status, family size, age and sex. **Clinical Status:** Duration with diabetes mellitus, Frequency of health facility visit, Type of health facilities, Type of diabetes, Presence of complications and Distance from health facility.

Operational Definitions

Economic burden of diabetic household: Financial expenditure for diabetic care and treatment become economic burden if it exceeds 20% of the disposable income (COOP expenditure) and extent to which catastrophic health expenditure push diabetic household income below poverty line (USD, 1.9 per day).

Catastrophic health expenditure: *diabetic* medical expenditure is catastrophic if a household's health expenditure exceeds 20% of the disposable income [23].

Medical impoverishment: The extent to which catastrophic health expenditure push diabetic household income below poverty line of birr 1,032 (USD 1.25 per day) [58]. That means comparing the proportion of the population below the poverty line before and after the diabetes cost happen excluding those who had been already below the threshold before the cost.

Direct costs: are monetary costs directly related to medical and non-medical expenditure of diabetes mellitus.

Indirect Cost: productivity losses in terms of lost income due to diabetes related morbidity, mortality and disability, borne to the individual patients and their family.

Medical Costs: are costs incurred for medication, hospitalization, diagnosis and consultation by diabetic patient

Non-medical costs: are costs borne to diabetic patients and their companions for transportation and meals service related to diabetes care and treatment.

Out-of-pocket Expenditures: The portion of medical expenses that a diabetic patient is responsible for paying in cash. That means expenditure without insurance coverage and fee waiver.

Poverty line: is defined as the percentage of the population living on less than USD 1.9 per day, purchasing power parity adjusted [58].

4.8 Data Analysis plan

After the data collection process was completed the data entry phase was started using EPI-data version 3.1 software. During data entry any error related to it was checked and corrected. Thereafter, the data was exported to Statistical Package for Social Science (SPSS) version 20 software for detail analysis.

Both descriptive and analytical statistics was applied to disclose the finding of the study during data analysis. Descriptive statistics like percentage and frequency counts was used for categorical variables and mean, median and standard deviation was also calculated for continuous variables.

Our cost data are not normally distributed therefore; median value could be more representative than the mean as a measure of central tendency or combination. The median measurement was more useful because it is not affected by extreme values in our data set. Normality test with (Shapiro- Wilk, $p > 0.05$) visual inspection of histograms and normal Q-Q plot showed that the total cost were not normally distributed with skewness of 3.69(SE =.122) and kurtosis of 16.5 (SE=.243) with large number of outliers and heteroscedasticity problem [Figure 3].

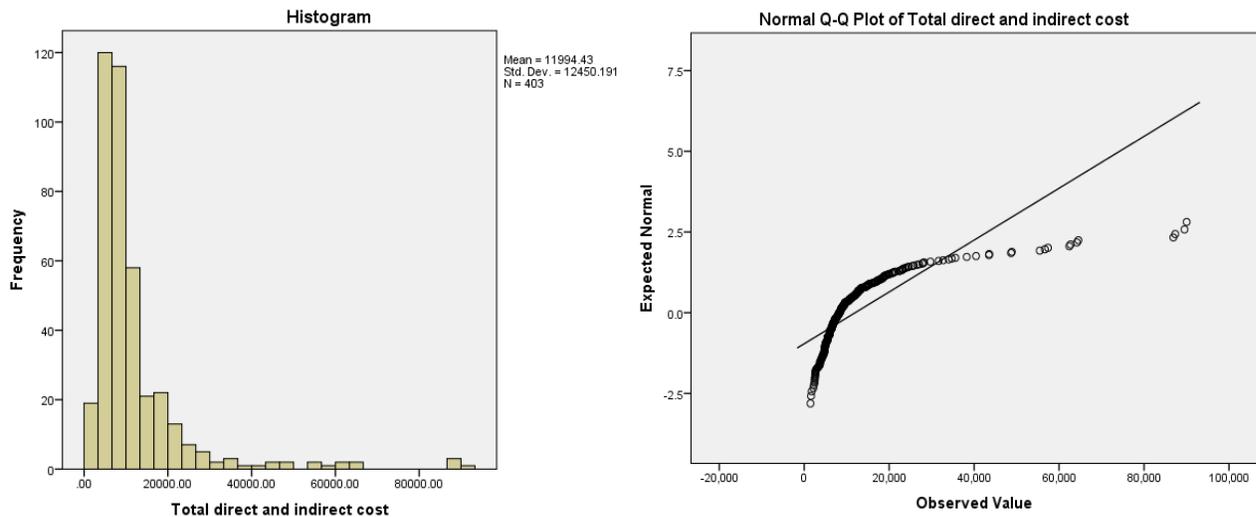


Figure 3: Normality test result of total cost of diabetes mellitus for the study participants in 2017, (n=403)

Model Estimation Plan

Two distinct models have been developed and computed for the total cost of diabetes mellitus and catastrophic out of pocket medical expenditure to determine variables that significantly associated with treatment costs and economic burden of the diseases.

First model: The distribution of the study outcome variable total cost is not normally distributed and right-skewed with large number of outliers; therefore, Generalized Linear Model gamma with log link transformed natural logarithm was used in order to minimize the effects of the skewness and kurtosis nature of our cost data. Result was considered as significant if p value less than 0.05 at 95% confidence interval.

Multivariate tests were used to see the design effect and identify the influencing factors of the independent variables on total cost. Finally adjusted Generalized Linear Model (GLM) was used to estimate the unique influence of independent variables on total cost (Equation 1).

$$y_i = \alpha + \sum_{i=1}^n \beta_i x_i + \epsilon \dots (1)$$

Where y_i is the total cost of diabetes as dependent variable, x_i is independent variables (Income level, type of DM, Frequencies of visit, Presence of complication, etc), β was the coefficient for each independent variable which measure level of influence of independent variables, α signifies the unknown intercept term, and ϵ was the random error term.

Separate model was employed for catastrophic medical expenditure to see what were the driving factors and the strength of influence. Since catastrophic out of pocket (COOP) medical expenditure was dichotomous variable binary logistic model had been used to compute and select the factors that influence COOP with p value of less than 0.05 significant level (Equation 1).

$$\ln(p|1-p) = \beta_0 + \sum_{n=1}^i \beta_i x_i + \epsilon_i \dots (2)$$

Where $\ln(p/1-p)$ is log odds of catastrophic expenditure as dependent variable, x_i is independent variables (Income level, type of DM, Frequencies of visit, Presence of complication, etc), β was the coefficient for each independent variable which measure level of influence of independent variables, α signifies the unknown intercept term, and ϵ was the random error term.

The assumptions behind using binary logistic regression for catastrophic medical expenditure were the dependent variable catastrophic medical expenditure was dichotomous such as catastrophic and non-catastrophic expenditures. The second assumption was there were more than two independent variables such as, Income level (continuous variables), type of diabetes (nominal variables), presence of complication (nominal variables), duration with diabetes (continuous variables), etc. The problem of multicollinearity also teste using Pearson correlation

coefficient $r=0.8$ as cut of point, if the correlation between independent variables (r) is greater than 0.8 multicollinearity exist then one of the two variables dropped.

Before adjustment considering all variables in the binary logistic models were significant predictors of catastrophic medical expenditure in the multivariate analysis. However, after a number of repeated backward stepwise analyses the final model had been designed with pseudo R squares Cox & Snell and Nagelkerke the regression model explained 55% and 73.3% of the total variation in the model respectively. Furthermore, the most reliable goodness of model fit test Hosmer and Lemeshow test reported 0.312. The model fitness was significant because Hosmer and Lemeshow test result was greater than $p = 0.05$ (Table 11).

4.9 Data Quality Management

The questionnaire developed for data collection purpose was translated in to local language Amharic which is the working language of the city and then translated back to English so as to preserve the constancy of the data to be collected. Questionnaire pretest was also undertaken to check the feasibility and for any adjustment.

Data collectors and supervisors from health background were enrolled and trained on the content and meaning of questions of the designed questionnaires. Furthermore, on daily basis the completeness, clarity and any misunderstandings on the questionnaires was checked by supervisors and principal researcher.

4.10 Ethical Consideration

Ethical clearance was obtained from Ethical Review Board of Jimma University institute of health. After obtaining official letter of permission, it was submitted to health fallibilities where data collection process takes place. Written and oral informed consent was obtained from the interviewee by informing the purpose of the study before asking any question. During data collection any interviewee had the right to withdraw from the process at any time and considered as non-respondent. All the individuals' information was recorded and used anonymously and confidentially throughout the study.

4.11 Dissemination Plan

The final report of the study will be presented and submitted in the form of soft and hard copy to Jimma University, Institute of Health Science, Department of Health Economics, Management and Policy. Besides, efforts will be made to present the findings on program based workshop in FMOH and SNNPR Health Bureau. Scientific conferences and journal publications will also be considered in addition to radios and Television broadcasts. The paper will also be preserved at jimma university library.

CHAPTER FIVE: RESULT

5.1 Economic and Socio-demographic Characteristics

Out of the total study participant 209 (51.9%) were male and 194(48.1%) were female. The age distribution of individuals participated in this study ranges from 1 to 86 with mean age of 39 years. Relatively, large number of the study participants 154(38.2%) fall in the age group of 41 to 60. Only 44(10.9%) were under the age categories of 61 and above. Observing at the marital status of the respondents 227(56.3%) of them were married and 129(32%) were unmarried. The role of the study participants in the household were almost equivalent, number of motherhood 129(32%), fatherhood 135 (33.5%) and childhood 118(29.3) were detected. The average family size of the individual interviewed was 3.46 (Table 1).

Large proportion of study participants attended primary school (132(32.8%)) or secondary education (86(21.3%)) and only 10(2.5%) were had masters and above degree. People who had first degree (60(14.9%)) and those who didn't have education (56(13.9%)) were almost equivalent. In the case of occupation, 120(29.8%) were employed and 91(22.6%) were students. About 66(16.4%) were Homemaker and 76(18.9%) were self-employed participant (Table 1).

About 253 (62.8%) patients had their own income and the rest 150(37.2%) were dependent on their families income. The median income of the study participant was 1,000 Birr with a maximum of 30,000 per month. Their family income ranges from 250 to 30,000 with median of Birr 3,000 per months. However, 24(6%) of the participants didn't have any income from any source. Diabetic patients who obtained routine medical follow up in selected health facilities come from a radius of 450 km. The minimum distance reported was 2 km with a mean of 21.4 km.

Table 1: Socio economic characteristics of the study participants attending health facilities in Hawassa city, in 2017, (n=403)

<i>Variables</i>		<i>Frequency</i>	<i>Percent</i>
<i>Sex</i>	Male	209	51.9
	Female	194	48.1
<i>Age</i>	1-20	116	28.8
	21-40	89	22.1
	41-60	154	38.2
	61 <	44	10.9
<i>Marital Status</i>	Single	129	32
	Married	227	56.3
	Separated	7	1.7
	Divorced	16	4
	Widowed	23	5.7
<i>Education</i>	No education	56	13.9
	Grade 1-8	132	32.8
	Grade 9-12	86	21.3
	Diploma	59	14.6
	Degree	60	14.9
	Masters and above	10	2.5
<i>Occupation</i>	Employed	120	29.8
	Unemployed	14	3.5
	Private Work	76	18.9
	Student	91	22.6
	Homemaker	66	16.4
	Retired	29	7.2
	Other (Daily Laborer,...)	7	1.7
<i>Household role</i>	Father	135	33.5
	Mother	129	32
	Child	118	29.3
	Relative	21	5.2
Household income	<3,000	203	50.4
	3,001 - 6,000	92	22.8
	>6,000	108	26.8

Note: Other in employment status was different from the listed categories like Daily laborer,

5.2 Clinical Characteristics

From the total study participant 248 (61.5%) have type 2 diabetes mellitus and the rest 155 (38.5%) were type 1 diabetic patients. Looking at how the study participant knew their diabetic status at first instance about 270(67%) said that they knew it during another disease examination, while 84(20.8%) knew their status directly through diabetic checkup. Only 49(12.2%) detect their DM status during general health status examination (Table 2).

Table 2: Type of diabetes and First time witness of the study participants attending health facilities in Hawassa city, in 2017 (n=403)

	<i>Variables</i>	<i>Frequency</i>	<i>Percent</i>
<i>Type of diabetes</i>	Type 1	155	38.5
	Type 2	248	61.5
<i>First time witness of DM Status</i>	General health status examination	49	12.2
	Diabetes specific examination	84	20.8
	Another diseases examination	270	67.0

The mean duration of stay with diabetes mellitus of the study participants after diagnosis was 6.42 (SD 5.464) years. Half of the respondents were living more than five years with this disease up to a maximum of 32 years. Most of the patients had routine follow up for every consecutive month with a mean of 12 (SD 6.86) and with a range of 1 to 48 times per a year. The average waiting and treatment time was 3.5 hours. (Table 3)

Table 3: Duration, Frequency of visit and waiting and treatment hour of the study participant attending health facilities in Hawassa city, in 2017 (n=403)

<i>Variables</i>	<i>Mean</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Std. Deviation</i>
Duration with diabetes	6.42	1	32	5.464
Frequency of visit	12.06	1	48	6.861
Number of waiting and treatment hour	3.562		8.0	1.9442

The presence of complication due to diabetic related illness was reported by 157(39%) of the study participant. The remaining 246(61%) responded they didn't have any complication that required inpatient admission. Among the complicated patients 87(55%) of them received treatment from public health facilities and the rest 70(45%) from private health facilities.

5.3 Cost of diabetes mellitus and its components

5.3.1 Direct cost

Average direct cost per patient per year was median of birr 6,488 (USD 235.75) with mean of birr 8,800.38 (USD 319). Where medical cost cover 86.3% of direct cost with median of birr 5,780 (USD 210) and mean 7,598 (USD 276). The average non-medical cost reported birr 1202.29 (USD 43.67) per patient per annum. Over all monthly average direct cost was birr 733.36 (USD 26.64) per patient. Major contributor of direct medical cost was made by medicines (42.59%), followed by diagnostic cost (30.7%), hospitalization cost covered (21.46%) and consultation cost add only 5.23% (Table 5).

The average non-medical cost of diabetic patient for meal consumption was reported as a median of birr 120 (USD4.36) with a mean of 334 (USD 12.13). Similarly, cost of meal for patient companions was conveyed a mean of birr 273.98 (USD 9.95).Whereas, average travel costs for patient and companions were a mean of 276.6 (USD 10) and 179.48 (USD 6.52) respectively. The median value of the travel cost and meal cost for companions were not generated due to more than half of the study participant didn't have companions during health facilities visit for routine follow up purpose (Table 5).

5.3.2 Indirect Cost

Indirect cost was measured by time devoted by diabetic patients and their caregiver in seeking treatment for 12 months period. It includes time spent by patients and their caregiver during outpatient and inpatient care and also homecare. Looking at the average working hour absence of the study participants was a mean of 160 (n=252, SD 128) hour for patients and 96 (n=172, SD 80) hour for companions. The total working hour losses by the patient were 40,920 (n=252) and 16,376 (n=172) for companions for the study period. Total working hour lost for both patient and companions was 57,296 (Table 4).

Table 4: Number of working hour absenteeism of the study participant due to diabetic related illness for patient and companions in 2017

	Mean	Median	Std. Deviation	Total
Patient	160	120	128	40,920
Companions	96	96	80	16,376
Total	142	96	189	57,296

Indirect costs of diabetes were reported a median of Birr 920 (USD 33.43) over 12 month period. Comparing the mean of indirect cost for patient and their companions; patient income loss accounted for 77% of the total indirect costs (Birr 2,450, USD 89) while the remainder 23% (Birr 743, USD 27) was due to income loss of the companions.

Result from this study depicted the average out of pocket expenditure borne by diabetes mellitus per patient per year was median of birr 6,488 (USD 235.75) with a mean of birr 8,800.38 (USD 319.8). Depending on the above result direct cost covered 73.4% from the total cost and the rest 26.6% held by indirect cost. (Table 5)

Table 5: Direct cost and indirect cost borne by diabetes mellitus to the study participant, in 2017 (n=403)

Variables	Median	Mean	Std. Deviation
Direct cost	6,488	8,800.38	9,177.33
Medical cost	5,780	7,598	8,552.31
<i>Medicine cost</i>	2,300	3,236.67	4,198.97
Orla glucose lowering agent	360	1515.08	3709.52
Insulin	1080	1398.41	1769.26
Medication for complication		432	2030.98
Other drugs		6.87	102.23
<i>Diagnostic cost</i>	2,150	2,356.37	2,402.65
Laboratory	144	292.63	449.9
Imaging		300	800
Eye care (Retinal camera, etc.)		344.81	704.82
<i>Medical Tools</i>	1200	1362	1358.69
Self-monitoring machine	400	719.6	781
Insulin syringe		324	442
Miscellaneous (cotton, etc.)		341.42	570
<i>Hospitalization cost (N=157)</i>	2,600	4,866.94	6,883.67
<i>Consultation cost</i>	120	399.7	493.53
Non-medical cost	490	1202	2132
<i>Patient</i>			
Meal cost	120	334	626.56
Travel cost	120	276.6	442.59
<i>Companions</i>			
Meal cost		273.98	786.48
Travel cost		179.48	478.78
Indirect cost	920.00	3,194.04	5624.35
<i>Patient cost</i>	381.81	2,450.94	5,026.93
<i>Companion cost</i>	0.0	743.09	2,322

Note: Direct medical and non-medical cost data were collected and summarized using micro costing method/bottom up approach: cost data were collected by means of reconciling from the medical record and patient report. Human capital approach was employed to compute indirect cost of productivity loss;

5.4 Diabetic cost with Socio Economic and Clinical Characteristics

The total management costs of diabetes also varied with the type of diabetes. Patients diagnosed with type 1 diabetes had the highest annual mean cost of birr 9,047(USD 328.74) compared to birr 8,645.96 (USD 314) for those diagnosed with type 2 diabetes. Moreover, non-medical cost of type 1 diabetes was much higher with a mean of birr 1,536.77(USD 55.84) than birr 993.24(USD 36) for type 2 diabetes (Table 6).

Table 6: Direct cost by type of diabetes of the study participant from health facilities in Hawassa city, in 2017 (in birr)

<i>Type of diabetes</i>		<i>Total direct cost</i>	<i>Medical cost</i>	<i>Non-medical Cost</i>
<i>Type 1</i> (n=155)	Mean	9,047.46	7,510.69	1,536.77
	Median	6,700	5,948.00	650.00
	Std. Deviation	9,323.38	9,061.12	2,360.95
<i>Type 2</i> (n= 248)	Mean	8,645.96	7,652.72	993.24
	Median	5,942.00	5,465.00	426.00
	Std. Deviation	9,100.416	8,236.687	1,951.869

Note: at 95% Confidence Interval P=.000, type1 ($\beta=3.98$)

The overall total cost of diabetes also increased with increasing age (Figure 4). The older the patient the higher becomes the cost of managing diabetes. The young patients (Age 1-20 age), had the lowest overall annual mean cost birr 9,144 (USD 332.26) compared to birr 15,879.32 (USD 577) for those aged 61 years and above.

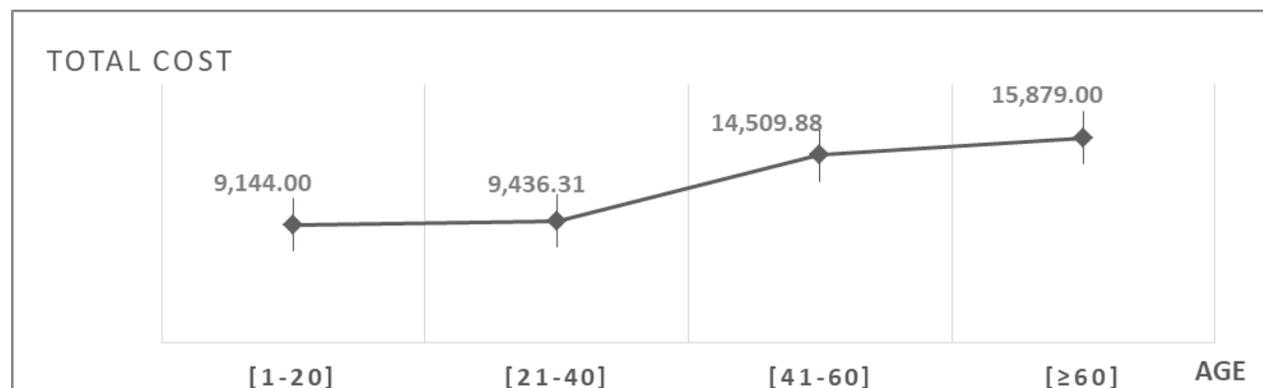


Figure 4: The total cost of diabetes by age categories of the study participants from health facilities in Hawassa city, in 2017 (In birr).

Concerning cost estimate observed between private and public health institutions: those Patients who received care and treatment from private health facilities had a mean treatment cost of birr 9,895.52 (USD 359.57), compared to birr 5,628.87 (USD 204.53) for those who obtained treatment from public health institutions (Table 7).

Table 7: Cost of diabetes by type of health institution of the study participant from health facilities in Hawassa city, in 2017 (in birr)

Variables		Medical cost	Non-medical Cost	Total direct cost	Total indirect cost
Public N=217	Mean	5,628.87	1,209.03	6,837.90	1,872.20
	Median	5,264.00	480.00	5,942.00	613.64
	Std. Deviation	3,226.95	2,017.94	3,994.62	3,049.99
	Maximum	26,070.00	15,660.00	26,154.00	21,818.18
Private N=186	Mean	9,895.52	1,194.43	11,089.95	4,736.20
	Median	6,783.00	519.00	7,706.00	1,472.73
	Std. Deviation	11,701.39	2,263.73	12,433.69	7,310.04
	Maximum	83,860.00	17,100.00	84,160.00	41,100.00

Note: at 95% Confidence Interval P=.014, private ($\beta=.126$)

Frequency of health facility visit was also another source of economic burden for the patients and their families. The rate of health facility visit for treatment and examination increases the cost of managing diabetes. Looking at the rate of frequencies by categorizing into different group, the total average cost per patient per year had increased. Patients who had more than 25 frequencies of visit spend a median of birr 10,993(USD, 399.45). Whereas median of birr 8,012.54(USD, 291.15) spend by patient with less than 12 health facility visits. Patients who had frequencies of more than 24 times in a years had higher cost than patients with less than 12 times visits in a year. (Table 8)

Table 8: Average total cost of diabetes by frequency of visit of the study participant attending health facilities in Hawassa city, in 2017 (in birr)

Frequency of visits	Median	Mean	Std. Deviation	Range
1-12	8,012.54	11,600.82	12,336.33	88,044.91
13-24	9,990.00	14,187.64	13,675.78	85,674.00
≥25	10,993.63	16,069.47	10,691.29	34,050.18

Management cost of diabetes also varied with the length of time the patient live with diabetes. Both direct and indirect cost of diabetes increased as the patient live longer with diabetes (Figure 3). Those who had the disease for more than 15 years had a mean cost of treatment birr 16,002

(USD 581.46) compared to birr 7,625 (USD 277) for those who had diabetes for less than 5 years. that means the excess cost ratio was 2.09.

Likewise, indirect cost of the disease also increases with the duration of diabetes with the patient increases. The mean indirect cost of the disease for patients who had follow up between 10 to 15 years was 2.3 (Birr 6,072 (USD 220.63) vs 2,617(USD 95) higher from those who had live between 1 to 5 years duration. The direct and indirect cost of the disease increases with the duration categories increases except for the last indirect categories that might be due to most of the study participant those who live more than 16 year were retired (Figure 5).

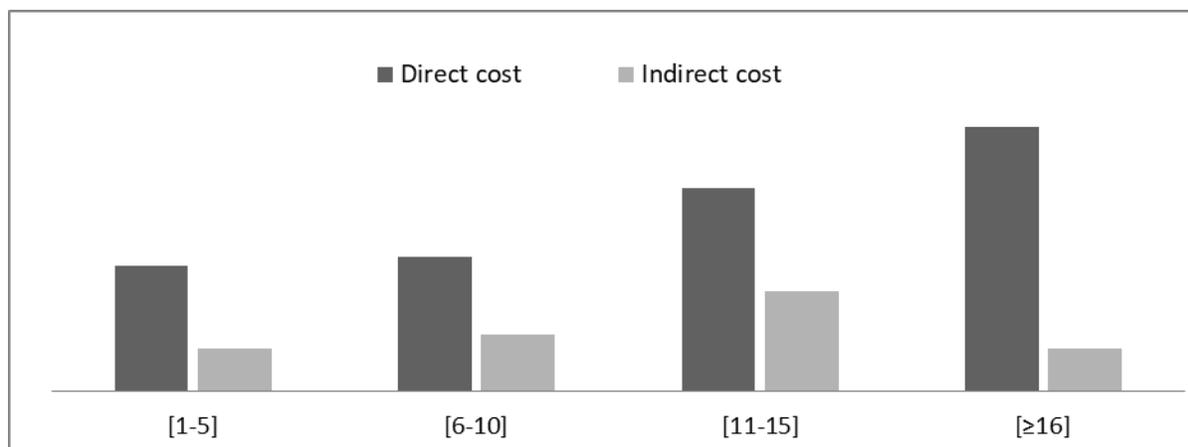


Figure 5: Patient duration with diabetes and direct and indirect cost for the study participant from health facilities in Hawassa city, in 2017 (in birr)

In this study we had considered level of income as a factor that influences the economic cost of the patient and their family. The result of the finding for both patient income and family income presented here. When we look at first the patient income and total cost of treatment the median total cost for income group (birr >10,000) was birr 33,733 (USD 1,225.76), compared to the lowest income group (birr <500) patient birr 7020 (USD 255.08) the difference were very significant. The highest income group had higher than to the lowest income group (Table 9).

Table 9: The average total cost of diabetes by patient income categories for the study participant from health facilities in Hawassa city, in 2017 (in birr)

<i>Variables</i>	<i>Median</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Range</i>	
Patient income group	0-500	7,020.00	8,536.00	5,396.68	41,893.00
	501-1,000	6,231.00	6,915.85	3,766.23	16,237.27
	1,001-2,500	7,592.54	10,800.38	9,248.22	55,172.27
	2,501-5,000	8,915.45	13,285.83	12,996.81	59,056.91
	5,001-10,000	12,884.54	16,741.58	15,716.13	85,084.91
	>10,000	33,733.00	40,117.84	23,872.15	74,722.73

Note: at 95% Confidence Interval P=.000, $\beta=7.38$

The result was similar when we look the family income level. Patients with higher family income group also had higher expenditure than the patient with lowest family income. Looking at the total cost of diabetes over groups of family income level the, we could understand that as the level of family income level increased the total cost of diabetes also increased. From eye ball observation from figure below the average cost of diabetes had increasing trend with the level of patient and family income (Figure 6).

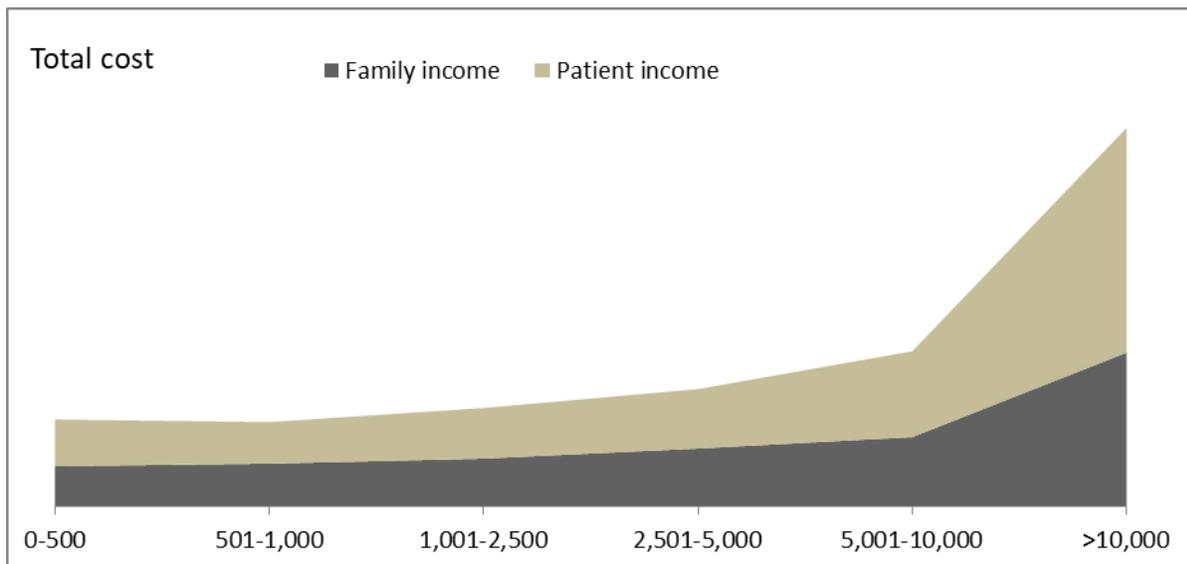


Figure 6: Median total cost of the diabetes mellitus by income categories for the study participant from health facilities in Hawassa city, in 2017 (in birr)

5.5 Catastrophic Expenditure and Medical Impoverishment

The occurrence catastrophic out of pocket medical expenditure due to diabetes portrayed that 209(52%) of the household direct medical expenditure resulted in consuming more than 20% of their disposable incomes. Furthermore, 87% of the patients with low income level (birr < 3,000, USD 109) were suffering catastrophic expenditure. However, only 8.3% of the highest income group (>6,000) households had catastrophic out of pocket expenditure (Table 10).

Table 10: Incidence of catastrophic out of pocket medical expenditure (COOPE) by household income categories in Hawassa city, 2017 (n=403)

<i>Variables</i>		<i>Patients with COOPE</i>	<i>Patients without COOPE</i>
Household income group	< 3,000	177(87%)	26(13%)
	3,001- 6,000	23(25%)	69(75%)
	>6,000	9(8.3%)	99(91.7%)

Pearson $\chi^2 = 210$, $p=0.000$,

Before making OOP expenditure 337(83%) of diabetic household were living above poverty line while, after making payments for direct medical cost 59(17.5%) of them become below poverty line. Technically speaking, 17.5% of non-poor household become impoverished due to diabetes related catastrophic out of pocket expenditure.

5.6 Model Estimation Result

5.6.1 Model Estimation for Total Economic Cost of Diabetes

Based on our Generalized Linear Model (GLM) regression estimate; Patient income level ($\beta=7.38$, $p<.000$), presence of complication ($\beta =.665$, $P<.000$), type 1 diabetes ($\beta =.398$, $P<.000$), Household income level ($\beta =3.11$, $p<.002$), private health facility utilization ($\beta =.126$, $P<.014$) and duration (longevity) with diabetes ($\beta = .019$, $p<.000$) were significantly and positively associated with large amount of total cost of diabetes toward the patients and their family (Table 10). The indication is that the presence of and the increment of these variables tend to increase the total cost of diabetes mellitus (Equation 1).

$$TC = 7.978 + 7.38PI_i + 3.11HI_i + 0.665C_i + 0.398T1_i + 0.126THI_i + 0.19D_i + 0.008A_i \quad (1)$$

Where TC is total cost of diabetes, PI =patient income, HI= Household income, C= presence of complication, T1 = type1 diabetes, THI = type of health institutions visited by diabetic patients, D= duration with diabetes, A= patient age.

5.6.2 Model Estimation for Catastrophic Medical Expenditure

Result from our binary logistic regression model; the presence of complication ($\beta= 2.06$, $p<.000^{**}$), Household income level of 3001-6000 ($\beta= 1.17$, $P<.000^{**}$), type 1 diabetes ($\beta=.985$, $P<.006^{**}$) and duration with diabetes ($\beta= .148$, $P<.000^{**}$) were significantly and positively associated with the chance of occurring catastrophic out of pocket medical expenditure (Table 11). The signal is the presence and increment one of the above variables increases the likelihood of happening catastrophic out of pocket medical expenditure (Equation 2).

$$\ln(p|1-p) = -4.716 + 1.17HI2 + 2.06C + 0.985T1 + 0.148D_i \quad (2)$$

Where $\ln(p/1-p)$ is log odds of catastrophic expenditure, HI2 stand for Household Income Category2 (3001-6000), C is Presence of Complication, T1 is type1 diabetes and D is duration with diabetes.

Diabetic patient with in income category of 3001-6000 per month is 1.17 times more likely to suffer catastrophic medical expenditure compared to other income categories. Large proportion

177(87%) of diabetic patients within the income categories (<3000) made catastrophic out of pocket expenditure. Patients contracting clinical complication are 7.86 times more likely to have catastrophic out of pocket medical expenditure. In other word patients without complication are 0.12 time more likely to make catastrophic medical expenditure.

Looking at the chance of incurring catastrophic medical expenditure between types of diabetes; patient with type1 diabetes is 2.678 times more likely to suffer catastrophic medical expenditure as compared to type2 diabetes. That means patient with type1 diabetes is 167.8% more likely to make catastrophic medical expenditure. Additional one year of longevity with diabetes increase a chance of suffering from catastrophic out of pocket medical expenditure by 16% (Table 13).

Table 11: Catastrophic out of pocket health expenditure with Crud Odds Ratio (COR) at 95% confidence interval in Hawassa city, 2017

Variables		COR	95% CI	P< Value
<i>Sex</i>	Male	0.801	(.405-1.584)	.524
	Female	1		
<i>Age</i>		1.071	(.994-1.032)	.098
<i>Education</i>	No education	1		
	Grade 1-8	.234	(.027-2.047)	.189
	Grade 9-12	.203	(.025-1.664)	.137
	Diploma	.193	(.022-1.661)	.134
	Degree	.080	(.009-.733)	.025
	Masters and above	.119	(.011-1.283)	.079
Household income	3,001 - 6,000	3.883	(1.164-12.946)	.027
	>6,000	1		
<i>Type of institutions</i>	Public	1		
	Private	.976	(.231-4.124)	.974
Distance from health facilities		1.006	(.996-1.017)	.213
Frequencies of visit		1.016	(.968-1.065)	.527
Duration with diabetes		1.068	(1.041-1.150)	.000
Presence of complication	With complication	16.63	(4.353-63.52)	.000
	Without Complication	1		
Type of diabetes	Type 1	8.163	(2.0-33.3)	.003
	Type 2	1		

Note: 1= reference group

Table 12: Summery statistics from GLM for factors affecting economic cost of diabetes mellitus (Gamma with log link)

Variables	Adjusted		
	Coefficient(β)	95% Wald CI	Sig.
Constant term	7.98	(7.75, 8.21)	.000
Type of diabetes			
Type 1	.398	(.23, .56)	.000
Type 2			.
Patient age	.008	(.004, .013)	.000
Presence of complication			
Complication	.665	(.566,.764)	.000
No complication			.
Duration (longevity)	.019	(.009, .029)	.000
Type of health facility			
Private	.126	(.026, .226)	.014
Public			.
Patient income	7.38	(4.91, 9.85)	.000
Household income	3.11	(1.18, 5.04)	.002
n = 403			
Omnibus Test			.000
Akaike's Information Criterion (AIC)			7821
Scaled Pearson Chi-Square			541.03

CI- 95% Confidence Interval at P<0.05

Table 13: Summery statistics from binary logistics regression for driving factors of catastrophic out of pocket medical expenditure (Natural log)

Variables	Adjusted			Sig
	Coefficient(β)	Exp (β)	95% CI for Exp(β)	
Constant	-4.716			.000
<i>Presence of Complication</i>				
Complication	2.06	7.86	(2.69, 22.92)	.000
No complication		1		
<i>Household Income</i>				
3001,6000	1.17	3.22	(1.22, 8.54)	.019
>6000		1		
<i>Type of Diabetes</i>				
Type 1	.985	2.68	(1.33, 5.39)	.006
Type 2		1		
Duration with diabetes	.148	1.16	(1.07, 1.26)	.000
n=403, P < 0.05				
R-square				
Nagelkerke R Square			0.733	
Cox & Snell R Square			0.550	
Hosmer and Lemeshow			0.312	

CHAPTER SIX: DISCUSSION

6.1 Estimation of diabetic costs

The findings from this study estimate that the median direct cost of study participant was birr 6,488 (USD 235.75) per annum. Our estimates appear to be relatively similar in order of magnitude from those developing countries than from developed nations. Similar study in Morocco estimates minimum direct cost for diabetes mellitus was USD 259 [14] and also recent study in Sudan [24] estimated that it is USD 175, other example was from India [37] showed USD 188 direct cost per patient per year. Likewise, study from Iran [24] also reported USD 152. However, comparing to developed countries like Germany minimum direct cost per patient was (USD 4,229) [5] as well as study from Sweden also recorded that USD 2,840.73 direct cost per annum relatively higher [44]. Recently, research from USA estimated average annual medical cost per case is USD 9,975 [46].

Despite the difficulty of comparing study findings among different countries due to health care market failure and methodological disparity, the similarity of our finding with developing countries and big variation with developed countries it might tell us something judgmentally on the bases of socioeconomic and demographic status. For instance, health facility standard, income level, medical subsidies, tax and tariff could be a good reason for the disparity and similarity. We also realized from the GLM statistical model estimate there is a positive association between income level and cost of diabetes mellitus treatment. Patient with relatively high income level ($\beta=7.38$; CI: 4.91, 9.85) tend to have high expenditure for diabetes care and treatment (Table 10).

The vast majority of the total direct cost is medical cost (86.3%) and the remaining cost shielded by non-medical cost. Pakistan's, Chinese's and India's studies discloses 80%, 67.2% and 74% of direct cost was medical cost which is indicate that medical cost surpasses non-medical cost [16, 28, 37]. It is usually common to have similar findings in almost all of cost of illness studies that medical cost is greater than non-medical cost. This is due to the measurement components of medical costs are numerous compared to non-medical cost commonly meal and travel cost. Whereas medical cost items include costs like medicine, diagnostic cost, hospitalization, consultations, etc.

Annual average medication cost per patient is estimated to be birr 2,300 (USD, 83.57) which is 42.6% of the total medical cost which is highest among the components of medical cost. Studies from India reported 42.38%, Morocco 35%, Iran 23.8% [36,41,31]. Our finding is seems similar with respect to medicine cost occupies the highest portion of medical cost. However, the Iran's report looks lesser compared to others findings. This was perhaps due to the health system in Iran have various mechanism to support expenses related to drug cost trough tax, tariff and subsidies [31].

The medical costs were could be influenced by the longevity of patient with diabetes. According to our finding the patients who had long duration (more than five years) had higher medical cost 9,260.7(USD 336.5) than the patient relatively recently (less than five years) diagnosed birr 6,421.58 (USD 233.3). That means based on the finding of this study the longer the duration with diabetes the higher become the cost of diabetes treatment. These might be due to as the patient live longer with diabetes the presence of complication become inevitable. Result from our regression model analysis also reported that there are positive association between medical cost and presence of complication ($\beta = .665$; CI: 566, .764) and longer duration with diabetes ($\beta = .019$; CI: .009, .029) (Table 10).

Study from Sweden also showed that patients with diabetic duration of less than 5 years had an annual cost of USD 2,383.59 and the cost rose to USD 2,506.54 between 5 and 10 years. The cost further elevated to USD 3,568.97 for the patient more than 10 years of follow up. This was common in most of other diabetes cost of illness (COI) studies around the world [43, 44, 45].

Addition reason for relatively high medical cost could be understood by looking at the cost associated with type 1 and type 2 diabetes mellitus. Patients with type 1 diabetes suffered higher out of pocket expenditure than type 2 diabetes. Estimate from this study showed that patients diagnosed with type 1 diabetes had the highest annual median cost of birr 6,700 (USD 243.45) compared to birr 5,942.00 (USD 215.84) for those diagnosed with type 2 diabetes. Result from model estimation also provides supporting hand to the above point of discussion; type 1 diabetes ($\beta = .398$; CI: 232, .565) had greater influence on diabetic related costs than type 2 diabetes. Likewise, different studies from African countries exhibited that the excess cost ratio between type 1 and type 2 diabetes was ranged from 1.80 to 5.66 [49]. Perhaps that is due to the nature of the disease Type 1 diabetic patients are insulin dependent and subject to frequent higher cost complication than type2 diabetes [1].

Another important driving factor for the higher cost of diabetes treatment was cost variations between public and private health facilities. The economic burden of patients and their family those who receiving treatment from private health facilities are suffering higher health care expenditure compared to patients who obtained treatment from public health facilities. Our findings of cost estimate and statistical test between the two types of institutions were in support to the above discussion: private health institutions had a median treatment cost of birr 7,706 (USD 280) compared to birr 5,942.00 (USD 216) public health facilities. The meaning is private health institutions had relatively higher cost over public health facilities despite health care service quality between the two types of health facilities. Model estimation also ensured that there is a positive association between the total cost and private health facility service utilization ($\beta = .126$; CI: .026, .226) than public health facility service utilization.

Further significant finding of the study was productivity loss (indirect cost) caused by diabetes was reported to be a median of Birr 920 (USD 33.34) over 12 month study period. Indirect cost cover 26.6% of the total cost. According to our result indirect cost of diabetes is lower compared

to direct cost. Similar finding from India estimated that 24% [37]. Experience from India was similar to our finding in a way that the proportion of indirect cost was lower than the proportion of direct cost from the total cost.

Generally speaking total cost of diabetes mellitus was determined by a number of aggravating factors like presence of complication, client age, patient and family income level, contracting type 1 diabetes, private health facilities attendance and longevity with diabetes are driving factors for greater treatment cost of diabetes. The presence and increments of the above variables tend to amplify the total cost of treatment (Table 10).

6.2 Incidence of Catastrophic Health Expenditure

The incidence of catastrophic out of pocket health expenditure among diabetic patient was a decent indicator of economic burden of diabetic households. About 209(52%) households direct medical expenditure results in consuming more than 20% of their disposable income. This indicates majority of diabetic household had heavy burden of catastrophic OOP expenditure. Particularly, household with low income level were holding the large share of the burden compared to the household relatively higher income group. Study from Nigeria also reported 69% of the poor had catastrophic expenditure [15].

All income group suffered catastrophic OOP expenditure while the lowest income group had the highest prevalence. In this study patient with income group of less than birr 3,000 (USD 106) 177(87%) of them were suffering from catastrophic OOP expenditure. Whereas, only 9(8.3%) from the higher income group (>6,000) suffered catastrophic OOP expenditure. In general catastrophic health expenditure declined as the income level of the household increase. This articulates the lowest income groups diabetic household were suffering considerably compared to the highest income group (Table 10).

It is not surprising to find high catastrophic expenditure in a low income country like Ethiopia with 29.6 % of the total population live under poverty line [58]. Furthermore, Ethiopia has no financial risk reduction mechanism to compensate high out of pocket expenditure borne from non-communicable diseases like diabetes. Obviously, the lower socioeconomic group, the poor was not protected from the impact of out of pocket spending. Ethiopian per capital health expenditure birr 571.59 (USD 20.77) [9] was another significant reason for catastrophic OOP expenditure. Result from this study estimate that annual per capital household expenditure for diabetic care and treatment was birr 6,488 (USD 235.75) that mean there are massive gap between government per capital health expenditure and diabetic household expenditure [USD 20.77 Vs USD 215].

The findings of this study can help decision-makers by identifying critical determinants of catastrophic OOP medical expenditure. From our regression model result the determinant factors had been pinpointed. The presence complication ($\beta= 2.06$, $p<.000^{**}$), Household income level of 3001-6000 ($\beta= 1.17$, $P<.019^{**}$), type 1 diabetes ($\beta=.985$, $P<.006^{**}$) and duration with diabetes

($\beta = .148$, $P < .000^{**}$) were significantly associated with higher catastrophic out of pocket medical expenditure (Table 13).

The occurrences of medical complication (OR:7.86; CI:2.69-22.9) were significantly associated with catastrophic OOP expenditure. Diabetic patients with complication are highly likely to incurred catastrophic OOP expenditure compared to patient without complication. Patients with clinical complication are 7.86 times more likely to have catastrophic out of pocket medical expenditure. In other word patients without complication are only 0.12 time more likely to make catastrophic medical expenditure. A study from United Arab Emirates (UAE) discloses patient with complications had 9.4 times higher cost than patient without complication [45].

Furthermore, patient with lowest income group of (<3000) had the higher likelihood to be affected by catastrophic OOP expenditure. About 87% of the patients made catastrophic OOP expenditure. Diabetic patient with in income category of 3001-6000 per month is 1.17 times more likely to suffer catastrophic medical expenditure compared to other income categories. Being in that group of income mean you are maximum possibility to make catastrophic medical expenditure by 17%. Several studies also found that lower income group of diabetic patient generally spent large portion of their income for diabetic care and treatment. Study from India and Nigeria reported that lower income group patient bear the higher economic burden of the diseases [26,48].

The chance of catastrophic expenditure occurrence for type 1 diabetes (OR=2.678;CI: 1.33, 5.39) was higher compared with type 2 diabetes. Patient with type1 diabetes is 2.678 times more likely to suffer catastrophic medical expenditure as compared to type2 diabetes. That means patient with type1 diabetes is 167.8% more likely to make catastrophic medical expenditure. This was perhaps due to type1 diabetes were high cost insulin dependency and frequent onset of complications. In addition to that most of types 1 diabetic patient were children and the need for caretaker was mandatory. This may result in boosting direct non-medical cost. Study finding from USA also showed medical cost of type1 diabetes were significantly higher than type2 diabetes [46]. This study also depicted the average cost of both medical (birr 5,948 vs 5,465) and non-medical costs (birr 650 vs 426) of type 1 diabetes were higher than the counterpart [Table 6].

Longevity of patient with diabetes (OR= 1.16; CI: 1.07, 1.26) is another additional driving factor for catastrophic OOP expenditure. As the length of duration with diabetes increased the risk of suffering from catastrophic expenditure also increased. Additional one year of longevity with diabetes increase a chance of suffering from catastrophic out of pocket medical expenditure by 16%. This is may be caused by the regimen pattern amendment for the patient to augment the impact of medication by prescribing additional medicines which result in extra cost. Supplementary reason for the above discussion is the chance of complication occurrence will increases as the patient lives long with diabetes mellitus [1].

6.3 Burden of medical impoverishment

The increasing trend of diabetes prevalence in Ethiopia and all over the world caused by population growth, aging, urbanization, and lifestyle changes could impose long-lasting economic burden to individual patients and to the national health economy at large [1].

Catastrophic out of pocket expenditure often result in medical impoverishment particularly to low income group households. In this case medical impoverishment is the assessment of diabetic related poverty measuring trough how much out of pocket direct medical expenditure pushing the diabetic household under poverty line. Based on our result 59(17.5%) diabetic non-poor household become impoverished (poor) due to catastrophic out of pocket expenditure.

Systematic study in Ethiopia also reported that diabetes was among the top 10 reasons of medical impoverishment [60]. Diabetic costs of direct medical expenditure were major significant determinant of financial insecurity for diabetic household. Furthermore, diabetic related impoverishment affects the living standard of the diabetic household by shifting and minimizing consumption budget to medical cost.

6.4 Limitation of the study

The findings in this study perhaps subject to several limitations such as: Self-reporting and 12 months recall period may result in under estimation or over estimation of diabetic related costs. This study also did not provide information on intangible cost which compromises quality of life, pain and suffering of people with diabetes and their families. Therefore, the burdens attributable to diabetes might be underestimated. Asset based information might be very sensitive to respondents. The respondents may not provide the exact amount of their income instead they prefer to report the proximate amount of income.

Furthermore, technically we used human capital approach to estimate indirect cost of productivity loss, in terms of lost earnings. While, human capital approach may overestimate the costs, it is the most commonly used method in cost of illness studies around the world. Moreover, minimum wage rate (Birr 420, USD 15.26) per month or birr 14 per day in Ethiopia [59] may under estimate the indirect cost. Furthermore, double counting might happen due to cost of co-morbidity that is the limitation of cost of-illness study.

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATION

7.1 Conclusion

The aim of the study was to estimate the cost of diabetes mellitus borne to the patients and their families and observing the burden of the diseases through measuring the extent of catastrophic out of pocket health expenditure and medical impoverishment among diabetic households. Factors associated with the economic burden of diabetes were also the intention of the study. We estimated that the total annual cost of diabetes per patient was a median of birr 8,256.72 (USD 300). Of which the median of direct cost was birr 6,488 (USD 235.75) and indirect cost birr 920 (USD 33.34). The result demonstrates direct cost of diabetes was higher than indirect cost.

Diabetes mellitus is a costly disease in Ethiopian healthcare system. The financial burden of the disease significantly affects large portion of diabetic Population. Majority of households with diabetic patient had catastrophic OOP health expenditure. All income groups suffered from catastrophic expenditure however, the poorest households had the highest burden. The presence of complications, lower household income level, type 1 diabetes and long duration with diabetes were critical determinants of catastrophic OOP medical expenditure.

Alternative indicator of the economic burden of diabetes was medical impoverishment resulted from catastrophic OOP expenditures pushing diabetic household to live below poverty line. About 17.5% Non-poor diabetic households become poor (impoverished) after making catastrophic health expenditure.

The presence of complication, type of diabetes, patient and household income level, type of health facility visit, duration with diabetes were significantly associated with large amount of direct and indirect economic cost of diabetes toward the patients and their family. Treatment costs were higher for patients with type 1 diabetes compared to type 2 diabetes. Likewise, the total cost of diabetes become higher and higher with the duration of diabetes. Another contributing factor for the economic cost of the diseases was the type of health facility where diabetic patient obtained care and treatment. Patients who obtained treatment from private facilities incurred higher cost compared to those who obtained from public health facilities. Patients and households with lower income level are suffering from higher total cost compared to patient and household with higher income level.

Since this paper is the prime study assessing the treatment cost of diabetes in Ethiopia from patient perspective, despite its limitations it perhaps provides fundamental information to patients and their family for household decision making, health care administrator for financial planning and negotiations, program and policy advocacy purpose by public health activists.

7.2 Recommendation

Based on the study findings the following recommendations have been forwarded to health care administrator and researcher:

Federal Ministry of Health

- Universal health coverage could not be achieved only by improving health care access without removing financial barrier. In order to minimize the economic impact of the disease FMOH should have to design financial risk reduction mechanism to compensate catastrophic out of pocket expenditure through expanding and strengthening community based health insurance (CBHI) and Social Health Insurance (SHI) scheme for pre diabetic and diabetic patients.
- For the poorest households with diabetic patient free diabetic care and treatment at the point of health care service delivery must be considered in an attempt to minimize the extent of medical impoverishment borne from diabetes care and treatment. That could be implemented through systematically strengthening the current fee waiver system for the poorest diabetic patient within the Ethiopian care financing strategy.
- The presence of complication is one of the major factors for the higher out of pocket medical expenditure for diabetic patients. Therefore, the economic impact of its complication could be significantly reduced by early detection and treatments of undiagnosed diabetes for the most at risk population through awareness creation and voluntary counselling and testing in outpatient and outreach setting.
- Household with type 1 diabetic patients are highly likely to suffer catastrophic out of pocket medical expenditure as compared to type 2 diabetic patients. Therefore, distinct consideration should be given to subsidize the cost of type 1 diabetes care and treatments.
- Longevity of diabetic care and treatment customarily resulted in increasing the chance of expending massive financial resources to diabetic patient and their household. Henceforth, old age retirement medical support would be helpful in order to minimize the susceptibility of diabetic related medical impoverishments.
- Generally, FMOH should have to run extensive prevention and treatment responses for diabetes mellitus using similar approaches implemented for HIV/AIDS responses in the long run. That would diminish the long lasting economic impact induced by diabetes related morbidity and disability.

Researcher:

- Further study should be done to distinctly recognize the burden of type1 and type2 diabetes. It is also important to investigate the common complications that influence the economic burden of diabetic household.

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ANNEXES I

Questionnaire

**JIMMA UNIVERSITY
INSTITUTE OF HEALTH SCIENCE
DEPARTMENT OF HEALTH ECONOMICS, MANAGEMENT AND POLICY
QUESTIONNAIRE FOR DIBETIC PATIENTS**

Interviewer: *The following explains the purpose of this interview and in particular the reasons for economic questions. You may either read out the following or use your own words to convey to the patient the reasons for the interview. The same questionnaire can be used for all patients at health facility.*

We would like to find out what extra money and time you and your family had to spend to visit health facilities. Your answers are important because they will give those who make decisions about patient treatment within the national healthcare service an idea of how much it costs you to use health services. Please answer every question. If you are not sure or cannot remember the exact details, please give the best answer/estimate you can. If you have a problem in answering any question, please ask for further explanation or jump to the next question. The information that you provide will be completely confidential. Your answers will be combined with the answers of other patients involved in the study and reported in such a way that it will not identify you or influence your pattern of treatment. If you would like any further information about this study please contact Mr. Yalew Tamirat by the following phone number and email address.

Phone Number: 0913171677

Email Address: yalewtamirat@gmail.com

Informed consent

I have read this form or the form has been read to me in the language I understand and I have understood the conditions stated above. I am willing to participate in this study.

Name of supervisor _____ signature _____

Name of enumerator _____ signature _____

PART I: SOCIODEMOGRAPHICS

101. Sex:

- 1. Male
- 2. Female

102. Age: _____

103. Marital Status

- 1. Single
- 2. Married
- 3. Separated
- 4. Divorced
- 5. Widowed
- 6. Other (SPECIFY)_____

104. Educational Status

- 1. No education
- 2. Grade 1-8
- 3. Grade 9-12
- 4. Diploma
- 5. Degree
- 6. Masters and above

105. Occupational status

- 1. Employed _ full timer
- 2. Unemployed_ seeking work
- 3. Private Work
- 4. Student
- 5. Homemaker
- 6. Retired
- 7. Others _____

106. Type of Employment

- 1. Government employee
- 2. Private employee
- 3. NGOs employee
- 4. Others

107. Your monthly income from all sources (Birr)

Amount of Birr

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108. Role in the household

1. Father
2. Mother
3. Child
4. Other _____

109. Number of adult household/Family member (age \geq 18)

Number of adults

110. Number of children in the household (age \leq 18)

Number of Children

111. How much is the income of the adult family members on average?

Amount of Birr

Part II: Clinical Status

201. How did you know your diabetic mellitus status at the first time?

1. During general health status check up
2. Having diabetic mellitus examinations
3. Having another diseases examination
4. I don't remember
5. Other _____

202. What type of diabetes do you have?

1. Type 1
2. Type 2

203. How frequently do you visit health facility for the last one year? _____

204. For how long do you follow up for diabetes care and treatment?

Year

205. In general, what would you say about your health state?

1. Very good
2. Good
3. Poor
4. Very poor

206. Have your health state interfered with your normal social activities with family, friends, neighbors or groups?

- | | |
|---------------|-------------------|
| 1. Not at all | 3. Quite a bit |
| 2. Slightly | 4. Almost totally |

207. Were you discouraged by your health problems?

- | | |
|---------------------|---------------------|
| 1. None of the time | 3. Most of the time |
| 2. Some of the time | 4. All of the time |

208. Were you fearful about your future health?

- | | |
|---------------------|---------------------|
| 1. None of the time | 3. Most of the time |
| 2. Some of the time | 4. All of the time |

209. If you were fearful, what is your major fear?

1. Illness of the diseases
2. Cost of medication
3. Changing feeding habit
4. Social interactions
5. Others

Part III: Direct Medical Cost

301. What kinds of medications and Diagnostic test do you use for the last 12 Months?

1. Insulin
2. Oral glucose lowering agents
(*Metformin, sulfonylurea, etc*)
3. Medication for Diabetes related complication
4. Laboratory test
5. Imaging (x-ray, MRI, etc)
6. Eye care
7. Consultations
8. Self-monitoring of blood glucose (SMBG) Test strips
9. Insulin syringes
10. Miscellaneous (methylated spirit, cotton wool)

302. How much do you pay for each medication for the last 12 Months?

1. Insulin
Amount of Birr
2. Oral glucose lowering agents (*Metformin, sulfonylurea, etc*)
Amount of Birr
3. Medication for Diabetes related complication
Amount of Birr
4. Other
Amount of Birr

303. How much do you pay for each diagnostic test for the last 12 Months?

1. Laboratory test
Amount of Birr
2. Imaging (x-ray, MRI, etc)
Amount of Birr
3. Eye care
Amount of Birr
4. Consultations
Amount of Birr

304. How much do you pay for medical tools for the last 12 Months?

1. Self-monitoring of blood glucose (SMBG) Test strips
Amount of Birr
2. Insulin syringes
Amount of Birr
3. Miscellaneous (methylated spirit, cotton wool)
Amount of Birr

305. Have you been admitted for inpatient treatment in the last 12 months?

1. Yes
2. No

306. If yes to Q303, where did you admitted most of the time?

1. Governmental health facilities
2. Private health facilities
3. NGOs Health facilities
4. Others

307. What type of admission services did you use?

1. Bed
2. Medication
3. Transport/Ambulance
4. Others specify _____

308. How much did you pay for the total inpatient services for the last 12 months?

1. Bed
Amount of Birr
2. Medication
Amount of Birr
3. Transport/Ambulance
Amount of Birr
4. Others
Amount of Birr
5. Total
Amount of Birr

309. What was your financial source for diabetes care and treatment?

1. Self
2. Family
3. Government
4. Insurance
5. Others

310. Where do you get medications and health care services most of the time?

1. Governmental health facilities
2. Private health facilities
3. NGOs Health facilities
4. Diabetes Associations
5. Others

Part IV: Direct Non-Medical Cost

Patient Travel and Meal Costs

401 How did you travel to the health facility? If you used more than one form of transport means please indicate the way you travelled for the main (longest in terms of distance) part of your journey.

- | | |
|-----------|---------------------------------|
| 1. Walked | 5. Private car |
| 2. Cycled | 6. Motorbike |
| 3. Bus | 7. Other (please specify) _____ |
| 4. Taxi | |

402. How frequently did you travel to health facilities using the above means of transport for the last 12 months?

Number of trips

403. If you travelled by one of the above means of transport for part or the entire journey, what was the average cost of transport?

Amount of Birr

404. How far away from the health facility do you live?

Number of kilometers

405. Over the last 12 months have you received meal (Food and Drinks) services during you were outside your home for *health facility visit*?

- 1. Yes
- 2. No

406. If yes to Q. 405, what was the total cost of your meal for the last 12 months? Please write the total cost of meal in the box below.

Total Cost

Companion Travel and Meal Costs

407. When you visited health facility did anyone normally accompany you?

- 1. Yes
- 2. No

408. If yes to Q. 407, who normally accompanied you to the health facility? Please circle the number(s) that best describe the person(s) who normally went with you to the health facility. You may circle more than one answer if appropriate

- 1. Partner/spouse
- 2. Child/children under 16 years
- 3. Other relative
- 4. Friend
- 5. Paid caregiver
- 6. Other (please specify)_____

409. How many companions did you have on average during health facility visit/stay for the last 12 months?

Average number of companions

410. How frequently did your main companions normally travelled with you to health facilities using the above means of transport (question 401) for the last 12 months?

Number of trips

411. If your main companion normally travelled with you the entire journey, what was the average cost of transport?

Amount of Birr

412. Over the last 12 months have your main companion received meal (Food and Drinks) services because of your health facility visit?

- 1. Yes
- 2. No

413. If yes to Q. 411, what was the total cost of your main companion meal for the last 12 months? Please write the total cost of meal in the box below.

Total Cost

Part V: INDIRECT NON MEDICAL COST: PRODUCTIVITY LOSSES

Patient Time Cost

501. Over the last 12 months how many hours a week were you expected to work in your main work? Please write the number of hours in the box below.

Number of working hours in week

502. Over the last 12 months how many hours a week, on average, did you spend on **unpaid** (e.g. household chores, shopping, caring for children or voluntary work) work? Please write the number of hours in the box below

Number of hours worked, on average, per week

503. Over the last 12 months how frequently did you visit health facility in a month? Please write the number of visit in the box below.

Number of visit

504. When you visited the health facility how long did you **normally** spend there? Please write the number of hours and minutes in the box below. *(Include both waiting time and treatment time)*

Number of hours

505. How many days were you absent from work or unable to work due to diabetes related illness for the last 12 months?

Number of days

506. Did you **normally** lose earnings as a result health facility visit for the last 12 months? Please circle the appropriate answer.

1. Yes
2. No

507. What was your main occupation for the last 12 Months?

Companion Time Costs

The next section of the questionnaire asks about the time/ working day lost to persons who **normally** accompanied you to the health facility based on the question asked 407 and 408.

507. If yes to Q. 407, how long did your companion normally stay with you at the health facility and home for the last 12 months? Please write the number of days in the box below.

Number of hours

508. What would your companion **normally** have been doing as their **main** activity if they had not gone with you to the health facility?

- | | |
|------------------------------------|-------------------------------------|
| 1. Housework | 6. Attending school or university |
| 2. Childcare | 7. Work leave |
| 3. Caring for a relative or friend | 8. Seeking work |
| 4. Voluntary work | 9. Paid work |
| 5. Leisure activities | 10. Other (please specify) |

509. Income of companion's _____

510. What was your companion's main occupation for the last 12 months?

ANNEXES II



**ጅማ ዩኒቨርሲቲ
የጤና ኢኮኖሚክስ፣ ሥራ አመራርና ፖሊሲ ትምህርት ክፍል
ለስኳር ታካሚዎች የተዘጋጀ መጠየቅ**

ውድ የዚህ ጥናት ተሳታፊዎች፡

የዚህ መጠየቅ ዋና ዓላማ በሐዋሳ ከተማ በሚገኙ ጤና ተቋማት በሚከታተሉ የስኳር ህምምተኞች እና ቤተሰቦቻቸው ላይ የስኳር ህመም የሚያመጣውን ኢኮኖሚያዊ ጫና በማጥናት ለፖሊሲ አውጪዎች፣ ለፕሮግራም ሰዎች በማቅረብ ለስኳር ህመምን የሚሰጠው አገልግሎት እንዲሻሻል እገዛ ለማድረግና ለጤና ኢኮኖሚክስ ድህረ ምርቃ መመረቂያ ማሟያ የሚሆን ጥናት ነው። ማንኛውም ዓይነት የሚሰጡን መረጃ/ምላሽ በምስጢር የምንጠብቅ ሲሆን የዚህ ጥናት መሳካት እርሶ በሚሰጡን ትክክለኛ መልስ ላይ የተመሰረተ በመሆኑ እባክዎን ይህንን መጠየቅ በሚገባ ካነበቡ ወይም ከተነበቡት በኋላ በአግባቡ /ትክክለኛውን ምላሽ ይስጡ።

ስለ ትብብርዎ በጣም አመሰግናለሁ!!

መስማማትን ማረጋገጫ

እኔ ይህን ካነበብኩ ወይም በሚገባኝ ቋንቋ ከተነበበልኝ በኋላ ሀሳቡ ከላይ እንደተገለፀው ተረድቻለሁ እና በዚህ ጥናት ለመሳተፍ ፈቃደኛ መሆኔን አረጋግጣለሁ።

ያልገባዎት ሀሳብ ወይም ጥያቄ ካለ ለአቶ ያለው ታምራት ከዚህ በታች በተሰጠው አድራሻ ይጠቀሙ፡

ስልክ ቁጥር :0913171677

ኢሜል: yalewtamirat@gmail.com

የመረጃ ሰብሳቢ ስም _____

የተቆጣጣሪ ስም _____

ፊርማ _____

ፊርማ _____

መለያ ቁጥር _____

ክፍል አንድ: ማህበራዊ፣ እኮኖሚያዊ እና አጠቃላይ የግለሰብ መረጃ / Sociodemographics /

ተ.ቁ	ጥያቄ	አማራጭ መልስ	ምርመራ/ሃደት
101	ጾታ	1. ወንድ 2. ሴት	
102	ዕድሜ	_____	
103	የጋብቻ ሁኔታ	1. ያላገባ 2. ያገባ 3. የተለያየ 4. የተፋታ 5. ባል/ሚስት የሞተባት/ችበት 6. ሌላ ካለ	
104	የትምህርት ደረጃ	1. ያልተማረ/ረች 2. ከ1-8 ክፍል 3. ከ9-12 ክፍል 4. ዲፕሎማ 5. ድግሪ 6. ማስተርስና ከዚያ በላይ	
105	የሥራ ሁኔታ	1. ተቀጣሪ 2. ሥራ የሌለው 3. የግል ሥራ 4. ተማሪ 5. የቤት እመቤት 6. ጡረተኛ 7. ሌላ ካለ	መልሶ 1ካልሆነ ወደ መጠይቅ 107 ይሂዱ
106	የሥራ አይነት	1. የመንግስት ሠራተኛ 2. የግል ድርጅት ሠራተኛ 3. መንግስታዊ ያልሆነ ድርጅት 4. ሌላ አይነት ካለ	
107	የእርሶ ወርሃዊ ገቢ ስንት ነው?	_____	
108	የቤት ውስጥ ኃላፊነት	1. አባወራ 2. እማወራ 3. ልጅ 4. ሌላ ካለ	
109	ዕድሜያቸው ከ18 ዓመት በላይ የሆኑ የቤተሰብ አባላት ብዛት?	_____	
110	ዕድሜያቸው ከ18 ዓመት በታች የሆኑ የቤተሰብ አባላት ብዛት?	_____	
111	የቤተሰብዎ ወርሃዊ ገቢ ስንት ነው?	_____	ከሁሉም የገቢ ምንጭ

ክፍል ሁለት: ከጤና ጋር የተገናኙ መጠይቆች/Clinical Status/

ተ.ቁ	ጥያቄ	አማራጭ መልስ	ምርመራ/ሃደት
201	ለመጀመሪያ ጊዜ የስኳር ህመም እንዳለብዎት እንዴት አወቁ?	1. ጠቅላላ የጤና ምርመራ ሳደርግ 2. የስኳር ህመም ምርመራ አድርጌ 3. ለሌላ ህመም ምርመራ ሳደርግ 4. አላስታውስም 5. ሌላ ካለ	
202	ምን አይነት የስኳር ህመም ነው ያለብዎት?	1. ታይፕ 1 2. ታይፕ 2	

203	በምን ያህል ጊዜ ውስጥ ለክትትል ወደ ጤና ተቋማት ይመጣሉ?	_____	
204	ለምን ያህል ጊዜ የስኳር ህመም ህክምና ክትትል አድርገዋል?	_____ ዓመት	
205	ያሉበትን የጤና ሁኔታን እንዴት ይገልጹታል?	1. በጣም ጥሩ 2. ጥሩ 3. ጥሩ አይደለም 4. በጣም ጥሩ አይደለም	
206	ያሉበት የጤና ሁኔታ ከቤተሰብዎ ወይም ከጓደኛዎ ወይም ከሥራ ባልደረባዎ ጋር ባለዎት ማኅበራዊ ህይወት ላይ የፈጠረው ተጽዕኖ አለ?	1. ምንም አልፈጠረብኝም 2. ትንሽ 3. በጣም ይፈጥርብኛል 4. ሙሉ ለሙሉ አበላሽቶብኛል	
207	ባለዎት የጤና ችግር ተስፋ ቆይቶ የወቃሉ?	1. አላውቅም 2. አንድ አንድ ጊዜ 3. ብዙ ጊዜ 4. ሁል ጊዜ	
208	ወደ ፊት ስለሚሆነው የጤናዎ ሁኔታ ፈርተው ያውቃሉ?	1. አላውቅም 2. አንድ አንድ ጊዜ 3. ብዙ ጊዜ 4. ሁል ጊዜ	
209	የሚፈሩ ከሆነ የሚያስፈራዎት ዋና ጉዳይ ምንድን ነው?	1. ህመሙ የሚያስከትለው በሽታ 2. የህክምና ወጪ 3. የአመጋገብ ዘይቤ ለውጥ 4. ማኅበራዊ ግንኙነት 5. ሌላ ካለ _____	

ክፍል ሦስት: የስኳር ህክምና ወጪ /Direct Medical Cost/

ተ.ቁ	ጥያቄ	አማራጭ መልስ	ምርመራ/ሂደት	
301	ለአለፉት 12 ወራት ምን ዓይነት መድኃኒት፣ ምርመራና የህክምና መገልገያ ቁሳቁስ ተጠቅመዋል?	1. ኢንሱሊን 2. በአፍ የሚወሰድ የስኳር መጠንን የሚቀንስ መድኃኒት 3. በስኳር ህመም ምክንያት ለተከሰቱ ሌሎች ህመሞች የተጠቀሙት መድኃኒት 4. የላቡራቶሪ ምርመራ	5. ኢሜጂንግ (ራጅ፣ ኤም.አር.አይ፣ ወዘተ) 6. የዓይን ምርመራ 7. ለጤና ክትትል 8. እራስን የመመርመሪያ መሳሪያ 9. የኢንሱሊን ሲርንጅ 10. ሌላ ካለ(ለምሳሌ ጥጥ)	
302	ለአለፉት 12 ወራት ለመድኃኒት ምን ያህል ወጪ አውጥተዋል?	1. ኢንሱሊን _____ ብር 2. በአፍ የሚወሰድ የስኳር መጠንን የሚቀንስ መድኃኒት _____ ብር 3. በስኳር ህመም ምክንያት ለተከሰቱ ሌሎች ህመሞች የተጠቀሙት መድኃኒት _____ ብር		

		4. ሌላ ካለ _____ ብር	
303	ለአለፉት 12 ወራት ለምርመራ ምን ያህል ወጪ አውጥተዋል?	1. የላቡራቶሪ ምርመራ _____ ብር 2. ኢሜጂንግ (ራጅ፣ ኤም.አር.አይ፣ ወዘተ) _____ ብር 3. የዓይን ምርመራና ህክምና _____ ብር 4. ለጤና ክትትል(ካርድ) _____ ብር	
304	ለአለፉት 12 ወራት ለህክምና መገልገያ ቁሳቁስ ምን ያህል ወጪ አውጥተዋል?	1. እራስን የመመርመሪያ መሳሪያ _____ ብር 2. የኢንሱሊን ሲርንጅ _____ ብር 3. ሌላ ካለ (ለምሳሌ ጥጥ) _____ ብር	
305	ለአለፉት 12 ወራት በጤና ተቋም ውስጥ ተኝተው ታክመው ያውቃሉ?	1. አውቃለሁ 2. አላውቅም	
306	ለጥያቄ ቁጥር 303 መልሶ አውቃለሁ ከሆነ አብዛኛውን ጊዜ ተኝተው የታክሙት የት ነው?	1. የመንግስት ጤና ተቋም 2. የግል ጤና ተቋም 3. መንግስታዊ ያልሆነ ጤና ተቋም 4. ሌላ ካለ _____	
307	በጤና ተቋማት ተኝተው ሲታክሙ ምን አይነት አገልግሎት ተጠቃሚ ነበሩ?	1. የመኝታ 2. የመድኃኒት 3. ቀዶ ጥገና 4. ላቡራቶሪ 5. ኢሜጂንግ(ራጅ፣ ኢ.ኮ፣ ኤም.አር.አይ) 6. የጉዞ/አምቡላንስ 7. ሌላ ካለ _____	
308	ባለፉት 12 ወራት ውስጥ ተኝቶ ለመታከም ምን ያህል ወጪ አውጥተዋል?	1. የመኝታ _____ ብር 2. የመድኃኒት _____ ብር 3. ቀዶ ጥገና _____ ብር 4. ላቡራቶሪ _____ ብር 5. ኢሜጂንግ _____ ብር 6. የጉዞ/አምቡላንስ _____ ብር 7. የምግብ _____ ብር 8. ሌላ ካለ _____ ብር 9. ጠቅላላ ወጪ _____ ብር	
309	የህክምና ወጪዎን የሚሸፍኑበት የገንዘብ ምንጭ ምንድን ነው?	1. በግል 2. ቤተሰብ 3. መንግስት 4. የጤና መድኃኒት 5. ሌላ ካለ _____	
310	ብዙ ጊዜ የስኳር ህመም መድኃኒትና ህክምና የሚያገኙት ከየት ነው?	1. ከመንግስት ጤና ተቋማት 2. ከግል ጤና ተቋማት 3. መንግስታዊ ካልሆኑ የጤና ተቋማት 4. ከስኳር ህመም ማሳበር 5. ሌላ ካለ _____	

**ክፍል አራት፡ ከህክምና ጋር ያልተገናኙ ወጪዎች/ Direct Non-Medical Cost/
የጉዞና የምግብ ወጪዎች /Travel and Meal Cost/**

ተ.ቁ	ጥያቄ	አማራጭ መልስ	ምርመራ/ሂደት
401	ወደ ጤና ተቋማት ሲሄዱ የሚገለገሉባቸው የመጓጓዣ አይነቶች የትኞቹ ናቸው?	1. በእግር 2. በሳይክል 3. በባስ 4. በታክሲ 5. በግል መኪና 6. በሞተር ሳይክል 7. ሌላ ካለ _____	ረዥም እርቀት የተጓዙበትን ይምረጡ
402	ለአለፉት 12 ወራት ወደ ጤና ተቋም ሲመጡ ምን ያህል ጊዜ ከላይ በመረጡት የመጓጓዣ አይነት ተጠቅመዋል?	የጉዞ ብዛት _____	
403	ካላይ በመረጡት የመጓጓዣ አይነት ለአንድ ጊዜ ጉዞ በአማካይ ምን ያህል ይከፍላሉ?	ብር _____	
404	የጤና ክትትል ከሚያደርጉበት የጤና ተቋም ምን ያህል እርቀው ይኖራሉ?	ኪሎ ሜትር _____	
405	ለአለፉት 12 ወራት ለጤና ክትትል ወደ ጤና ተቋም ሲመጡ ከቤት ውጪ የምግብ አገልግሎት ተጠቅመው ያውቃሉ?	1. አውቃለሁ 2. አላውቅም	
406	ለጥያቄ ቁጥር 405 መልሶ አውቃለሁ ከሆነ ለአለፉት 12 ወራት ለምግብ ምን ያህል ወጪ አውጥተዋል?	ጠቅላላ ወጪ _____	

የአስታማሚ የጉዞና የምግብ ወጪ/ Companion Travel and Meal Costs/

ተ.ቁ	ጥያቄ	አማራጭ መልስ	ምርመራ/ሂደት
407	ወደ ጤና ተቋም ለህክምና ሲመጡ አብሮት የሚሆን አስታማሚ አሉት?	1. አለኝ 2. የለኝም	
408	ለጥያቄ ቁጥር 407 መልሶ አለኝ ከሆነ ዋና አስታማሚዎ ማን ነው?	1. የትዳር አጋር 2. ልጅ 3. ዘመድ 4. ጓደኛ 5. ተከፋይ አስታማሚ 6. ሌላ ካለ _____	ለረዥም ጊዜ ሲያስታምሞ የነበረ
409	በጤና ተቋማት ለህክምና ሲቆዩ በአማካይ ምን ያህል አስታማሚ ነበሩት ለአለፉት 12 ወራት?	የአስታማሚ ብዛት በአማካይ _____	
410	ለአለፉት 12 ወራት የእርሶዎ አስታማሚ ምን ያህል ጊዜ ከእርሶዎ ጋር አብሮው ወደ ጤና ተቋም ተጉዘዋል?	የጉዞ ብዛት _____	በጥያቄ ቁጥር 401 በመረጡት የመጓጓዣ አይነት

411	ለአለፉት 12 ወራት ከእርሶ ጋር አብረው ለተጓዙት አስታማሚዎ ለአንድ ጊዜ ጉዞ በአማካይ ምን ያህል ከፈሉ?	ብር _____	
412	ለአለፉት 12 ወራት አስታማሚዎ ከእርሶ ጋር ለጤና ክትትል/ህክምና ወደ ጤና ተቋም ሲመጡ ከቤት ውጪ የምግብ አገልግሎት ተጠቅመው ያውቃሉ?	1. ያውቃሉ 2. አያውቁም	
413	ለጥያቄ ቁጥር 412 መልሶ ያውቃሉ ከሆነ ለአለፉት 12 ወራት ለምግብ ምን ያህል ወጪ አውጥተዋል?	ጠቅላላ ወጪ _____	

ክፍል አምስት: ከጤና አገልግሎት ጋር ተዛማጅነት የሌላቸው ወጪዎች /PRODUCTIVITY LOSSES የስኳር ህመምተኛ ለህክምና ያጠፉት ጊዜ መለኪያ /Time Cost/

ተ.ቁ	ጥያቄ	አማራጭ መልስ	ምርመራ/ሂደት
501	ለአለፉት 12 ወራት በሳምንት ምን ያህል መደበኛ የሥራ ሰዓት ይሠሩ ነበር?	የሥራ ሰዓት ብዛት _____	
502	ለአለፉት 12 ወራት በአማካይ ምን ያህል የትሩፋት ሥራ ሰዓት ይሠሩ ነበር?	የሥራ ሰዓት ብዛት _____	ለምሳሌ: የቤት ውስጥ ሥራ፣ የቦሳ አድራጎት ሥራ
503	ለአለፉት 12 ወራት በአንድ ወር ውስጥ ምን ያህል ጊዜ ወደ ጤና ተቋም ለምርመራ መጥተዋል?	የመጡበት ጊዜ ብዛት _____	
504	ወደ ጤና ተቋም መጥተው በአማካይ ለአንድ ጊዜ ጉብኝት ምን ያህል ሰዓት ያጠፋሉ/ ይቆያሉ?	የሰዓት ብዛት _____	አገልግሎቱን ለማግኘት የጠበቁበትን ሰዓት ጨምሮ
505	ለአለፉት 12 ወራት በህመም ምክንያት ምን ያህል ቀን ከሥራ ቀርተዋል?	የቀን ብዛት _____	
506	በአለፉት 12 ወራት ወደ ጤና ተቋም አገልግሎት ለማግኘት ባጠፉት ጊዜ ውስጥ ያጡት ገቢ ነበረ?	1. ነበረ 2. አልነበረም	
507	ለአለፉት 12 ወራት በምን ዓይነት ሙያ ሲሠሩ ቆይተዋል?	የሙያ ዓይነት _____	

የስኳር ህመምን አስታማሚ ያጠፉት ጊዜ መለኪያ /Companion Time Cost/

ተ.ቁ	ጥያቄ	አማራጭ መልስ	ምርመራ/ሂደት										
507	ለጥያቄ ቁጥር 407 መልሶ አላኝ ከሆነ ለአለፉት 12 ወራት አስታማሚዎ ምን ያህል ቀን ከእርሶ ጋር ቆይተዋል?	የቀን ብዛት _____											
508	አስታማሚዎ ከእርሶ ጋር ወደ ጤና ተቋም መጥተው ባያስታምሞዎ ምን ሊሠሩ ይችላሉ?	<table border="1"> <tr> <td>1.የቤት ውስጥ ሥራ</td> <td>6.ትምህርት መማር</td> </tr> <tr> <td>2.ልጅ መንከባከብ</td> <td>7.የሥራ ፍቃድ</td> </tr> <tr> <td>3.ዘመድ ወይም ጓደኛን መንከባከብ</td> <td>8.ሥራ ማፈላለግ</td> </tr> <tr> <td>4.የበጎ ፈቃድ አገልግሎት</td> <td>9. መደበኛ ሥራ</td> </tr> <tr> <td>5.እረፍት</td> <td>10. ሌላ ካለ_____</td> </tr> </table>	1.የቤት ውስጥ ሥራ	6.ትምህርት መማር	2.ልጅ መንከባከብ	7.የሥራ ፍቃድ	3.ዘመድ ወይም ጓደኛን መንከባከብ	8.ሥራ ማፈላለግ	4.የበጎ ፈቃድ አገልግሎት	9. መደበኛ ሥራ	5.እረፍት	10. ሌላ ካለ_____	
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510	ለአለፉት 12 ወራት አስታማሚዎ ምን ዓይነት ሙያ ሲሠሩ ቆይተዋል?	የሙያ ዓይነት _____											

DECLARATION

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

Name: _____

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Date of submission: _____

Approval of internal examiner

Name _____

Signature _____

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

Name and Signature of the first advisor

Name _____

Signature _____

Name and Signature of the second advisor

Name _____

Signature _____