ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCE

SCHOOL OF PUBLIC HEALTH

ECONOMIC BURDEN OF DIABETESMELLITUS ON PATIENTS AND THEIR FAMILIES ATTENDING HOSPITALS IN ADDIS ABABA, ETHIOPIA.

By

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APPROVAL SHEET

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I undersigned agree to accept all responsibilities for the scientific and ethical conduct of this research project and declare that this thesis is my original work in partial fulfilment of the requirement for the Master of Public Health in Health System Management and Health Policy specialty

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Contents

LIST OF ACRONYMS

DM	Diabetes Mellites
CHE	Catastrophic Health Expenditure
NCD	Non-Communicable Disease
CNCD	Chronic Non- Communicable Disease
WHO	World Health Organization
IDF	International Diabetic Federation
USD	United State Dollar
ADA	American Diabetic Association
OOP	Out-of-Pocket Expenditure
SES	Socio-Economic Status
COE	Catastrophic Out Pocket Expenditure

Abstract

Background: Diabetes is a chronic disease that imposes a substantial economic burden on countries, health systems, patients, and their families. The cost of treating and caring for diabetes puts a significant strain on household budgets exposing household for catastrophic expenditure.

Objective: To determine the rate of catastrophic health expenditure, identify associated factors and coping strategies among diabetes patient attending in hospitals, Addis Ababa, Ethiopia.

Method: A institutional-based cross-sectional survey was conducted in purposefully selected two public and two private hospital in Addis Ababa from July 3 to September 15 2023. A total of 391 adult diabetic patients who have had a hospital follow-up in the last 6 months or more were enrolled. A stratified sampling technique was applied. Patient data was collected through face-to-face interviews using a questionnaire administered via the ODK Collect app. Data was imported to STATA version 17 for analysis. Binary and multiple logistic regression was used to assess factor associated with catastrophic health expenditure, p value less than 0.05 was used as a significance level.

Result: The study enrolled 387 diabetic participants with a response rate of 98%. The incidence of catastrophic health expenditure was 35.6% at 15% of non-food expenditure. Community-based health insurance membership (AOR = 0.222; 95% CI: 0.112–0.439), frequency of appointment (AOR = 0.262; 95% CI: 0.137–0.500) and emergency visit (AOR = 10.863; 95% CI: 4.303–27.421) were statistically significant associated with catastrophic expenditure. Own money (saving and salary), family support and community based health insurance was the main coping mechanism to finance their treatments.

Conclusion: The study revealed economic burden of diabetes is substantial and community based health insurance, frequent appointment and emergency visit were identified as factor associated with economic burden. Therefore, to alleviate the economic strain, community-based health insurance should be expanded, frequent appointment and emergency visits should be decreased by following diabetes medication advice.

1. INTRODUCTION

1.1 Background of the study

A catastrophic health expenditure is a healthcare-related bill that exceeds your ability to pay. It frequently involves the encashment of savings and assets, including, at times, homes and businesses. It can impoverish and devastate families for many years. The World Health Organization proposes that health expenditure should be called catastrophic whenever it is greater than or equal to 40% of non-subsistence income consumption (non-food consumption expenditure) (1). Wagstaff and van Doorslaer (2003) set this threshold at 10 percent of total household budget (2).

Each year, 996 million people globally, which constitutes 12% of the world's population, are burdened with catastrophic healthcare costs. Furthermore, 100 million individuals are pushed into poverty due to out-of-pocket (OOP) healthcare payments. According to the World Health Organization (WHO) in African out of 47 countries, 37 had OOP health expenditure exceeding 20% of the threshold. In 2019, Ethiopia reported OOP payments of 39% of the threshold (3).

Diabetes is one of the chronic non-communicable diseases (CNCD) with a high likelihood of imposing catastrophic healthcare expenditure. It is a chronic, metabolic disease characterized by elevated levels of blood glucose (or blood sugar), which leads over time to serious damage to the heart, blood vessels, eyes, kidneys and nerves. The most common is type 2 diabetes, usually in adults, which occurs when the body becomes resistant to insulin or doesn't make enough insulin. Type 1 diabetes, once known as juvenile diabetes or insulin-dependent diabetes, is a chronic condition in which the pancreas produces little or no insulin by itself. For people living with diabetes, access to affordable treatment, including insulin, is critical to their survival.

Diabetes mellitus is a growing epidemic with a significant global health challenge, affecting approximately 537 million individuals, with the majority residing in low- and middle-income countries. The International Diabetic Federation (IDF) has predicted that the prevalence of diabetes will increase to 783 million by 2045. Of note, Africa is expected to experience the

most significant increase in the number of individuals with diabetes, with an estimated 107% rise and a projected total of 117 million individuals affected by 2045 (4).

The cost of diabetes poses a significant global health challenge, with a global annual cost of 825 billion dollars, with China ($170 billion), the United States ($105 billion), and India ($73 billion) bearing the most significant costs per country. World leaders have pledged to address the growing health concern of non-communicable diseases (NCDs), particularly diabetes, in order to meet the global NCD targets for 2025 and NCD-related Sustainable Development Goal targets for 2030 (4).

According to a recent report by the International Diabetes Federation, the prevalence of diabetes in Ethiopia was estimated to be 3.4% in 2021, with approximately 1.9 million people affected. This places Ethiopia fourth among the Top five African countries in terms of diabetes prevalence (4).

In developing countries such as Ethiopia, a significant portion of healthcare costs must be paid for by patients through out-of-pocket payments. The Federal Ministry of Health's report in 2015/16 revealed that households contributed approximately 30.6% of health spending in the form of out-of-pocket payments. The financial impact of diabetes on individuals and families can be substantial, with the cost of treating and caring for diabetes placing a strain on household budgets, particularly in low-income households (5,6). Therefore, this paper assessed the rate of catastrophic health expenditure, identify associated factors, and explored coping mechanisms among diabetes patients in Addis Ababa.

1.2 Statement of problem

Financial protection is a fundamental aspect of achieving universal health coverage (UHC) and ensuring that individuals can access healthcare without facing financial hardship. However, globally, many individuals experience significant financial distress and even fall into poverty due to the high costs associated with healthcare services (7).

The incidence of catastrophic health spending has been on the rise, with up to 12% of the population in certain countries experiencing extreme financial distress and up to 5% being pushed into poverty. From 2000 to 2017, the number of individuals experiencing catastrophic health spending rose significantly, from 579 million to 996 million. This increase in catastrophic health spending is primarily attributed to the rise in out-of-pocket (OOP) health expenditure (7,8).

Diabetes, in particular, has become an increasingly expensive burden on healthcare systems worldwide. The direct costs of diabetes have risen significantly over the past 15 years, with global health expenditure on diabetes increasing from USD 232 billion in 2007 to USD 966 billion in 2021, representing a 316% increase. This accounts for approximately 11% of overall healthcare expenditure. Unfortunately, many developing countries, including Ethiopia, have allocated minimal resources to diabetes prevention and control programs. In Africa, only 1% of the global diabetes-related expenditure is allocated, making it the second-lowest amount worldwide. Consequently, individuals in Ethiopia face high out-of-pocket expenses, particularly for chronic diseases like diabetes, which can lead to catastrophic financial burdens (4,9).

Ethiopia has been challenged by the growing prevalence of non-communicable diseases (NCDs) such as diabetes. It is one of the four countries in Sub-Saharan Africa with the highest adult diabetic populations. In St. Paul and Black lion Specialized Hospital the trend of diabetes from 2005 to 2009 revealed an increase in the admission of diabetics; diabetes account for 20% of all NCD (10).

According to the World Bank, Ethiopia's health expenditure per capita in 2020 was $29. This relatively low figure suggests that a significant portion of healthcare costs in Ethiopia is covered through out-of-pocket expenses, which accounted for 37.7% of the total health expenditure. This indicates a high reliance on individual payments for healthcare services in the country (9).

In Ethiopia, While some studies have estimated the direct and indirect costs of diabetes, and others have estimated the incidence and intensity of catastrophic health expenditure, However, there is still a significant gap in comprehensive research conducted on patients to determine the extent of catastrophic health expenditure, associated factors, and coping mechanisms related to diabetic care (11,12).

1.3 Significance of the study

This study will provide crucial information on the extent of financial hardship experienced by diabetic patients and their families living in Addis Ababa. This information can be used to inform policy decisions and interventions aimed at reducing the economic burden of diabetes on patients and their families. This study's findings can also inform the development of social protection programs that provide financial support to households facing high healthcare expenses. Additionally, the study will shed light on coping mechanisms employed by patients and their families to manage the financial burden of diabetes, which can inform the development of support programs for patients and their families. Overall, this study has important implications for improving the quality of life of diabetic patients and their families in Ethiopia.

2. LITERATURE REVIEW

2.1. Catastrophic healthcare expenditure

Catastrophic health expenditure refers to the situation when a person or household spends a large portion of their income on health care, pushing them into poverty. This can occur when someone has a serious illness or injury that requires expensive medical treatment, and they do not have adequate insurance coverage or financial resources to cover the costs. According to the World Health Organization (WHO), catastrophic health expenditure occurs when a household spends more than 10% of its total income on health care. This can lead to financial hardship, reduced access to other essential goods and services, and even worsened health outcomes (13).

Diabetes imposes a substantial economic burden on countries, health systems, people with diabetes, and their families (4). According to the American Journal of Medicine, health care expenses were the leading cause of bankruptcy in the United States in 2007, accounting for 62% of all bankruptcies (14).

Diabetes' economic expenses are rising with time. According to a study conducted by the American Diabetes Association (ADA), expenditures increased by 26% between 2012 and 2017. In 2017, the entire projected cost of diabetes was $327 billion. People with diabetes have medical expenses that are 2.3 times more than they would be if they did not have diabetes (15).

In India, the trend in catastrophic health expenditure between 1993 to 2014 showed the proportion of catastrophic health expenditure increased 1.47-fold between the 1993-1994 expenditure survey (12.4%) and the 2011-2012 expenditure survey (18.2%) and 2.24-fold between the 1995-1996 utilization survey (11.1%) and the 2014 utilization survey (24.9%) (16).

In the comparative study of the United States and South Korea, 5.8% of older adults had catastrophic out-of-pocket medical spending that exceeded 50% of annual household income in the United States, while only 3.0% did in South Korea (17).

According to a survey conducted in Bangladesh on health-related financial catastrophe of chronic illness capacity to pay approach (CHE at a threshold of 40%), households spent 11% of their total budgets on health, and nearly 9% of households faced financial catastrophe (18).

According to a Korean study on the association between chronic disease and catastrophic health, diabetic households are 9.6% more likely to experience catastrophic health expenditure (CHE) than those who are not at a threshold of ≥40 % (19).

In the study done in south Africa; the incidence of catastrophic health expenditure due to diabetic care was found to be 25% and 13% when calculated by 10% threshold of capacity to pay and variable of total household expenditure respectively (20).

A study conducted in Kenyan slum communities indicated; the proportion of households facing CHE varies widely between 1.52% and 28.38% depending on the type of method used and the thresholds (21).

In Ethiopia, around 2.1% of families would face CHE with a 10% threshold of total consumption, with Afar (5.8%) and Benishangul (4%) having the highest rates, whilst Oromia region would have the largest numbers of affected households, due to large population size (22).

According to a study conducted in Southwest Shewa, the total cost of diabetes is estimated to be US$ 14996.97, with a mean cost of US$ 37.68. The direct cost of diabetes care was estimated to be 47.2% of the total cost (22). The study in economic burden of diabetes in Addis Ababa resulted in the median direct cost of a study participant was 21.86 US$ per patient per month. This medical cost accounted for 58.9% of the total (11).

2.2. Factor associated with catastrophic health expenditure

2.2.1. Socio-demographic factors

One study conducted in Iran found that females were more likely to experience catastrophic health expenditure than males, with the odds ratio being 1.35 (95% CI: 1.24-1.47) after adjusting for other factors such as income and insurance status (24). Another study conducted in China found that older adults were more likely to experience catastrophic health expenditure than younger adults, with the odds ratio being 1.32 (95% CI: 1.16-1.50) after adjusting for other factors such as income and insurance status (25).

However, a systematic review of studies conducted in low- and middle-income countries found inconsistent results regarding the association between sex and catastrophic health expenditure (26). Similarly, a study conducted in Ghana did not find a significant association between age and catastrophic health expenditure (27).

A study conducted in Indonesia found that households with lower levels of education were more likely to experience catastrophic health expenditure (28). Similarly, a study conducted in India found that households with lower levels of education were more likely to experience catastrophic health expenditure (29). In Kenya, a study found that households with higher levels of education were less likely to experience catastrophic health expenditure (30). Similarly, a study conducted in Ghana found that households with higher levels of education were less likely to experience catastrophic health expenditure (31). Overall, these studies suggest that there is an association between educational status and catastrophic health expenditure, with households with lower levels of education being more vulnerable to this financial burden.

A study in Vietnam found that households with five or more members were more likely to experience catastrophic health expenditure compared to those with fewer members (32). A study conducted in Iran found that households with larger family sizes were more likely to experience catastrophic health expenditure (33). Similarly, a study conducted in China found that households with smaller family sizes were less likely to experience catastrophic health expenditure (34).In South Africa, a study conducted found that households with smaller family sizes were less likely to experience catastrophic health expenditure (35). Similarly , A study conducted in Nigeria found that households with larger family sizes were more likely to experience catastrophic health expenditure (36). Overall, these studies suggest that there is an association between family size and catastrophic health expenditure, with households with larger family sizes being more vulnerable to this financial burden.

In Thailand, a study found that households with health insurance were less likely to experience catastrophic health expenditure (37). Similarly, a study conducted in Turkey found that households with health insurance were less likely to experience catastrophic health expenditure (38). Similarly, a study conducted in India found that households without health insurance were more likely to experience catastrophic health expenditure (39).

A study conducted in Ghana found that households without health insurance were more likely to experience catastrophic health expenditure (40). A study conducted in Ethiopia also found

that households without health insurance were more likely to experience catastrophic health expenditure. The study found that households with health insurance had a lower probability of incurring catastrophic health expenditure compared to those without insurance (41). Similarly, a study conducted at Asella Referral Hospital in Southeast Ethiopia, community-based health insurance was found to have a significant impact on reducing catastrophic health expenditure among patients with chronic diseases (42).

2.2.2. Socio-economic factors

Another determinant factor of catastrophic health expenditure is household income status. All socio-economic status (SES) groups suffered catastrophic expenditure but the poorest quartile had the highest incidence. The study on the association between cost of expenditure (COE) and household economic level in Korea showed; the rate of catastrophic health expenditure was higher among households in the first economic quantile than in the third (10% vs 0.2%) (17). In India, the proportion increase was greater for the poor than the rich (3.00-fold versus 1.74-fold) (43).

In South Africa; odds of incurring catastrophic health expenditure increase in lowest socio-economic groups (3rd, 4th and 5th wealth quantile); households within the higher wealth quantile have reduced odds of incurring catastrophic expenditure (20). In Nigeria at 30 % fixed threshold, the catastrophic levels were 78, 47, 52 and 39 % (quintile1–quantile 4), respectively while at variable threshold of 10 and 40 % threshold (quintile1 and quantile 4), the costs were 86 and 17 %, respectively (44).

In a recent study conducted in Addis Abeba, the incidence of CHE was 94% in the low-income group and 92% in the high-income group, at a 40% threshold, while the intensity was 22% and 17%, respectively (12).

2.2.3. Clinical status

A study published in the Journal of Diabetes and its Complications in 2019 investigated the association between clinical status and catastrophic health expenditure in individuals with diabetes mellitus. The researchers found that individuals with poorly controlled diabetes and complications related to the disease were more likely to experience catastrophic health expenditure. This was attributed to the higher healthcare costs associated with managing complications such as diabetic retinopathy, neuropathy, and cardiovascular diseases (45).

A study conducted in Nigeria found that individuals with uncontrolled diabetes and complications were more likely to experience financial hardship due to healthcare costs (46).

A study conducted in Ethiopia has shown similar association between clinical status and catastrophic health expenditure. The research found that individuals with poorly controlled diabetes and complications were more likely to experience financial hardship as a result of healthcare costs (47).

2.2.4. Type of health facilities.

One study conducted in India found that patients who received care at private hospitals were more likely to experience catastrophic health expenditure compared to those who received care at public hospitals. This was attributed to the higher out-of-pocket costs associated with private healthcare services (48).

A study conducted in Nigeria found that the prevalence of CHE was higher among households that used private health facilities compared to those that used public health facilities. The study found that 17.5% of households that used private health facilities experienced CHE, while only 2.9% of households that used public health facilities experienced CHE (49).

2.3. Coping strategy

Household savings and income were the primary sources of finance for NCD care, accounting for around 45% of NCD-related out-of-pocket expenses, with a range of 40% to 60% among the different NCDs (21). In one study conducted in Bishkek, Kyrgyzstan, 67.6% of respondents used income or savings (27).

Health Survey (2002–04) across 40 low- and middle-income countries finds the mean prevalence of borrowing and selling to be 22 and 10%, respectively (29).

In an Indian study borrowing accounts for 47% of all coping strategies with a substantial difference between rural and urban areas of 40 and 26 correspondingly. More borrowing is reported by households visiting private hospitals than by households visiting public hospitals. The incidence of borrowing is more concentrated among urban poorer household whereas in rural the problem is distributed evenly (30).

Selling assets is more common in poorer households than in non-poorer households. Males from both low and non-poor backgrounds are more likely to finance treatment through the sale of household assets, but persons from advantaged groups (non-poor) are less likely to choose the option of selling household assets (30).

A study conducted in Ethiopia on costs of illness and coping strategies; saving (13%), sale of assets (29%) and waivers privilege (17%) were the three most common coping strategies used by patients (31). A study conducted in Bahir Dar found 61% of respondents used savings and salary to cover diabetes care expenses, while 21.2% relied on support from family or relatives. Additionally, 13.5% resorted to selling assets, and 3% borrowed money to manage the cost. Among households facing catastrophic health expenditure (CHE) for diabetes treatment, 50.63% used savings, and 24.67% relied on family support (55).

CONCEPTUAL FRAMEWORK

The conceptual framework that illustrates the relationship between the independent and dependent variables.

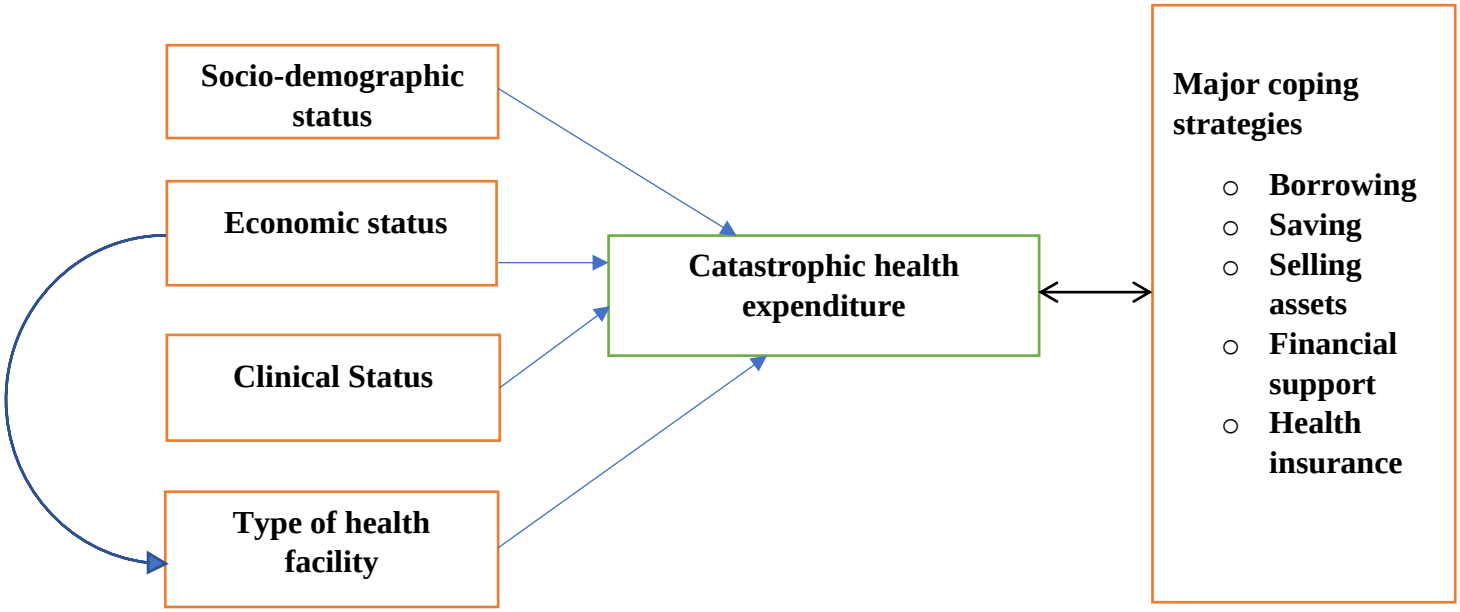

Figure-1. Conceptual framework for CHE of diabetes care, major associated factors, and coping strategies.

3. OBJECTIVE

3.1. General objective

To assess the level of catastrophic health expenditure, identify associated factors, and explore coping mechanisms among diabetes patients attending hospitals in Addis Ababa, Ethiopia.

3.2. Specific objectives

- To determine the prevalence of catastrophic health expenditure among diabetes patients attending in hospitals.
- To identify the factors associated with catastrophic health expenditure among diabetes patients
- To explore the coping mechanisms used by diabetes patients to manage healthcare expenses.

4. METHOD

4.1. Study area

Addis Ababa, the capital and largest city of Ethiopia, is located in the central highlands of the country. There are significant number of health facilities that are dedicated to providing management services for diabetes mellitus (DM). The city boasts a total of six government hospitals and five private hospitals, all of which offer comprehensive DM care. Additionally, there are 86 public/governmental health centres that cater to the needs of individuals with diabetes.

The study area for this research study focused on four major hospitals in Addis Ababa; Zewditu Memorial Hospital, Minilik II Referral Hospital, Bethezatha General Hospital, and Lancet General Hospital. These hospitals serve as critical healthcare providers for the city and surrounding areas, offering a range of medical services to patients from diverse backgrounds.

4.2. Study design

An institutional-based cross-sectional study was conducted from July 3 to September 15, 2023 in hospitals located in Addis Ababa that provide services for the management of diabetic Mellitus.

4.3. Source population

All diabetic patients living in Addis Ababa.

4.4. Study population

Diabetic outpatients receiving services at Zewditu Memorial Hospital, Minillik referral Hospital, Bethezatha General Hospital, and Lancet General Hospital.

4.5. Inclusion and exclusion criteria

Inclusion:

- Adult diabetic patients/clients who have follow up in the hospitals for the last 6 months and more.

Exclusion:

- Client of pregnancy-related diabetes/gestational diabetes,
- Critical ill patients who are unable to respond.
- Patients/clients using inpatient services.
- Clients who are unable to talk or children <18

4.6. Sample size determination

The sample size was determined using single proportion population formula taking a prevalence of 59% based on previous research conducted in Bahir Dar (55).

The formula is: -

$$n = \frac{\left(z\alpha_{/2}\right)^2 p(1-p)}{d^2} = 372 \text{ --------- (1)}$$

Where:

- n = the desirable sample size
- $Z(\alpha/2)$ = the critical value at 95% level of significance (1.96)
- p = proportion of patients with catastrophic health expenditure (0.59)
- d = marginal error (0.05)

A total number of 391 participants was estimated to be included for the study upon adding 5% contingency (5% non-response rate =0.05x372=19).

4.7. Sampling procedure

Four Hospitals namely Zewditu, Mellinik, Bethezatha and Lancet were selected purposively among public and private hospital in Addis Ababa based on the criteria of capacity in provision of DM services and number DM patient in care and long service year. The sample size was proportionally allocated to the four hospitals based on the number of patients on treatment which was obtained from the Addis Ababa Health bureau. Then, to obtain a representative sample, systematic random sampling method was applied to select eligible study participants from each hospital.

K value was calculated using Kish formula, which is used to calculate the sampling interval (k) for systematic sampling. ki=1+3.322 (logni)

- ki: The initial value of the sampling interval, which is usually set at 1.

- 3.322: A constant value derived from statistical theory that ensures a certain level of precision in the sample estimation process.

- logni: The logarithm (base 10) of the population size (n) being sampled. This component adjusts the sampling interval based on the size of the population being sampled.

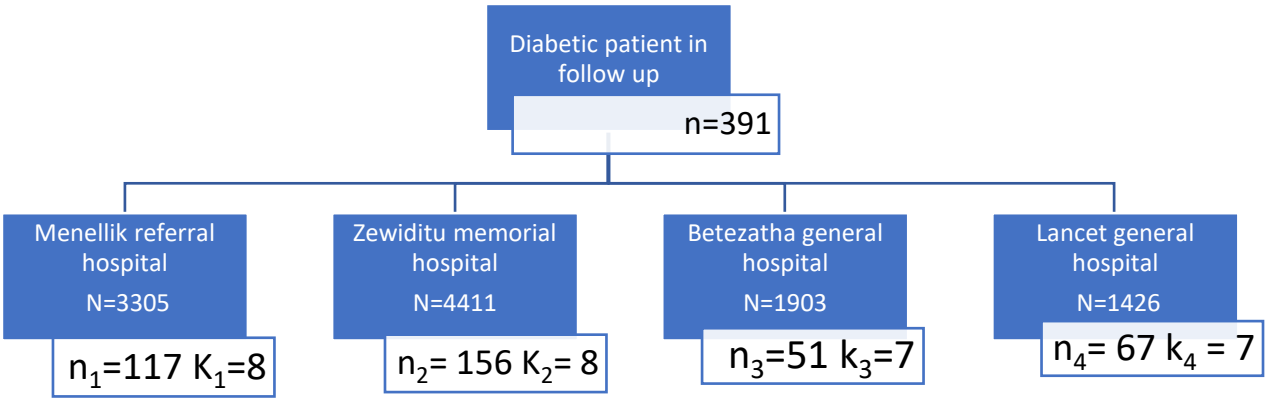

FIGURE 2: Schematic presentation of sampling techniques used to select study participants from 2 public and 2 private hospitals in Addis Ababa, 2023.

4.9. Data collection tools and procedure

A structured data collection tool was adopted from similar study that was previously used to collect data(10,11). The data collection tool was prepared in English language and later translated to Amharic language for better communication with the study participants. Then the questionnaire was a pre-tested in a total of 22 diabetic patients (i.e., 5% of the sample size) who were receiving services in Tikur anbessa specialized hospital prior to the data collection.

The data was collected from patients who attended follow-up appointments over two months, from July 3 to September 15, 2023. Patients' data was collected through face-to-face interviews using a questionnaire administered via the ODK Collect app, following the completion of their follow-up appointments by setting up a separate space for interviews. The data collection process was supervised by the researcher and carried out by four data collectors, including three recently graduated public health officers and one BSc nurse. The

use of the ODK Collect app facilitated efficient and accurate data collection, with the collected data securely stored and analyzed for further insights.

4.10. Study variable

The study considered various factors such as patient age, gender, income, education, and occupation to understand the occurrence of catastrophic health expenditure. The study also used explanatory variables such as household size, age of head of household, education level, and out-of-pocket expenditure for treating diabetic mellitus. The study hypothesized that outpatient department care, health status of household members, type/place of treatment, household size, and age of head of household are positively associated with catastrophic health expenditure.

4.11. Measurement of outcome

The direct cost, measured from the patient's perspective using a bottom-up approach, includes out-of-pocket expenses for both medical and non-medical costs. Medical costs encompass expenses for registration, medication, and laboratory tests during a one-month follow-up period. Non-medical costs include transportation, food, and accommodation for both patients and caregivers during the same period.

Indirect costs reflect the productivity loss due to the illness, measured in terms of the time lost by patients and caregivers during travel and consultations for diabetes follow-up. This was estimated using the human capital approach, converting the forgone time to cost based on daily wage rates. The costs were collected in Ethiopian birr.

Measuring catastrophic health expenditure

The outcome variable catastrophic health expenditure was estimated using method proposed by Wagstaff and van Doorslaer Methodology. This method was used by taking non-food household expenditure, total household expenditure and household income as denominator. OOP expenditure at point of services was used as numerator. The OOP expenditure was assessed from patient perspective using bottom up approaches.

Catastrophic health expenditure $CHEi$ is indicate by binary variable. Whether catastrophic health expenditure occurred in household as shown in formula

$$CHE_i = \begin{cases} 1 & \text{If } \frac{OOP_i}{X_i} \geq Z \\ 0 & \text{If } \frac{OOP_i}{X_i} < Z \end{cases} \quad \text{----------(2)}$$

Where, OOP is Out of pocket expenditure at point of services, Xi is Non-food, Total household expenditure or Household income and Z is catastrophic thresholds.

The measures of the incidence (headcount) and intensity of catastrophic health expenditure named catastrophic expenditure overshoot, and catastrophic expenditure mean positive overshoot was estimated as follows.

Catastrophic expenditure headcount refers to the proportion of households that experience catastrophic healthcare expenditure, which is when out-of-pocket healthcare expenses exceed a certain percentage of household income. This indicator measures the extent to which households are at risk of financial hardship due to health care costs.

$$H \coloneqq \frac{1}{N}\sum_{i=1}^{N} E_i \quad ---------- (3)$$

Where N is the sample size and

Ei, equals 1 if OOPi/NFEi> z and zero otherwise.

Overshoot refers to the amount by which actual healthcare expenditure exceeds the threshold for catastrophic expenditure.

$$0 = \frac{1}{N}\sum_{i=1}^{N} 0\,\text{i} \quad ---------(4)$$

Mean positive overshoot is the average amount by which actual healthcare expenditure exceeds the threshold for catastrophic expenditure across all households that experience catastrophic expenditure. This indicator provides a more nuanced understanding of the extent to which households are impacted by catastrophic healthcare expenses.

$$MPO = \frac{0}{H} \rightarrow 0 = HxMPO \quad ---------- (5)$$

There is no universally accepted catastrophic threshold level and different study used various threshold levels. Therefore, different threshold levels were employed to assess the sensitivity of catastrophic health expenditure at different threshold ranging from 10% to 40% was employed. However, to assess the factors associated with catastrophic health expenditure 15% of non-food expenditure was used since this threshold was used by pervious similar research in Ethiopia.

4.12. Data Quality Management

Based on the objective of the study a questionnaire was developed and translated into local language/Amharic then back-translated into English to maintain consistency. Then the questionnaire was used during a pre-test. Data collectors with health background were trained and conducted the actual data collection. Furthermore, a supervisor checked on the filled forms daily for completeness, accuracy, clarity and any missing's in the questionnaire. Furthermore ODK collect app was used to collected data which minimize the skipping of key variable and ensure data quality.

4.13. Data processing and analysis

The data collected using the ODK collect app was regularly checked on the Kobo tool box server by the supervisor every night during the data collection period, and a backup was taken to ensure the safety of the data. On the final day of data collection, the data was thoroughly checked and then transferred to STATA version 17 verifying whether there were incorrect entries and missing data.

Descriptive statistics including mean, median, standard deviation and proportion, was used to summarize the data. Then the data was presented using a table and bar graph. Binary and multi variable logistic regression was used to assess factor associated with catastrophic health expenditure. Variables with P value less than 0.25 in the bivariate analysis was considered as candidates for multivariable logistic regression. In multi variable regression adjusted odds ratio with 95% confidence was estimated and P value less than 0.05 was used to declare statistical significance.

4.14 Data Quality Assurance

In order to enhance the quality of the data, the data collectors were trained for one days on the objective and methodology of the research, and data collection approach. The questionnaire was translated into the local language, Amharic, in order to increase the response rate. The local language was then retranslated into English to cross-check whether there were any differences in translation. The draft questionnaire was subjected to pilot testing with a total of 22 diabetic patients (i.e., 5% of the sample size) who are receiving services in Tikur anbessa specialized hospital prior to the data collection. To minimize missing variables, the ODK collect app was used by making variable fields required and using appropriate skipping patterns.

4.15. Operational definition

Out-of-pocket health expenditure: direct payments made by DM patients to health care providers at the time-of-service use.

Direct costs: Direct medical and non-medical cost incurred by patient of caregiver for the diagnosis and treatment of diabetes;- For example, the cost of prescribed drugs, investigations, and so on.

Indirect costs: costs associated with loss of working time of the patients and its caregiver or the loss of income related to the illness (due to absenteeism, missing business appointment).

Catastrophic expenditure: Out-of-pocket payments for diabetic care that exceeds 15% of non-food expenditure.

4.16. Ethical Consideration

Prior to conducting the study, Ethical clearance was obtained from the School of Public Health of Addis Ababa University's College of Health Science, and Addis Ababa Health Bureau. Additionally, a permission letter was obtained from the selected four hospitals. All participants were provided with detailed information about the study's aims and methods prior to being interviewed. Informed written and verbal consent was obtained from each participant before the interview. To minimize any anticipated risks associated with sharing personal information, assessments and interviews were conducted in a private area to ensure confidentiality and privacy. Rapport building was emphasized to establish a close and harmonious relationship between the interviewer and respondent, thus avoiding potential social desirability issues.

Overall, these ethical considerations were taken into account to ensure that the study was conducted in an ethical and responsible manner, with the rights and welfare of participants being protected.

5. Result

5.1 Demographic and Socio-Economic Characteristics

The study enrolled 387 participants, which yielded a 98% response rate. More than half (53.2%) of the study participants were female. The ages of respondents range from 18 to 79, with a mean of 55.29 and SD of 16.36. The majority of study participants were orthodox (253, 65%) in religion and married (273, 70.5%). 117 (30.2%) participants were employed, and among them, nearly half (56, 48.2%) were government employees. Almost nearly all of the respondents (353, 91.2%) were from Addis Ababa. The household size of study participants ranges from 1 to 7, with a mean of 3.85 and SD of (±1.46). Household average monthly income was 10967 with SD (±18336.6). Regarding community-based health insurance, more than half (51.9%) of participants were enrolled in the scheme (Table 1).

5.2 Clinical Characteristics

The average duration since being diagnosed with diabetes was 147.8 (+128.4) months. The majority (374, or 96.6%) of respondents had regular follow-up, and among them, 318 (85%) had appointments every three months (Table 2).

Table 1: Demographic and Socio-Economic Characteristics among the study participant (N=387) in four hospitals in Addis Ababa, 2023.

Characteristics	*Category*	*Frequency*	*Percent*
Sex	Male	181	46.77
	Female	206	53.23
Age in year	18-35	70	18.1
	35-50	69	17.8
	51-65	118	30.5
	66-79	130	33.6
Religion	Orthodox	252	65.1
	Muslim	31	8
	Catholic	23	5.9
	Protestant	67	17.3
	Other*	14	3.6
Marital status	Single	40	10.3
	Married	273	70.5
	Widowed	60	15.5
	Separated/Divorced	14	3.6
Occupation	Unemployed	42	10.8
	Employed	117	30.2
	Retired	77	19.9
	Housewife	104	26.9
	Merchant	33	8.5
	Other	14	3.6
Type of Employment (N=117)	Government Employee	56	48.3
	Private organization employee	45	38.8
	NGOs employee	15	12.9
Educational status	No formal education	39	10.1
	Primary education (1-8)	74	19.1
	Secondary education (9-12)	87	22.5
	Tertiary education (above 12)	187	48.3
Residence	Addis Ababa	353	91.2
	Out of Addis Ababa	34	8.8
Household size	<=4	260	67.2
	>4	127	32.8
Household income in ETB	<=5000	61	15.8
	5000-15000	139	35.9
	15000-30000	115	29.7
	>30000	72	18.6
CBHI membership	No	186	48.1
	Yes	201	51.9
Type of health facility	Public	271	70.00
	Private	116	30.00

Table 2: Clinical characteristics among study participants

Characteristics	*Category*	*Frequency*	*Percent*
Type of Diabetes	Type I insulin-dependent	111	28.7
	Type II I insulin-independent	276	71.3
Regular Follow up	No	13	3.4
	Yes	374	96.6
Appointment	Every Month	56	15
	Every Three month	318	85

5.3 Cost of diabetes treatment and household expenditure

The annual average household food and non-food expenditure of diabetes patients were 104093 (±57219.26) and 169694.8 (±758681.7) ETB, respectively. Annual average total household expenditure in Ethiopian birr was 273787.8 (±769300.8).

The mean (±SD) annual outpatient treatment cost of diabetes were 9928.07 (±11459.27), with mean direct medical cost of 8948.34 (±11085.89) ETB and mean indirect medical cost of 8948.34 (±11085.89) ETB.

Among diabetic patients 32(8.3%) obtained inpatient services within one year period, with average inpatient cost of 15752.19 (±16797.77) ETB. The mean direct medical and non-medical cost was 13139.38 (±16904.56) and 2612.81 (±3643.04) ETB, respectively. Regarding cost of emergency visit 38(9.8%) obtained the services with an average expense of 26313.89(±30731.88) ETB annually.

Overall the average annual out-of-pocket expenditure for treatment among diabetes patients was 13814.37(±21641.98) ETB. The direct medical cost take the largest share of OOP expenditure of DM treatment with mean of 12584.49(±21156.72) ETB annually while the mean direct non-medical cost was 1229.89 (±2233.01). The lost productivity by patients and caregiver was 885.56 (±2147.01) ETB annually (Table 3).

Table 3: Cost of diabetes treatment and household expenditure among diabetes patients in Addis Ababa, 2023.

TYPES OF COST	N	MEAN	STD.DEV.	MEDIAN
Household Expenditure Per Month				
Food Expenditure	387	104093	57219.26	96000
Non-Food Expenditure	387	169694.8	758681.7	74700
Total Expenditure	387	273787.8	769300.8	180960
Outpatient(OPD) Cost				
Direct Medical Cost Annually				
Registration/Card	199	2718.18	5277.1	2240
Laboratory	300	5689.17	6236.42	4700
Insulin	129	4600.62	2624.60	4800
Insulin Syringe	139	594.96	625.41	400
Oral Anti-Hyperglycemic Agent	112	4813.93	11531.61	3660
Total	387	8948.34	11085.89	6120
Direct Non-Medical Cost Annually				
Food And Drink	131	711.91	1250.80	400
Transportation	370	772.69	1020.35	400
Total	387	979.73	1452.04	600
Total OPD Cost	387	9928.07	11459.27	7600
Inpatient Cost				
Direct Medical Cost Annually				
Registration/Card	25	11406.4	19749.03	8000
Laboratory	13	4346.15	3430.164	3000
Medication	13	2307.69	1548.37	2000
Bed	12	4066.67	2204.68	3000
Total	32	13139.38	16904.56	9800
Direct Non-Medical Cost Annually				
Food And Drink	17	4582.35	3710.33	3200
Transportation	19	300.49	301.49	100
Total	32	2612.81	3643.04	985
Total Inpatient Cost	32	15752.19	16797.77	14000
Emergency Cost				
Direct Medical Cost Annually	38	25966.53	30773.66	10000
Direct Non-Medical Cost Annually	38	347.37	512.41	150
Total Emergency Cost	38	26313.89	30731.88	11200
Total Cost				
Direct Medical Cost	387	12584.49	21156.72	7480
Direct Non-Direct Cost	387	1229.89	2233.01	600
Total OOP	387	13814.37	21641.98	8120
Lost Productivity	387	885.56	2147.01	

5.4 Catastrophic health expenditure

Table 4 presents the incidence and intensity of catastrophic health expenditure among diabetes patients. The incidence of catastrophic health expenditure among diabetes patients varies from 11.9% at 15% of total expenditure to 88.6% at 10% of household income.

The incidence of catastrophic expenditures declines as the threshold rises. For instance, when non-food expenditure was used, the incidence of catastrophic expenditure declined from 44.7% to 14.5% when the threshold rose from 10% to 40%.

The intensity of catastrophic health expenditure is estimated using overshoot and mean positive overshoot. The overshot ranges from 1.8% to 87% at different thresholds and methods. Similarly, the MPO varies from 8.3% to 129.5%.

The overshoot declines as the threshold level increases from 10% to 40%; for example, when non-food expenditure is utilized, the overshoot declines from 14.9% to 10%. On the other hand, MPO increases as the threshold level rises; for instance, when non-food expenditure is used, the MPO increases from 33.3% to 49.5% while the threshold level rises from 10% to 40%.

Table 4: The incidence and intensity of catastrophic health expenditure among diabetes patients in four hospitals, Addis Ababa, 2023

Method	*Catastrophic Threshold* *10%*	*15%*	*25%*	*40%*
OOP as share of nonfood expenditure				
Head count (%)	44.7	36.4	23.8	14.5
Overshoot (%)	14.9	12.9	10	7.2
MPO (%)	33.3	35.5	42.1	49.5
OOP as share of total expenditure				
Head count (%)	21.2	11.9		
Overshoot (%)	1.8	0.98		
MPO (%)	8.5	8.3		
OOP as share of Income				
Head count (%)	88.6	79.8	65.4	51.7
Overshoot (%)	87	82.8	75.6	66.9
MPO (%)	98.2	103.8	115.7	129.5

5.5 Coping strategies

Figure 2 shows the coping strategies used to finance diabetes treatment. The majority 341 (88.1%) of respondents used their own money to finance their treatment, while 150 (38.76%) relied on family support. Community-based health insurance was used by 132 (34.11%) of diabetes patients.

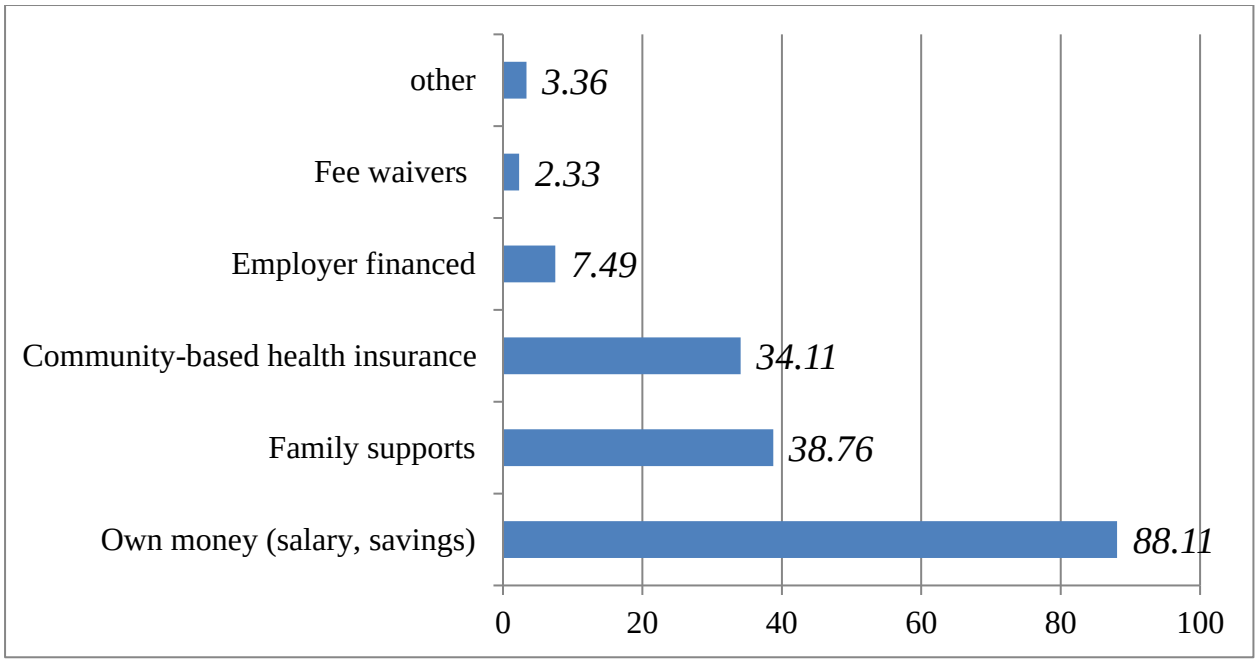

Figure 4: Coping strategies among diabetes patients in Addis Ababa, 2023

5.6 Factor Associated with catastrophic health expenditure

Logistic regression was employed to assess factors associated with catastrophic health expenditures among diabetic patients. The binary logistic regression was performed and the result is presented in Table 5.

Table 5: Binary regression to identify factor related with catastrophic health expenditure among diabetes patients in Addis Ababa

Variable	*Categories*	*CHE*		*COR 95% CI*	*P-value*
		Yes	No		
Sex	Male	67	114	1	
	Female	74	132	0.953(0.630-1.144)	0.823
Religion	Orthodox	91	161	1	
	Muslim	6	25	0.424(0.167-1.773)	0.71
	Catholic	9	14	1.13(0.4736-2.73)	0.773
	Protestant	28	39	1.27(0.733-2.2)	0.393
	Other	7	7	1.769(0.601-5.203)	0.30
Marital status	Single	16	24	1	
	Married	88	185	0.712(0.360-1.411)	0.332
	Widowed	31	29	1.603(0.721-3.621)	0.260
	Separated/Divorced	6	8	1.125(0.327-3.860)	0.851
Occupation	Unemployed	11	31	1	
	Employed	43	74	1.64(0.7478-3.586)	0.217
	Retired	35	42	2.35(1.033-5.338)	0.042*
	Housewife	39	65	1.69(0.764-3.741)	0.195
	Other	13	34	1.07(0.421-2.755)	0.876
Educational status	No formal education	13	26	1	
	Primary education (1-8)	28	46	1.217(0.538-2.749)	0.636
	Secondary education (9-12)	29	58	1(0.448-2.228)	1
	Tertiary education (above 12)	71	116	1.224(0.591-2.536)	0.58
Residence	In Addis Ababa	127	226	1	
	Outside Addis Ababa	14	20	1.245(0.608-2.550)	0.548
CBHI membership	No	96	90	1	
	Yes	45	156	0.27(0.174-0.419)	<0.001*
DM Type	Type 1	26	85		
	Type 2	115	161	2.33(1.416-3.850)	0.146
Appointment	Every Month	33	23	1	
	Every Three Month	97	221	0.305(0.170-0.548)	<0.001*
Admission	No	127	228	1	
	Yes	14	18	1.396(0.6719-2.90)	0.371
Emergency visit	No	111	238	1	
	Yes	30	8	5.19(0.695-38.87)	<0.001*
Hospital Type	Public Hospital	86	185	1	
	Private Hospital	55	61	1.93(1.242-3.027)	0.482

In the bivariate analysis Occupation, CBHI membership, appointment and emergency visit, showed significant association whereas Sex, Religion, Marital status, Occupation, Educational status, Residence, Admission, DM Type and Hospital Type doesn't show significant association. Therefore based on bivariate analysis the diabetes patients who are retried from occupation were 2 times (COR=2.35 95% CI: 1.033-5.338) more likely to face catastrophic health expenditure than patients who are unemployed. Diabetes patients who are CBHI members were 73% (COR=0.27 95% CI: 0.174-0.419) less likely to face catastrophic health expenditure than their counterpart. Diabetes patients who had appointment every three month were 69% (COR= 0.305 95% CI: 0.170-0.548) times less likely to incur catastrophic expenditure than patients who had appointment every month. Diabetes patients who had emergency visit were 5 (COR=5.19 95%CI: 0.695-38.87) times more likely to face catastrophic health expenditure than patients who doesn't had emergency visits(Table 5).

In multiple logistic regressions, only CBHI membership, appointments, and emergency visits were identified as significant factors associated with catastrophic health expenditure among diabetes patients (Table 6).

Diabetes patients who are CBHI members were 75.8% (AOR = 0.242; 95% CI: 0.124-0.469) less likely to have catastrophic expenditures for diabetes treatment as compared to those who are not CBHI members. Similarly, diabetes patients who had appointments every three months were 73.4% (AOR = 0.266; 95% CI: 0.140-0.506) less likely to incur catastrophic expenditures as compared to patients who had appointments every month (Table 6).

Diabetes patients who had an emergency visit were 10.8 times (AOR = 10.809; 95% CI: 0.280-27.295) more likely to suffer from catastrophic health expenditures than those patients who didn't have an emergency visit (Table 6).

Table 6: Factor associated with catastrophic health expenditure among diabetes patients in Addis Ababa, 2023.

Variable	*Categories*	*CHE*		*COR 95% CI*	*AOR 95% CI*	*P-value*
		Yes	No			
Occupation	Unemployed	11	31	1	1	
	Employed	43	74	1.64(0.7478-3.586)	0.611(0.246-1.513)	0.287
	Retired	35	35	2.35(1.033-5.338)	1.44(0.569-3.637)	0.441
	Housewife	65	65	1.69(0.764-3.741)	1.124(0.459-2.751)	0.797
	Merchant	10	23	1.07(0.421-2.755)	0.728(0.231-2.291)	0.587
CBHI membership	No	96	90	1	1	
	Yes	45	156	0.27(0.174-0.419)	0.242(0.124-0.469)	<0.001*
DM Type	Type 1	26	85		1	
	Type 2	115	161	2.33(1.416-3.850)	1.74(0.945-3.215)	0.075
Appointment	Every Month	33	23	1	1	
	Every Three Month	97	221	0.305(0.170-0.548)	0.266(0.140-0.506)	<0.001*
Emergency visit	No	111	238	1	1	
	Yes	30	8	5.19(0.695-38.87)	10.809(4.280-27.295)	<0.001*
Hospital Type	Public Hospital	86	185	1	1	
	Private Hospital	55	61	1.93(1.242-3.027)	0.826(0.414-1.647)	0.589

*significant at 1%

6. Discussion

The study aimed to determine the rate of catastrophic health expenditure, factors associated with catastrophic health care expenditure, and coping mechanisms with health care expenditure among diabetes patients attending hospitals in Addis Abeba, Ethiopia.

The level of catastrophic health expenditure among diabetes patients varies depending on the threshold level and methodologies used; for instance, the catastrophic expenditure rate varies from 11.9% at 15% of total expenditure to 88.6% at 10% of household income. The incidence of catastrophic expenditure was 35.5% at 15% non-food expenditure. This finding is comparable to a study conducted among chronic disease patients in the Asella referral hospital, where 30% of chronic disease patients incur catastrophic expenditure at 15% of non-food expenditure (57). Also, the finding is consistent with a systematic review of the incidence of catastrophic health expenditure in Ethiopia (40%)(56).
The finding is higher than the study conducted among diabetes patients in South Africa (25%) and Iran (28.9%)(20,58). This discrepancy might be related to the study population; our study includes patients from both public and private hospitals while those studies involved participants from public health facilities alone.

The incidence of catastrophic health expenditure found in our study is lower than that of a study conducted among diabetic patients attending in Bahir Dar city, which was 59.6% at 40% of non-food thresholds, and a study conducted among chronic disease patients in Dessie referral hospital (64.2%)(55, 42). This difference could be attributed to the fact that in our study more than half of the patients had access to health insurance. Furthermore, the finding was lower than the study conducted among diabetic patients in Northwest China (75.19%)(37).

The severity of health payments for diabetes treatment was assessed using overshoot and mean positive overshoot (MPO). The average proportion by which health payments for diabetes treatment exceeded 15% of non-food expenditure among the study population was 12.9%, while the average proportion by which out-of-pocket payments exceeded the threshold among patients who incurred catastrophic health expenditure was 35.5%. This indicated diabetes patients had faced financial hardship in accessing treatment for their medical condition, as diabetes patients spend nearly 13% of their annual non-food expenditure on their treatments. The financial hardship is more exacerbated among patients

who already experienced catastrophic health expenditure since they spent nearly more than one-third of their annual non-food expenditure on their medical treatment.

To cope with their medical expenses, the patients utilized different coping strategies. The majority of patients still rely on their own to finance their medical conditions. Others use family support as their main coping mechanism. The finding is similar to a study conducted in Bahir Dar in which the majority of diabetes patients use their own savings and family support to cope with diabetes care payments (55). Similarly the finding is in line with study conducted in Ethiopia where saving and sale of assets were the most common coping strategies used by patients (31).

Diabetes patients who are CBHI members were 77.8% less likely to incur catastrophic expenditures for diabetes treatment as compared to those who are not CBHI members. This indicates that community-based health insurance enrollment had a significant impact on reducing financial hardship among diabetes patients. The study is in line with a study conducted in Northeast Ethiopia, where insured households were 81% less likely to face catastrophic expenditures (59). Similarly, a study conducted among chronic disease patients indicated enrolment in community-based health insurance reduced the incidence of catastrophic health expenditure by 19%(57).

Patients with diabetes who had checkups every three months were 73.8% less likely to have catastrophic spending than patients who had appointments every month, indicating a substantial relationship between the frequency of hospital visits and catastrophic expenditure. This is explained by the fact that frequent hospital visits result in higher out-of-pocket expenses for direct medical care, such as lab testing and registration. In addition, compared to those who visited hospitals less frequently, they spent more on direct non-medical expenses like food and transportation (60). This finding is supported by study conducted among chronic disease patients in Dessie referral hospital were the number of hospital visit and cost of direct non-medical cost(transport and food) significantly associated with catastrophic health expenditure (61).

Diabetes patients who had an emergency visit were ten times more likely to suffer catastrophic health expenditures than those who didn't have an emergency visit. This depicted a patient who faced a diabetic emergency had been exposed to financial hardship in their medical treatment. The finding is consistent with a systematic review conducted in Ethiopia, in which the odds of catastrophic expenditure were eight times higher among households with emergency visits and those admitted to hospitals (56). This is explained by the fact that emergency diabetes treatment is more often expensive as it requires intensive lifesaving treatment.

The study's overall findings demonstrated that diabetic people experience financial difficulties when pursuing medical care for their illness. To alleviate the economic strain, community-based health insurance should be expanded, and emergency visits should be decreased by following diabetes medication advice. Furthermore, the frequency of appointment for diabetes follow is identified as a significant factor that imposes diabetes patients to financial hardship.

7. Strength and limitation of the study

7.1 Strength of the study

The study contributes to the existing body of literature by identifying the level of catastrophic health expenditure, coping mechanisms, and factors associated with catastrophic health payments among diabetes patients. In addition, the study had the following strengths: It included diabetes patients from both public and private hospitals to give consideration to private health facilities. Additionally, the study utilized a digital data collection platform to improve data quality; and employed different methods of catastrophic payment estimation at varying threshold levels to assess sensitivity. The methodology employed in the study and random selection of study subjects is another strength of the study which helps to reduce bias and increase the generalizability of the study results to the larger population.

7.2 Limitation of the study

Despite the aforementioned strengths, the study was not without limitations. The initial limitation has to do with recall bias since research participants might not be able to recall all of their prior household and medical expenses. The study's second limitation is that it is facility-based, meaning it only reveals the extent among patients and their families who are seeking hospital treatment; this might result in an underestimation of the incidence. The purposeful selection of hospital is also another limitation of the study.

8. Conclusion

The study demonstrated that there is high incidence and intensity of catastrophic health spending among diabetes patients that resulted in a substantial financial burden on individuals and families due to diabetes treatment and related costs. The incidence of catastrophic health expenditure varies from 89% to 12%, depending on the threshold and method used. Among the study participant patients, the severity of financial challenges is especially remarkable because diabetics often spend between 7% and 49% of their non-food income on medical care.

The study showed that, among diabetic patients, the incidence of catastrophic health spending had statistically significant association with community-based health insurance, length of appointment times, and emergency visits. Furthermore, individuals with diabetes employed several coping strategies to cover the costs of their medical care. To pay for their medical care, people still mostly rely on their income (salary and savings), family assistance and community health in

9. Recommendation

Based on the study finding the following recommendation is forwarded;

- ✓ The Federal Ministry of Health and Ethiopian health insurance should have expanded the coverage of community-based health insurance to provide financial protection for diabetes patients.
- ✓ The health professional should have to make the appointment duration more reasonable to minimize the economic burden due to frequent hospital visits.
- ✓ A measure should have to be taken to reduce the incidence of emergency visit among diabetes patients
- ✓ To reduce reliance on saving and own money to cope with health care expenses a prepayment scheme should have to be strengthened.
- ✓ Further studies should have to be conducted to explore the economic burden of diabetes treatments.

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Annex 1: Information sheet

My name is……. I am a data collector for Kebron Kilil. She is conducting a study on assessing the economic burden of diabetes on patient and their family in Addis Ababa for the partial fulfilment of a master's in Health system management at Addis Ababa University. The purpose of this study is to determine the catastrophic health expenditure and its impact on patient' households due to diabetes patient living with them. In addition, this will explore the associated factors contributing to the catastrophic level of expenditure of the disease and the coping strategies.

Hence, conducting this study will be used as a basic input to policy makers and other responsible bodies of the country which could be an input for strengthening the risk pooling and payment mechanisms and other prevention strategies development which will prevent a catastrophic level of financial expense and maintain the health states of cancer patients.

Becoming part of study will not have any payment you gain but the study finding will give an insight for policy makers that might have an influence on the current health care practice. It might take you 25-30 minutes to finish the interview. You are being part of the study by chance and you will not get any harm because of participating in the study. Your participation in this study is completely voluntary. You have the right to withdraw from the study in any time if you want. We reassure all your responses will remain strictly confidential and will be handled in secured manner. The information you provide will be used only for the purpose of the study stated above. Therefore, I would like to confirm your consent to be part of the study.

Do you agree to be part of the study?

Agree ☐ Disagree ☐

Thank you very much to be part of the study

Annex 2: Consent form

I, the undersigned have been informed about the purpose and use of this study and the information I am going to provide will be used only for the purpose of this research and I was also informed that my identity as well as the information I provide will be kept confidential. In addition, I have been informed that the information I give will be used only for the purpose of the study

Therefore, I agree to participate in the research voluntarily.

Participant's signature _____ Date _____

Investigator name _____ Signature _____

Annex 3: Study tool

Patient code_____

Individual survey identifications

Do you agree to be part of the study? *If response is "Yes" (thank the respondent for their willingness to take part in the study and proceed to the survey questions.) If response is "NO" (thank the individual and go to the next eligible respondent)*

Yes ☐ NO ☐

Identification questions

Date of Interview _____

Data collector name _____

Name of the hospital

1. Zewditu Memorial Hospital
2. Menelik II Referral Hospital
3. Bethzatha general hospital
4. Lancet general hospital

Section One: Demographic and Socio-Economic Characteristics

S. No	Question	Option (Measurements)	Skip
101	Sex	1. Male 2. Female	
102	Age	_____ year	
103	Marital status	1, Single 2. Married 3. Separated 4. Widowed 5.Divorced 6.Others, specify_____	
104	Educational status?	1. Not able to read and write 1. Read and write 2. Primary education (1-8) 3. Secondary education (9-12) 4. Tertiary education (above 12)	
105	Main	1.Unemployed 2, Employed	If 1,

	occupation/ employment?	3. Retired 4, Student 5. House wife 6. Trade 7. Private business 8. Others _____	3, 4,5,6 skip to Q7
106	If employed, what is type of employment are you engaged in	1. Government employee 2. Private organization employee 3. NGOs employee 4. Others	
107	Role in household	1. Father 3. Child 2. Motherhood 4. other	
108	Place of residence	5. Adds Ababa 6. Outside of Addis Ababa	
109	Number of Family members	_____	
110	How many members of the family are employed at moment?	_____	
111	What is your average monthly income??	_____birr	
112	On average how much is the income of other family members?	_____birr	
113	Are you a member of community based health insurance	1. Yes 2. No	

Section Two: Clinical Characteristics of Diabetic Mellitus and Role of Individual

S. No	Question	Option	Skip
201	For how long do you follow up as the diabetes patient/client?	_____ months	
203	What type of diabetic case do you have?	1. Type 1, insulin-dependent 2. Type 2, insulin-independent 3. I don't know/other _____	
204	How frequently do you visit health facility in the last six month ?	_____ times	
205	Do you have a regular follow up for your diabetic condition?	1. Yes 2. No	
206	How often is you regular follow up?	1. Every month 2. Every two months 3. Every three months 4. Every six months 5. other	
205	During check-up, on average, how long do you wait at reception to see a doctor?	_____hours	
206	Do you have taken any prevention action to minimize complication?	1. Yes 2. No	If 2 skip to Q 9
207	If yes Q 207 above, what type of prevention does have you taken? How much does it cost per months?	1. Control of feeding habit ____ birr 2. Regular exercise _____birr 3. Other _____ birr 4. Total _____birr	

Section Three: Costs of treatment

S. No	Question	Option	Skip
301	In the past six month, how many times did you get out patient service at the health facility due to your DM conditions?	_____	
302	During the current /For today's/ follow-up visit, how much did you spend on the following items in ETB? (If the respondent does not know how much he/she paid per item, please report the total payment under "Card/Registration fee")	Card/Registration fee Laboratory Insulin Insulin syringes Oral anti-hyperglycaemic agent If the answer is nil, please enter "0" do not leave	
303	how much did you spend on the following items in ETB in the last visit? (If the respondent does not know how much he/she paid per item, please report the total payment under "Card/Registration fee")	Card/Registration fee Laboratory Insulin Insulin syringes Oral anti-hyperglycemic agent	
304	Mainly/regularly from where do you get the medications and other services? (You can Chose more than one answers)	1. Governmental health facility 2. Private health facility 3. NGOs 4. DMs Associations 5. Others	
305	Have you been admitted tohospital/clinics, inpatient treatment in the last 6 months?	1.Yes 2.No	If 2 skipto 306

306	If Yes to above question (admitted), what was its total cost for this services? (If the respondent does not know how much he/she paid per item, please report the total payment under "Card/Registration fee")	Card/Registration Laboratory Medication(Insulin/ Insulin syringes/Oral anti-hyperglycemic agent) Bed Transpiration for you and your caregiver Food and drink for you and your caregiver	
307	During your regular follow up to health facilities in last 6 months do you use services like cafeteria?	Yes No	If 2 skip 308
308	If yes in Q 308, how much do you and your caregiver costs in average?	_____birr	If 2 skip to 313
309	What transport modality have you used to travel from home to health facility in last visit? *Multiple answer is possible	Walk Bicycle/motor cycle Bajaj/Taxi Public transport car Own/relative's car Other	
310	How much did you pay for a single trip	_____birr	
311	Have you paid for lodging/accommodation for you and for your caregiver in last/current visit?	Yes No	If 2 skip 312
312	on average, how much do you pay for lodging/accommodation per each visit?	_____ birr	

Section Four: Loss of work days

S. No	Question	Option	Skip
401	In the last 6 months because of DMs do you have stopped going to school/ work and stayed home?	1. Yes 2. No	
402	If yes in Q 401, for how many days were you absent in last 6 months?	1. ___days from school 2. ___days from work	
403	In the last 6 months has someone come with you for follow up?	1. Yes 2. No	
404	If yes in Q404, How many caregivers were with you?	_____	
405	If yes in Q 404, how many days in 6 months your caregiver with you?	___ days	
406	In last 6 months have had inpatient services?	1. Yes 2. No	If 2 skip to 407
407	If yes in Q 407, for how many daysdo you get services?	___ days	
408	Do you have had any one with you, during your inpatient services?	1. Yes 2. No	If 2 skip 409
409	If yes Q 408, how many caregivers, for how many days stay? (Consider main caregiver only)	_____Caregiver _____days	

Section five: Emergency and inpatient costs

S. No	Question	Option	Skin
501	Did you have an emergency visit in the 6 months/ not regular visits?	1. Yes 2. No	If 2 skip to 701
502	If yes in Q 601, how many times do you visit?	_____ times	
503	During your emergency case, from where did you get services?	1. Government Hospitals 2. Health centres 3. Private health facilities 4. Others	
504	In last 6 months, how much was your total emergency medication/treatment costs?	_____birr	
505	During your emergency visits was a caregiver with you?	1. Yes 2. No	If 2 skip to 701
506	If yes in Q605, how many caregivers, for how many days stay, (Consider Only main caregiver)	1. _____ caregiver 2._____ Days	
507	In last 6 months, do you have had an emergency transport		If 2 skip to 601
508	how many times do you had, How much was average transport costs per single visits?	_____days _____birr	

Section Six: Household budgets

S. No	Question	Option	Skip
601	Total average weakly food expenditure of your household	____birr	
602	In the last 30 days, how much was household expense for:	1. House rent_____ Birr 2. Water_____ Birr 3. Electricity_____Birr 4. Mobilecard/telephone/internet____Birr 5. Educational expense_____Birr_ 6. Clothing ____birr 7. Transportation___birr 8. Household health care cost____birr 9. Recreation and entertainment __birr 10. Other goods and services____birr	

Section seven: Coping strategy

No.	Question	Option	Skip
	What are main source of financing above-mentionedcosts	1. Own money (salary, savings) 2. Borrowing 3. Sell off assets 4. My family supports 5. Reduce HH food consumption 6. Reduce HH non-food consumption 7. Community-based health insurance 8. Fee waivers from Kebele/Tabia/woreda 9. Other (please specify)	

Section eight: Housing and amenities

No	Question	Option	skip
801	Does the household own a house?	1. Yes 2. No	
802	How many rooms does the house you live in have?	_____	
803	What are the main types of material the for floors in your house?*	Mud/Cow dung Stone Cement Wood Grass Ceramic Other	
804	What are the main types of material the for walls in your house?	Mud/Cow dung Stone Cement Hollow block Wood Grass Clay Other	
805	What are the main types of material the for roof in your house?	Mud/Cow dung Stone Cement/brick Wood Grass Iron sheet Other	
806	What is your main source of cooking	Firewood Charcoal Electricity Gas_ Cylinder Kerosene Other	
807	What is your main source of lighting?	Electricity Kerosine Gas – biogas Candle Firewood Other	
808	Does your household have any	1. Television _____quantity____	

	of the following items? If yes specify the quantity	2. Computer _____quantity____ 3. Motorcycle ____quantity____ 4. Car or truck ____quantity____ 5. Refrigerator ____quantity____	

በጥናቱ ተሳታፊ ግለሰቦች መለያ_____

የግለሰብየዳሰሳጥናትመለያዎች

የጥናቱ አካል ለመሆን ተስማምተሃል? ምላሹ "አዎ" ከሆነ

(ተጠሪውንበጥናቱለመሳተፍላሳዩትፈቃደኝነትአመስግኑእናወደጥናቱጥያቄዎችይቀጥሉ) መልሱ "አይ"

ከሆነ (ግለሰቡንአመስግኑእናወደሚቀጥለውብቁምላሽሰጪይሂዱ)

የመለየትጥያቄዎች፡

የቃለ መጠይቁ ቀን _____

የመረጃ ሰብሳቢ ስም _____

የሆስፒታሉ ስም፡

1. ዘውዲቱ መታሰቢያ ሆስፒታል
2. ዳግማዊ ምኒልክሪፈራል ሆስፒታል
3. ቤተዛታ አጠቃላይ ሆስፒታል
4. ላንሴት አጠቃላይ ሆስፒታል

ክፍሌአንድ: ማህበራዊና ኢኮኖሚያዊ አጠቃሊይ የግለሰብ መረጃ

ተ.ቁ	ጥያቄ	አማራጭ	እለፍ
101	ጾታ	1. ወንድ 2. ሴት	
102	ዕድሜ	_____	
103	የጋብቻሁኔታ	1. ያገባ 5. የተፋታ 2. ያገባ/አብሮየሚኖሩ 6. ሌላካለይግለፅ 3. ተለያይተዉየሚኖሩ 4. ባሌ/ሚስትየሞተበት	

104	የትምህርትሁኔታ	1. ማንበብናመጻፍየማይችል 2. ማንበብናመጻፍ 3. የመጀመሪያደረጃ 4. ሁለተኛደረጀ 5. ዲግሪናከዚያበሊይ	
105	ላለፉት 12 ወራትዋናስራዎምንድንነዉ?	1. ስራየሌለዉ 5. የቤትእመቤት 2. ተቀጣሪ 6. ንግድ 3. ጡረተኛ 7. የግሌስራ 4. ተማሪ 8. ሌላ	መሌሶ 1፣3፣4፣5፣6፣7ከሆነወደ ጥያቄ107 ይሂዱ
106	ተቀጣሪከሆኑበምንዓይነትስራላይነውየ ተሰማሩት?	1. በመንግስት 3. በግሌ 2. መንግስታዊባሌሆኑድ ርጅት 4. ሌላ	
107	ቤትውስጥያልዎትኃላፊነት?	1. አባት 3. ልጅ 2. እናት 4. ሌላ	
108	የምኖሪያአዲራሻ	1. አዲስአበባ 2. ከአዲስአበባዉጪ	
109	በቤተሰብዎዉስጥየሚገኙሰዎችብዛት	_____	
110	በቤተሰብዎዉስጥበአሁኑጊዜምንያህል ዎቹስራአላቸው?	_____	

111	የእርስዎወርሃዊገቢመጠንስንትነዉ?	_____ብር	
112	የቤተሰብዎአጠቃሊይወርሃዊገቢመጠንስንትነዉ?	_____ብር	
113	የህብረትሰብጠናመድንተጠቃሚኖት	1. አዉ 2. አይ	

ክፍሌሁለት: የስኪርህመምዓይነትናየግለሰቦችድርሻ

ተ.ቁ	ጥያቄ	አማራጭ	እለፍ
201	ለምንያህሌጊዜነዉየስኪርህመምክትትልያደረጉት?	_____ወር	
202	ምንአይነትየስኪርህመምነዉያለብዎት?	1. ታይፕ 1 2. ታይፕ 2 3. አላዉቅም/ሌላ	
203	ለስኪርህመምዎመደበኛክትትልአለዎት	1. አዉ 2. አይደለዉም	
204	በምን ያህል ጊዜ ነዉ ለክትትልየሚመጡት?	1. በየ 1 ወር 2. በየ 2 ወር 3. በየ 3 ወር 4. በየ 6 ወር 5. ሌላ	
205	ለክትትልሲመጡሀኪምፊትለመቅረብበአማካይለምንያህልጊዜ/ሰዓትነዉበመጠበቂያዉየሚጠብቁት?	_____ _____ሰዓት	
206	የስኪርህመሞእንዳይባባስየሚወስዱትወይምየሚሰሩትየመከላከልተግባርአለ?	1. አዎ 2. አይ	መልሶ 2ከሆነወደ ጥያቄ 301ይሂዱ
205	ከላይበቀረበውጥያቄመልሶአዎከሆነ፣ምንዓይነትተግባርነዉየሚያከናውኑት? ለዚህምንያህሌወጪበወርያወጣሉ?	1. አመጋገብማስተካከለል ___ብር____	

		2. የአካሌእንቅስቃሴ____ብር____ 3. ሌላካለ_ብር_____ 4. ድምር_ብር_____	

ክፍሌሶስት: የስኪር ሀክምና ወጪ

ተ.ቁ	ጥያቄ	አማራጭ	እለፍ
301	ባለፉትስድስትወራትውስጥየስኪርህመምዎምክንያትበጤናተቋምውስጥስንትጊዜየታካሚአገልግሎትአግኝተዋል?	_____	
302	በአሁኑየክትትልጉብኝት፣በብርለሚከተሉትእቃዎችምንያህልአውጥተዋል? (መልስሰጪውበእቃውላይምንያህልእንደከፈለካላወቀ፣እባክዎጠቅላላክፍያውንበ"ካርድ/የምዝገባክፍያ" ስርያሳውቁ	1. የካርድ / የምዝገባክፍያ 2. ላቦራቶሪ 3. ኢንሱሊን 4. የኢንሱሊንመርፌዎች 5. በአፍየሚወሰድመድሃኒት	
303	በባልፎውየክትትልጉብኝት፣በብርለሚከተሉትአገልግሎቶችምንያህልአውጥተዋል?	1. የካርድ / የምዝገባክፍያ 2. ላቦራቶሪ	

	(መልስሰጪውበእቃውላይምንያህልእንደከፈለካላወቀ፣እባክዎጠቅላላክፍያውንበ"ካርድ/የምዝገባክፍያ" ስርያሳውቁ	3. ኢንሱሊን 4. የኢንሱሊንመርፌዎች 5. በአፍየሚወሰድመድሃኒት	
304	ብዙጊዜ/በአብዘኛውጊዜከየትነውየስኪርህክምናአገልግልቶችንየሚያገኙት?	1. ከመንግስት ጤናተቋም 2. ከግልጤናተቋም 3. መንግስታዊ ካልሆነተቋም 4. ከማህበር/ከስኪር 5. ከሌላቦታ	
305	ባለፉት 6 ወራትበሆስፒታል/በክሉኒክተኝተዉታክመዉነበር?	1. አዎ 2. አይ	መልሶ 2 ከሆነወደጥያቄ 307ይሂዱ
306	ከላይላለውጥያቄምልሶአዎከሆነ፣ለዚህአገልግሎትአጠቃላይወጪውስንትነበር? (መልስሰጪውበአገልግሎቶችላይምንያህልእንደከፈለካላወቀ፣እባክዎጠቅላላክፍያውንበ"ካርድ/የምዝገባክፍያ" ስርያሳውቁ)	1. ካርድ 2. ላቦራቶሪ 3. መርሃኒት 4. አልጋ 5. የትራንስፖሪት	

		6. የምግብ እናምጠጥ	
308	ባለፉት 6 ወርለክትትልጤናተቋምበሚመላለሱበትወቅትለምግብናለመስተንግዶነገሮችወጪአውጥተውነበር?	1. አዎ 2. አይ	መልሶ 2 ከሆነወደጥያቄ 310 ይሂዱ
309	መልሶአዎከሆነምንያህልወጪነበረያወጣችሁትእርሶናአብሮትየነበረውሰውበአማካይበአንድደርሶምልስጉብኝት	_____ብር	
310	ክትትልወደሚያደረጉበትየጤናተቋምለመሄድምንአይነትየመጓጓዣዘዴይጠቀማሉ?	1. በእግር 2. በታክሲ 3. በአዉቶቢስ 4. በግልመኪና 5. ሌላ	
311	የአንድጉዞደርሶመልስየመጓጓዣወጪዎትምንያህልነው?	____ብር	
312	ባለፈው/በአሁኑጉብኝትለእርስዎእናለእንክብካቤሰጪዎለማደሪያ ከፍለዋል?	1. አዎ 2. አይ	
313	በአማካይበእያንዳንዱጉብኝትለማድሪያምንያህልይከፍላሉ?	____ብር	

ክፍሌአራት: ለህክምናየዋለቀናት

ተ.ቁ	ጥያቄ	አማራጭ	እለፍ
401	ባለፉት6 ወራትከስኪርህመምጋርበተያያዘት/ቤትወይምስራሳይሄዱቤ ትውስጥየቀሩበትቀናትነበርዎት?	1. አዎ 2. አይ	መልሶ2ከሆነወደጥያቄ403ይሂዱ
402	በጥያቄቁጥር 401 መልሶአዎከሆነበአጠቃሊይባልፉት 6 ወራትምንያህልቀንቀሩከት/ቤትወይምከስራ?	1. _____ ቀናትከት/ቤት 2. _____ _ቀናትከስራ	
403	ባለፉት6 ወራትከእርሶጋርጤናተቋምየሚመጡሰዎችወይምአስታማሚዎችነበርዎት?	1. ዎ 2. ይ	መልሶ2ከሆነወደጥያቄ406 ይሂዱ
404	መልሶአዎከሆነከእርሶጋርጤናተቋምየሚመጡሰዎችወይምአስታማሚዎችቁጥራቸዉስንትነው?	_____	
405	ከእርሶጋርጤናተቋምየሚመጡሰዎችወይምአስታማሚዎችምንያህልቀናትንመጡ?	_____ቀን	
406	ባለፈው 6 ወርቤትውስጥተኝተው/ከአቅምበላይሆኖቦዎትያውቃል?	1. ዎ 2. ይ	መልሶ2ከሆነወደጥያቄ408ይሂዱ
407	መልሶአዎከሆነባለፉት6 ወራትምንያህልቀን ይሆናል?	_____ _____ቀን	

408	ባለፈው 6 ወርቤትውስጥተኝተው/ከአቅምበሊይሆኖቦዎትድጋፍናእንክ በካቤየሚያደርግሌዎትሰውነበረ?	1. አዎ 2. አይ	መልሶ2ከሆነወደጥያ ቄ501 ይሂዱ
409	በጥያቄቁጥር 407 መልሶአዎከሆነምንያህልቀንእንክብካቤተደረገሌዎት?	____ ቀን _	

ክፍልአምስት፡ድንገተኛህክምናወጪ

ተ.ቁ	ጥያቄ	አማራጭ	አለፍ
501	ባለፉት 6 ወራትከስኪርህመምጋርየሚገናኝድንገተኛህመምአጋጥሞትነበር?	1. አዎ 2. አይ	መልሶ 2 ከሆነወደጥያቄ 601 ይሂዱ
502	ከላይበቀረበዉጥያቄመልስዎአዎከሆነበ6 ወርምንያህልጊዜ፤በአጠቃሊይምንያህልቀንወሰደቦዎት?	1. _____ጊዜ 2. _____ቀን	
503	በድንገተኛህመሞጊዜከየትነበረህክምናአገልግሎትያገኙት?	1. ከመንግስትሆሲፒታል 2. ከጤናጣቢያ 3. ከግልጤናተቋማት 4. ሌላ_____	
504	ባለፉት6 ወራትአጠቃሊይየድንገተኛህክምናወጪዎትምንያህልነበረ?	_____ብር	
505	ባለፉት 6 ወርበድንገተኛህመሞጊዜድጋፍየሚያደረግልዎትአስታማሚነበርዎት?	1. ዎ 2. ይ	መልሶ2ከሆነወደጥያቄ601ይሂዱ
506	መልሶአዎከሆነምንያህልድጋፍሰጪነበርዎት፤ምንያህልቀንቆዩ፤በአማካይምንያህልደሞዝ/ገቢአወጣ?	1._____ድጋፍሰጪ/አስታማሚ 2._____ቀን	

ክፍሌስድስት: በስኪርህክምናተፅዕኖየሚፈጥሩእናየቤተሰብወጪዎች

ተ.ቁ	ጥያቄ	አማራጭ	ኾለፍ
601	አጠቃላይየቤተሰብዎአማካይሳምንታዊየምግብወጪ	_____ብር	
602	ባለፉት 30 ቀናትየቤትውስጥወጪምንያህልነበር፡-	1. የቤትኪራይ____ብር 2. ውሃ_____ ብር 3. ኤሌክትሪክ _____ብር 4. የሞባይልካርድ/ስልክ/ኢንተርኔት ____ብር 5. የትምህርትወጪ __ብር_ 6. ልብስ ____ብር 7. መጓጓዣ ___ብር 8.የቤተሰብጤናክብካቤ ____ብርወጭ 9. መዝናኛእናመዝናኛ __ብር 10. ሌሎችእቃዎችእናአገልግሎቶች ____ብር	

ክፍልሰባት: የመጋለጥወጪ

ተ.ቁ	ጥያቄ	መልስ	አለፍ
701	ከላይየተጠቀሱትወጪዎችዋናየፋይናንስምንጮችምን ድናቸው	1. የራስገንዘብ (ደሞዝ፣ቁጠባ) 2. መበደር 3. ንብረቶችንመሸጥ	

		4. ቤተሰቤይደግፉኛል 5. የምግብፍጆታንቀንሽ 6. የምግብያልሆኑፍጆታዎችንይቀንሱ 7. የማህበረሰብአቀፍየጤናመድን 8. ከቀበሌ/ወረዳየሚከፈልክፍያ 9. ሌላ (እባክዎይግለጹ	

ክፍልስምንት፡መኖሪያቤትእናመገልገያዎች

ተ.ቁ	ጥያቄ	ምልስ	እለፍ
801	መኖሪያቤቶትየራሶነዉ	1. አዎ 2. አይ	
802	የሚኖሩበትቤትስንትክፍሎችአሉት?	_____	
803	የቤቶትወለልምንድነዉ	1. ጭቃ/የላምኩበት 2. ድንጋይ 3. ሲሚንቶ 4. እንጨ 5. ሳር 6. ሴራሚክ 7. ሌላ	
804	የቤቶትግድግዳምንድነዉ	1. ጭቃ/የላምኩበት 2. ድንጋይ 3. ሲሚንቶ 4. ባዶብሎክ 5. እንጨት 6. ሳር 7. ሸክላ 8. ሌላ	
805	የቤቶትጣሪያምንድነዉ	1. ጭቃ/የላምኩበት 2. ድንጋይ 3. ሲሚንቶ / ጡብ 4. እንጨት 5. ሳር	

		6. የብረትሉህ 7. ሌላ	
806	ዋናውየማብሰያዎምንጭምንድነው?	1. የማገዶእንጨት 2. ከሰል 3. ኤሌክትሪክ 4. ጋዝሲሊንደር 5. ኬሮሲን 6. ሌላ	
807	የእርስዎዋናየመብራትምንጭምንድንነው?	1. ኤሌክትሪክ 2. ኬሮሲን 3. ጋዝ - ባዮጋዝ 4. ሻማ 5. የማገዶእንጨት 6. ሌላ	
808	የእርስዎቤተሰብከሚከተሉትዕቃዎችውስጥአንዳቸው ምአላቸው? አዎከሆነመጠኑንይግለጹ	1. ቴሌቪዥን _____ ብዛት ____ 2. ኮምፒውተር _____ብዛት___ 3. ሞተርሳይክል _____ ብዛት ____ 4. መኪናወይምየጭነትመኪና _____ብዛት____ 5. ማቀዝቀዣ _____ብዛት____	

ASSURANCE OF PRINCIPAL INVESTIGATOR

(USE THE FOLLOWING IN ONE PAGE)

I, the undersigned agree to accept all responsibilities for the scientific and ethical conduct of the research project. I will provide timely progress report to my advisor and seek the necessary advice and approval from my primary advisors in the course of the research. I will communicate timely to my advisors all stakeholders involved in the study including any source of funding for this research.

Name of the student: KEBRON KILIL

Date: JANUARY,2023

Signature: _____

Approval of the primary Advisor

Name of the primary advisor: DR. SALE WORKNEH

Date: JANUARY,2023

Signature: _____