



**SAINT PAULOSE HOSPITAL MILLENNIUM MEDICAL COLLEGE**

**SCHOOL OF NURSING**

**THE PREVALENCE OF MANEMIA AND ASSOCIATED FACTORS AMONG  
ADULT DIABETES MELLITUS PATIENTS IN SELECTED GOVERNMENTAL  
HOSPITAL IN ADDIS ABABA**

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|                                   |                                                                                                                        |
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## **Acronyms and Abbreviation**

|      |                                         |
|------|-----------------------------------------|
| ACEI | Angiotensin Converting Enzyme Inhibitor |
| AGE  | Advanced Glycation End product          |
| CKD  | Chronic Kidney Disease                  |
| DM   | Diabetic Mellitus                       |
| EGFR | Estimated Glomerular Filtration Rate    |
| EPO  | Erythropoietin                          |
| ESRD | End Stage Renal Disease                 |
| G/dl | Gram Per Deci Liter                     |
| Hb   | Hemoglobin                              |
| HCT  | Hematocrit                              |
| RBC  | Red Blood Cell                          |
| WHO  | World Health Organization               |

## Abstract

**Background:** The precise magnitude of anemia among chronic disease patients is difficult to ascertain because many of the patients with DM and other chronic diseases are not screened and investigated sufficiently to establish the diagnosis of anemia. In Ethiopia, limited researches are done on anemia among diabetic patients. This study is aimed to determine the magnitude of anemia and associated factor among adult DM patients in selected governmental hospital in Addis Ababa, Ethiopia.

**Method:** Institutional based cross-sectional study analysis was conducted in simple randomly selected governmental hospitals in Addis Ababa with the determined sample size of 320. The data was entered in to epi data version 4.6 then cleaned and exported to Statistical Package for the Social Sciences (SPSS) version 20. Descriptive statistics for categorical variables were presented in frequencies and percentages. Logistic regression was computed to assess factors associated to anemia in DM patients. The summary measures of estimated crude and adjusted odds Ratios with 95% confidence interval were presented and P-value <0.05 was used to declare statistical significance.

**Results:** This study result revealed that the magnitude of anemia among adult DM patients in selected governmental hospitals of Addis Ababa is 24.9%. Educational status of elementary school (AOR=2.978 CI=1.231-7.202) was significantly associated factor for anemia among DM Patients in a selected governmental hospital in Addis Ababa.

**Conclusion and Recommendation:** Anemia was a major health problem among DM patients in the study area. Therefore, routine screening of anemia for all DM patients aiding in early identification and improved management of diabetes will lead to improved quality of life in these patient populations. Therefore, governmental stakeholders should give special consideration to the development of anemia in chronic illness that has an overt negative consequence on the health of the population.

**Key words:** Anemia, Diabetes Mellitus, Adults, Ethiopia

# 1. INTRODUCTION

## 1.1. Background

Anemia is a reduction of hemoglobin concentration in blood, which consequently reduces the oxygen-carrying capacity of red blood cells unable to meet the physiological needs/requirements of the body (1). World Health Organization (WHO) criteria was used to define anemia as: Hgb concentration <13 g/dl for males and < 12 g/dl for females. It was further classified into mild anemia (female: 11–11.9 g/dl; male: 11–12.9 g/dl), moderate anemia (8–10.9 g/dl) and severe anemia (< 8 g/dl) (2).

The chronic hyperglycemia of patients with diabetes mellitus is associated with relatively specific long-term microvascular complications affecting the eyes, kidneys, and nerves, as well as an increased risk of cerebrovascular disease(3, 4).

Globally, Iron deficiency is the most common cause of anemia but other nutritional deficiencies (including folate, vitamin B12, and vitamin A), acute inflammation, chronic inflammations, and inherited or acquired disorders can also cause anemia by reducing hemoglobin synthesis, red blood cell production, or red blood cell survival (4). Anemia is one of the preventable complications of DM, but it is less focused and estimated by the diabetes care providers.

Hemoglobin concentration alone cannot be sufficient to diagnose iron-deficiency anemia, but it can provide general information on the magnitude and severity of anemia (5). DM and anemia are closely associated and diabetic patients tend to develop anemia because of different factors, including free radicals, pro-inflammatory cytokines, and renal disease(6).

There is a significant association between hemoglobin concentration and fasting blood glucose. High incidence of anemia is likely to occur in patients with poorly controlled diabetes and in patients with diabetes and renal insufficiency(6).

The risk of occurring anemia among DM patients with kidney disease is higher and occurs earlier than in those patients with the same level of renal impairment from other etiologies(7, 8).

It should be noted that due to the development of diabetic nephropathy which further undermines the renal production of EPO positively contributing an increased anemic framework(9, 10).

Diabetic neuropathy, chronic inflammatory activity, increased levels of advanced glycation end products (AGEs), erythropoietin hypo-responsiveness, effects of oxidative stress, and anti-diabetic medications are other possible cause of anemia in DM patients(11, 12).

Micronutrient deficiencies like cyanocobalamin, folate, and iron among diabetic patients lead to anemia. In addition to this, using medications (like Metformin) for a long duration may interfere with the absorption of cyanocobalamin, which may cause anemia(13).

## **1.2. Statement of the Problem**

Globally, anemia affects more than 1.62 billion people (24.8% of the global population) and it is responsible for 8.8% of the total disabilities. South Asia and Sub-Saharan Africa are among the highly burdened zones, while the westerns are least affected. Ethiopia is one of the highly affected Sub-Saharan countries by anemia(14). Anemia is the second target of global nutrition for 2025, it has a significant negative impact on the overall global and national development(15).

The prevalence of anemia among T2DM patients varies in different areas; up to 20% in Australia, 46.5% in Caribbean population, 41.7–63% in Pakistan, 41.4% in Cameroon, 29.8% and 63% in Egypt(16).

Developing countries similar to Ethiopia account for the most significant proportion of anemia due to inadequate intake of nutrients, infectious diseases, and inherited conditions(17). On the other hand, again, people with chronic illnesses (kidney problems, cancer, diabetes, etc.) are the risk factors even if the causes of anemia are multifactorial(18). Due to the development of diabetes mellitus, nephropathy may arise, which further undermines the renal production of erythropoietin, positively contributing to an increased anemic framework(19).

There is considerable evidence that anemia exacerbates severity and impairs the outcome of peripheral small vessel disease in diabetic patients (8). Anemia can make certain that can worsen kidney, heart, and artery diseases, which are more common in people with diabetes (20).

Some studies have shown that reduced erythropoietin production and anemia happen earlier in people with diabetes and kidney disease than in those with kidney disease and no diabetes. Serious complications of early onset anemia in diabetic patients include severe symptomatic neuropathy leading to efferent sympathetic denervation of the kidney and possible damage to the renal interstitial and inability to produce appropriate erythropoietin, systemic inflammation and inhibition of erythropoietin release(11).

Anemia is found to contribute to the development and progression of micro and macro-vascular complications of diabetes, which has a negative impact on the quality of life and an additional burden on

the health of the patients which could decrease the productivity overall life of the affected population(20, 21).

Despite the high prevalence of anemia in patients with diabetes, even in the absence of renal disease and its significant adverse effect on disease outcomes(22, 23), very little research has been conducted on the burden of anemia among adults with diabetes in sub-Saharan Africa.

In Ethiopia anemia screening among diabetes patients is not practiced during their follow-ups. Therefore, anemia can put diabetes patients at high risk of hospitalization and premature death. But there is an information gap on the exact magnitude of anemia among adult diabetic patients(24).

### **1.3. Significance of the study**

This study was aimed to assess the magnitude and associated factors of anemia among diabetes mellitus patients at Selected governmental hospitals in Addis Ababa from December 6/2021 to January 1/2022. So, there is a need to research to realize feasible solutions and to inform clinicians on successful monitoring anemia status among diabetes patients and to prevent the possible complications at their early stage.

Besides, this study will help clinicians, policymakers, and health planners in designing the best and appropriate early anemia screening and approaching strategies. the study aid in the routine screening of anemia for all DM patients aiding in early identification and improved management of diabetes which lead to improved quality of life in this patient population. The study was used also to increase the patient knowledge of DM complications and proper medication adherence and regular medical evaluation.

## **2. LITERATURE REVIEW**

### **2.1. The magnitude of Anemia Among DM Patients**

Globally, the prevalence of concurrent anemia and diabetes mellitus (both type 1 and type 2) ranges from 14% to 45% in various ethnic populations worldwide(25). The magnitude of anemia among T2DM patients varies among studies and regions, ranging from 7.7% in the United States of America (USA) to 67%in India(26, 27).

As studies showed that the prevalence of anemia among diabetic patients was 23% in Accra, Ghana, 55.5% at the primary health center attached to King Faisal University, Al Ahsa, Saudi Arabia, 58.8% in Nagpur, Maharashtra, India, and 84.8% at the Austin and Repatriation Medical Center (ARMC)(27). Even though several studies have been conducted in different parts of the world on anemia with cross-sectional study designs among T2DM patients, its magnitude varies among their findings up to 63% in Pakistan (28), 41.4% in Cameroon, 39.4% in Malaysia, 18% in India, 55.5% in Saudi, and 34.8% in Ethiopia(29). Such a difference will make the understanding of the exact magnitude of anemia among T2DM patients. In Ethiopia, there are only a few researches done on the association of hematologic profiles and renal disease among diabetic patients.

In a study made in Harari Region, Eastern Ethiopia a cross-sectional study which was about Anemia and associated factors among type-2 diabetes mellitus patients attending public hospitals revealed 34.8% of the participants were anemic(29), and another study which was made in Debre tabor a cross-sectional study which was about Prevalence of Anemia and its Associated Factors Among Adult Diabetes Mellitus Patients at Debre Tabor General Hospital, Northcentral Ethiopia, The prevalence of anemia among diabetic patient was 29.81 (30).

Similarly, a study made in Aider, the magnitude of anemia and associated factors among adult diabetic patients in Tertiary Teaching Hospital, Northern Ethiopia, 2019, cross-sectional study From a total of 262 diabetes patients, (17.9%) were found to be anemic (6.7% males and 11.5% females)(24).

## **2.2. Factors Associated with Anemia.**

Various studies revealed the development of anemia in DM patients is significantly associated with a marital status(31), educational status (32), Body mass index (BMI), hypertension, glycemic control, and chronic kidney diseases(33). The duration of diabetes (27), and microvascular complications of diabetes such as diabetic nephropathy, neuropathy, and retinopathy have all been found to be significantly associated with anemia in T2DM patients(34), history of recent blood loss (29), Parasitic infection(30), Specific medications such as Angiotensin-Converting Enzyme Inhibitors (ACEI), angiotensin receptor blockers and insulin have also been found to have a significant association with anemia in T2DM patients (35).

Using medications (like Metformin) for a long duration may interfere with the absorption of cyanocobalamin, which may cause anemia(13).According to a study made in Aider Comprehensive Specialized Hospital, Tigray, the magnitude of anemia is high among diabetic patients. Occupation of the participants, residency, was significantly associated with anemia(24).

Cancer is an important risk factor for anemia, particularly when it affects the digestive system because it causes intermittent bleeding (generally unnoticeable), which leads to anemia(36), Another mechanism is the decreased response to EPO, mainly during cancer chemotherapy(37).

### 2.3. Conceptual Framework

This Diagrammatic framework is to describe the associated factors for anemia among DM patients.

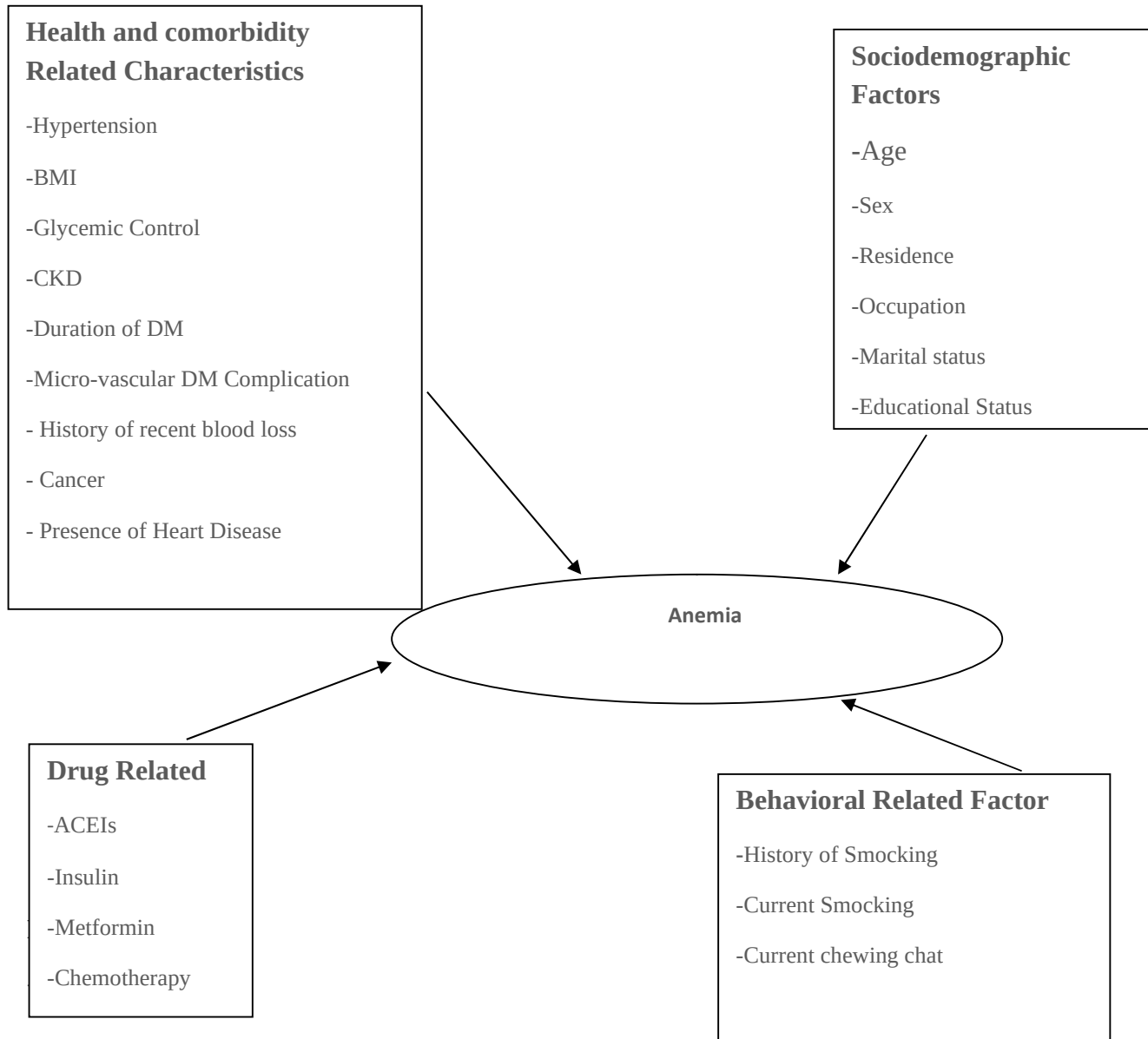


Figure 1. Conceptual frame work of associated factor for anemia which is adopted from different literature (1, 38, 39).

### **3. Objectives**

#### **3.1. General Objective**

This study aimed to assess the prevalence and associated factors of anemia among adult diabetes patients who are admitted & having regular followed up at a selected Governmental hospital in AA. 2022

#### **3.2. Specific objective**

- To determine the magnitude of anemia among DM patients in a selected governmental hospital in Addis Ababa from January 6/2022 to February 1/2022.
- To identify the associated factor for anemia among DM patients in selected governmental hospitals in Addis Ababa from January 6/2022 to February 1/2022.

## **4. METHODS AND MATERIALS**

### **4.1. Study area**

Addis Ababa was the last imperial capital of Ethiopia and serves as the capital of the modern state of Ethiopia. Addis Ababa came into existence in 1886 as a mineral springs resort for Ethiopia's royal family and nobility. In 1892, Emperor Menelik II (1889-1913) made it the capital when he constructed his palace there. By 1896, members of the nobility began to build permanent homes in the new capital. Neighborhoods bearing the names of these nobles provided housing for their followers along with districts for the imperial employees(40).

The study was conducted in those randomly selected Governmental Hospital Found in Addis Ababa which are St. Paul hospital, Ras Desta Damtew hospital, Eka Koteba hospital, and Saint Peter Hospital. The St. Paul's Hospital Millennium Medical College in Addis Ababa is the second-largest hospital in Ethiopia. the hospital was built by Emperor Haile Selassie I in 1969 with the help of the German Evangelical Church. It aimed to serve the poor. a medical college was formed in 2007(41).

St. Peter TB specialized hospital is one of the governmental hospitals operating under the ministry of health in Ethiopia. It is one of the great tuberculosis hospitals in Africa. Ras Desta Damtew hospital was organized to serve people and for the memories of Ras Desta Damtew, and Eka Koteba Hospital was one of the federal minister hospitals serving as treatment of COVID-19 center. It was the first Hospital for initiation of COVID-19 treatment center, though it has other branches for other health services. These the above hospitals are selected randomly to study the magnitude of anemia and its associated factor among DM Patients(42, 43).

### **4.2. Study Period**

- The duration of the study lasted from January 6/2022 to February 1/2022

### **4.3. Study Design**

- An institutional based cross-sectional study design was conducted at selected governmental hospital in Adiss Ababa from January 6/2022 to February 1/2022

#### 4.4. Source Population

- All populations with DM who are admitted or in follow-up receiving care in a governmental hospital in Addis Ababa.

#### 4.5. Study Population

- Adult DM patients who are admitted, on follow-up or at emergency for treatment during data collection time from January 6 to 20, 2022 in 4 selected hospitals.

#### 4.6. Eligibility Criteria

- Inclusion Criteria= All patients with DM in selected hospitals.
- Exclusion Criteria= Cards with no clear diagnostic methods, lost Card.

#### 4.7. Sample Size Determination

The sample size based on the research objective will be as follows;

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

According to previous research in Debre Tabor General Hospital, Northcentral Ethiopia, we used  $P=29.81\%(1)$ .

$$n = \frac{(1.96)^2 (0.298)(1 - 0.298))}{0.05^2} = 291$$

After adding a 10% non-response rate, final sample size becomes 320.

#### 4.8. Sampling Procedure

From the total of 12 Governmental Hospitals found in Addis Ababa, four government hospitals were selected using a simple random sampling method. Then the total sample size was distributed proportionally to each study hospital based on the number of patients in each hospital. finally, Study participants were selected from each hospital using a simple random sampling method.

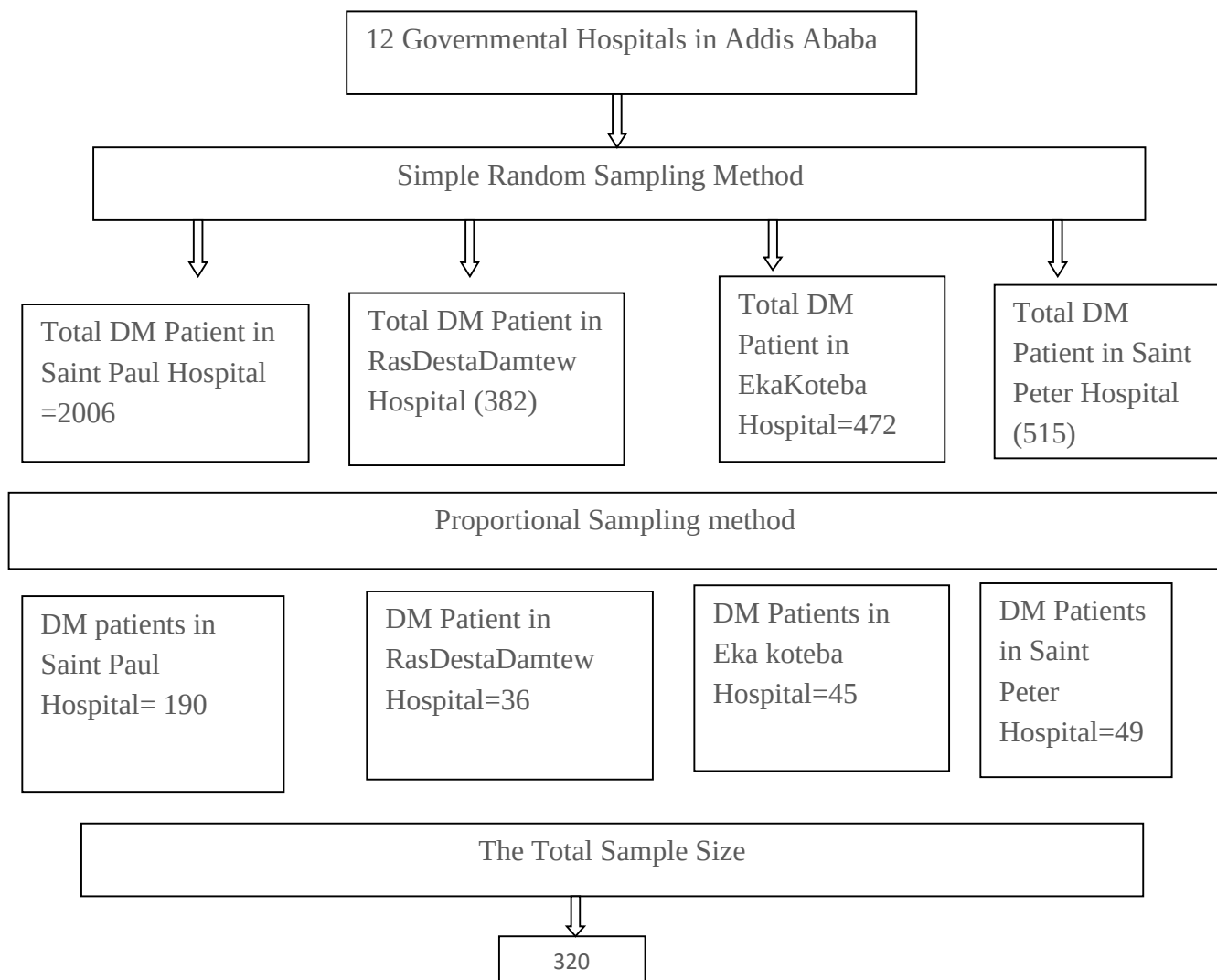


Figure 2. Schematic representation of the Sampling Procedure

## 4.9. Study Variables

### 4.9.1 Dependent Variables

#### ➤ Anemia

### 4.9.2 Independent Variables

- Hypertension
- BMI
- Current smoking
- CKD
- Micro-vascular complication of DM
- Insulin
- Cancer chemotherapy
- Sex
- Occupation
- History of smoking
- History of recent blood loss
- Glycemic control
- History of parasitic infection
- Duration of DM
- ACEI
- Metformin
- Educational status
- Residence
- Marital status
- Presence of heart disease
- Current chewing chat

#### **4.10 Data Collection tool and procedure**

Data was collected by using interviews, and using structured questionnaire adapted from similar work of literature, it was collected by a total of 7 BSc nurses health professionals from all the selected hospitals and chart review using a checklist.

The questionnaire was prepared in English language and translated into local languages (Amharic) and back to English language. The questionnaire was collected on socio-demographic characteristics, health and comorbidity-related characteristics, drug-related characteristics, and behavioral characteristics.

The questionnaire has an interview part that is to be gathered directly from the patient and data to be addressed from the patient chart review, by using interviews the patient sociodemographic data has 6 components, and the behavioral factors that have 4 components can be assessed.

All other questionnaires that include the health and comorbidity characteristics that have 11 components and drug-related characteristics which have 5 components are addressed by the patient chart review, and clarification was given for every unclear question depending on the request of the respondents.

#### 4.11 Operational Definitions

**Poor Glycemic Control:** defined as patients whose average fasting blood glucose measurements of the three consecutive visits was above 130 or below 70 mg/dL(44).

**Micro-vascular DM Complication:** Microvascular complications of diabetes are those long-term complications that affect small blood vessels. These typically include retinopathy, nephropathy, and neuropathy(45)..

**Anemia:** Anemia is a condition in which lack enough healthy red blood cells to carry adequate oxygen to your body's tissues. World Health Organization (WHO) criteria were used to define anemia as Hgb concentration <13 g/dl for males and < 12 g/dl for females (2).

#### 4.12 Data quality and Control

To ensure completeness and consistency of o data, clarification was given for data collectors. A meeting session was held on every day of the data collection period and thorough checking was done before using the filled questionnaire, a pretest was conducted on 5% Of the sample size facilities outside the study area before actual data collection time.

Data editing was conducted daily by data collectors and principal investigators to check for completeness of the questionnaire. Data were entered and cleaned by the principal investigator before analysis. The questionnaire was translated to the Amharic version for accurate data and to minimize misunderstanding and converted back to English.

#### 4.13 Data Analysis

The data was entered into epi data version 4.6 then exported to Statistical Package for the Social Sciences (SPSS) version 20. Descriptive statistics were presented as categorical variables were presented in frequencies and percentages. Logistic regression was computed to assess the statistical association. Bi variate analysis was done to check the existence of crude association and to select candidate variables, those variables which had a P-value of < 0.25 in the bivariate analysis were selected to enter into the final model. Hosmer-Lemeshow model fitness test was conducted and the result becomes  $\chi^2 = 5.486$  and P-value of 0.705. Multicollinearity was also determined to assess the VIF and all the variables VIF was found to be below 5 which was in the acceptable range. A multivariable logistic

regression model was used to identify the independent factors associated with anemia. the summary measures of estimated crude and adjusted odds ratios with 95% confidence interval were presented and P-value <0.05 was used to declare statistical significance.

#### **4.14 Ethical consideration**

Ethical Clearance was obtained from SPMMC Ethical review committee and the Addis Ababa health bureau. Permission was obtained from the head of each facility. written consent was obtained from the respondents before interviewing. The data was obtained from the volunteer individuals. study participants were informed that they have the right to stop the interview and no potential risk by participating in the study. All study participants were treated equally and they were informed about the aim, method, and anticipated benefits of the research.

All the study procedures were conducted based on scientific principles; the investigator makes sure that confidentiality was exactly ensured in such a way that no disclosure of the study subject concerning the finding was made.

#### **4.15 Dissemination of the result**

The study result was presented at Saint Paul Hospital Millennium Medical College. The research result is disseminated in hospital where the study was conducted and Addis Ababa City Administration Health Bureau and to the Ministry of Health and sent for publication in the reviewed journal.

## 5. RESULTS

### 5.1. Socio-demographic characteristics

Two hundred ninety-seven Patients took part in the study, resulting in a response rate of 92.8%. from the participants, (Table 1). Table 1. Socio-demographic characteristics of adult dm patients in a selected governmental hospital in Addis Ababa.

| Variables          | Category                 | Frequency | Percentage |
|--------------------|--------------------------|-----------|------------|
| Sex                | Male                     | 145       | 48.8       |
|                    | Female                   | 152       | 51.2       |
| Residence          | Urban                    | 240       | 80.8       |
|                    | Rural                    | 57        | 19.2       |
| Educational Status | Unable to read and write | 47        | 15.8       |
|                    | Able to read and write   | 44        | 14.8       |
|                    | Elementary school        | 58        | 19.5       |
|                    | Secondary school         | 66        | 22.5       |
|                    | University/College       | 82        | 27.6       |
| Marital Status     | Single                   | 56        | 18.9       |
|                    | Married                  | 202       | 68         |
|                    | Divorced                 | 18        | 6.1        |
|                    | Widowed                  | 21        | 7.1        |
| Occupation         | Government Employed      | 80        | 26.9       |
|                    | Private Employed         | 52        | 17.5       |
|                    | Farmer/Unemployed        | 72        | 24.2       |
|                    | Merchant                 | 27        | 9.1        |
|                    | Daily Laborer            | 9         | 3          |
|                    | Other/House Wife         | 57        | 19.2       |

## 5.2. Health and comorbidity related characteristics

In this study health-related characteristics were assessed to examine the magnitude of anemia among DM Patients. health conditions such as CKD, gastrointestinal disease. history of intestinal parasites, cardiovascular disease (heart disease, hypertension) and others have an impact on anemia. The percentage of those participants who have a history of the intestinal parasites was 46 (15.5 %), and hypertension was 181 (30.6%) (Table2).

Table 2. Health related characteristics of study respondents in Selected hospitals, Addis Ababa, 2022

| Variables                        | Category                | Frequency | Percentage |
|----------------------------------|-------------------------|-----------|------------|
| Hypertension                     | Yes                     | 181       | 60.9       |
|                                  | No                      | 116       | 39.1       |
| BMI                              | Below 18.5(underweight) | 22        | 7.4        |
|                                  | 19-24.9(Healthy)        | 184       | 62         |
|                                  | 25-29.9(Over weight)    | 89        | 30         |
|                                  | 30 and above(obese)     | 2         | 7          |
| Glycemic control                 | Poorly controlled       | 155       | 52.2       |
|                                  | Controlled DM           | 142       | 47.8       |
| CKD                              | Yes                     | 58        | 19.5       |
|                                  | No                      | 239       | 80.5       |
| Duration of DM                   | <5 Years                | 109       | 40.1       |
|                                  | 6-10 Years              | 102       | 34.3       |
|                                  | >10 Years               | 76        | 25.6       |
| Microvascular Complication of DM | Yes                     | 66        | 22.2       |
|                                  | No                      | 231       | 77.8       |
| History of recent Blood lose     | Yes                     | 23        | 7.7        |
|                                  | No                      | 274       | 92.3       |
| History of Parasitic infection   | Yes                     | 46        | 15.5       |
|                                  | No                      | 251       | 84.5       |
| Cancer Diagnosis Before          | Yes                     | 33        | 11.1       |
|                                  | No                      | 264       | 88.9       |
| Cancer Currently                 | Yes                     | 19        | 6.4        |
|                                  | No                      | 278       | 93.6       |

|               |     |     |      |
|---------------|-----|-----|------|
| Heart Disease | Yes | 70  | 23.6 |
|               | No  | 227 | 76.4 |
| Anemia        | Yes | 74  | 24.9 |
|               | No  | 223 | 75.1 |

The magnitude of anemia among adult DM patients

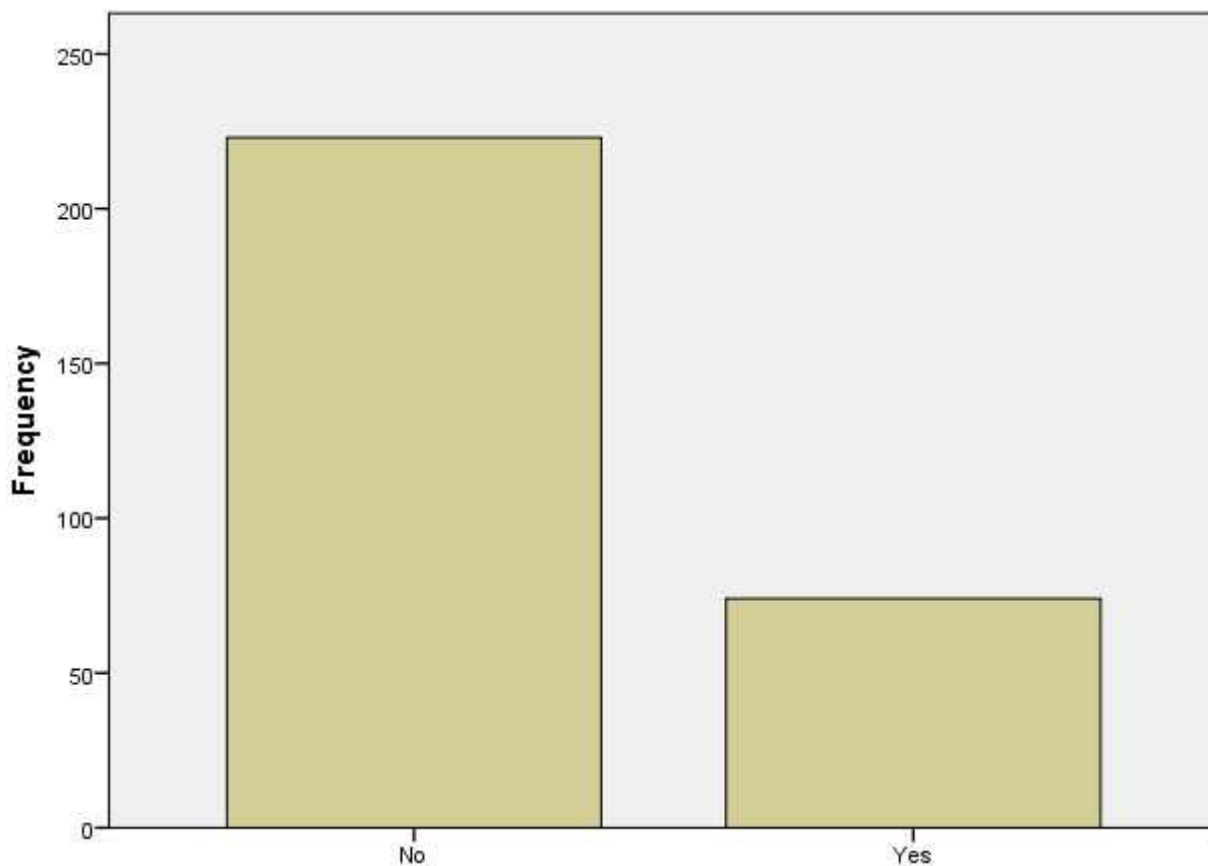


Figure 3. The magnitude of Anemia among study respondents in Selected hospitals, Addis Ababa,

### 5.3. Drug-related characteristics

Various medications like ACEI, metformin alone or in combination were assessed. medication like insulin account for around 143 (48.1%) metformin 176 (59.3%) and that of ACEI was 119 (40.1%) (Table3).

Table 3. Drug-related characteristics of study respondents in Selected hospitals, Addis Ababa, 2022

|                     |     |     |      |
|---------------------|-----|-----|------|
| Insulin Therapy     | Yes | 143 | 48.1 |
|                     | No  | 154 | 51.9 |
| Metformin Therapy   | Yes | 176 | 59.3 |
|                     | No  | 121 | 40.6 |
| ACEI Therapy        | Yes | 119 | 40.1 |
|                     | No  | 176 | 59.9 |
| Cancer Chemotherapy | Yes | 14  | 4.7  |
|                     | No  | 283 | 95.3 |

#### 5.4. Behavioral Factors

In this study, behavioral factors for anemia were screened for anemia. The percentage of those who were smocking was 5.4%, chewing chat 10.1%, Smocking before was 17.8% (Table4)

Table 4. Behavioral Factor for study respondents in selected hospitals, Addis Ababa, 2022

|                        |     |     |      |
|------------------------|-----|-----|------|
| Smocking Before        | Yes | 53  | 17.8 |
|                        | No  | 242 | 81.5 |
| Smocking now/currently | Yes | 16  | 5.4  |
|                        | No  | 281 | 94.6 |
| Chewing Chat           | Yes | 30  | 10.1 |
|                        | No  | 267 | 89.9 |

## 5.5. Bi-variable and multivariable logistic regression analysis

Bivariate and multivariate analyses were performed. In binary logistic regression, factors associated with anemia were; Age, educational status, metformin therapy, occupation and history of intestinal parasite.

In multivariate logistic regression, Elementary school educational status (AOR =2.978, CI=1.231-7.202) was significantly associated with anemia.

Table 5. Bi-variable & multivariable logistic regression model showing the distribution of factors associated with anemia among DM patients in Addis Ababa selected governmental hospital(n=297)

| Variables                      | Category                 | Anemia    |            | COR (95%CI)        | P. value | AOR (95%CI)         | P. value |
|--------------------------------|--------------------------|-----------|------------|--------------------|----------|---------------------|----------|
|                                |                          | Yes       | No         |                    |          |                     |          |
| Age                            | 18-30                    | 13(27.6%) | 24(51%)    | 1                  |          |                     |          |
|                                | 30-40                    | 14(24.1%) | 44(75%)    | 0.587(0.238-1.451) | 0.249    | 0.599(0.221-1.1621) | 0.313    |
|                                | >40                      | 47(23.3%) | 155(76.7%) | 0.560(0.265-1.185) | 0.129    | .645(.273-1.523)    | 0.317    |
| History of intestinal parasite | Yes                      | 16(34.7%) | 30(65.2%)  | 1.775(0.905-3.482) | 0.095    | 2.087 (.986-4.418)  | 0.055    |
|                                | No                       | 58(23%)   | 193(76.8%) | 1                  |          | 1                   |          |
| Metformin therapy              | Yes                      | 38(21.5%) | 138(78.4%) | 0.650(0.383-1.105) | 0.111    | 0.596 (0.328-1.084) | 0.090    |
|                                | No                       | 36(42.3%) | 85(70%)    | 1                  |          | 1                   |          |
| Educational Status             | Unable to read and write | 14(29.75) | 33(70.2%)  | 1.622(0.713-3.691) | 0.249    | 2.609 (0.893-7.619) | 0.080    |
|                                | Able to read and write   | 6(13.6%)  | 38(86.3%)  | 0.604(0.219-1.663) | 0.329    | 0.747 (0.251-2.222) | 0.601    |
|                                | Elementary school        | 20        | 38         | 2.012(0.941-4.305) | 0.071    | 2.978 (1.231-7.202) | 0.015*   |
|                                | Secondary school         | 17(25.7%) | 49(74.2%)  | 1.327(0.616-2.859) | 0.471    | 1.462 (0.621-3.439) | 0.384    |
|                                | College/University       | 17(20.7%) | 65(79.2%)  | 1                  |          | 1                   |          |
| Occupation                     | Government employed      | 18(16.3%) | 92(83.6%)  | 1                  |          |                     |          |
|                                | Private employed         | 17(31.4%) | 35(64.8%)  | 1.673(7.66-3.665)  | 0.197    | 1.613(0.682-3.815)  | 0.276    |

|  |                   |           |           |                    |       |                    |       |
|--|-------------------|-----------|-----------|--------------------|-------|--------------------|-------|
|  | Unemployed/farmer | 19(26.3%) | 53(73.6%) | 1.235(5.88-2.592)  | 0.577 | 0.698(0.267-1.826) | 0.463 |
|  | Merchant          | 5(17.2%)  | 22(76.6%) | 0.783(0.260-2.361) | 0.664 | 0.587(0.181-1.909) | 0.376 |
|  | Daily laborer     | 8(88.9%)  | 1(11.1%)  | 0.431(0.50-3.674)  | 0.441 | 0.251(0.024-2.579) | 0.245 |
|  | Other/housewife   | 43(75.4%) | 14(24.5%) | 1.121(0.504-2.494) | 0.779 | 1.462(0.621-3.439) | 0.384 |

**\***, Significant at *P*-value <0.05

## 6. DISCUSSION

The magnitude of anemia in this study is lower than a study made in Harari Region which is 34.8%, (29), and nearly in line similar with the study made in the out-patient diabetic clinic of Dessie Referral Hospital in Northeast Ethiopia which was 26.7%(46). But it is higher than in the study made in Aider Tertiary teaching Hospital that was 17.9%(24).

This might be due to the reason that DM patients found in Addis Ababa mostly have a sedentary lifestyle, limited physical activity, and less restriction of fatty foods and salt intake. Additionally, most of them are substance abused like drinking and chronic alcoholism that making them to be anemic than DM patients found in Aider Tertiary teaching hospital. However, DM patients in Harari Region are highly substance abused than all, typically chewing chat rather than obtaining a balanced diet made them have a high prevalence of anemia.

In this study educational status with those of elementary school was significantly associated with anemia, those with educational status of elementary school were 2.978 times more vulnerable to develop anemia in comparison to that of university or college graduate DM patients.

This may be due to having limited knowledge about the disease and its complication, knowledge deficient may be about regular medical checkup, proper medication adherence, accurate self-administered medication including the right time and dosage.

In addition, because of restricted knowledge, they may lack proper personal and environmental hygiene that made them to develop different communicable disease that worsens DM patients to be anemic. Among the different communicable disease, intestinal parasitic infection is common to most of them. Intestinal parasitosis mainly Hookworm, Strongyloidiasis, whipworm, Schistosomiasis, are known to suck blood and cause anemia. Also, they can penetrate the intestinal mucosa and cause further bleeding and anemia.

Furthermore, these intestinal parasites can compete for the host nutrition resulting in nutritional deficiency anemia(47).

## 7. CONCLUSION AND RECOMMENDATION

### 7.1. Conclusion

Here, anemia is a considerable public health problem. The significant factors for the development of anemia among diabetic patients were Age from >40 years, Gastrointestinal Disorders, and history of intestinal parasite infections, and heart disease regular anemia assessment is essential by health care providers to reduce the burden and consequence.

### 7.2. Recommendation

Generally, based on the finding of this study it is recommended:

**For health facilities and government stakeholders:** Selected Governmental hospitals in this research study and other governmental stakeholders should give special consideration to the development of chronic illness that has an overt negative consequence on the health of the population. They need to plan about adequate resource allocation for screening, prevention, and management of anemia and its associated factor, resource should be allowed for deworming and iron supplements.

**For health care workers:** Health workers found in the selected hospital should give appropriate counseling and education on smoking, drinking, and dietary management as it has an impact on the development of anemia and routine screening and prevention of intestinal parasite infection and health education during the clinical assessment at chronic care. regular physical exercise minimizing fatty foods, and regular medical checkup for heart disease condition is advisable.

**For future researchers:** Future researchers should conduct a prospective cohort study to better understand the determinants of anemia among diabetic patients.

### 7.3. Limitation and strength of the study.

The strength of the study is that the data collection process was collected by trained health professionals, and using both interview and chart review enables to get better accurate data.

However, as a constraint, blood glucose measurement and screening for anemia were not conducted for all participants during data collection this made it difficult to determine the patient current condition for anemia blood glucose level. In addition, since the study is cross-sectional, it may not show cause and effect relationship

## 8 REFERENCE

1. Engidaw MT, Feyisa MS. Prevalence of anemia and its associated factors among adult diabetes mellitus patients at Debre Tabor General Hospital, Northcentral Ethiopia. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*. 2020;13:5017.
2. Paul D, Paul S, Asaduzzaman M, Juliana FM, Hossain MS. Prevalence of type 2 diabetes mellitus patients with anemia in a Bangladeshi population-A Case Control Study. *Int J Heal Sci Res*. 2017;7(3):121-5.
3. Punthakee Z, Goldenberg R, Katz P. Definition, classification and diagnosis of diabetes, prediabetes and metabolic syndrome. *Canadian journal of diabetes*. 2018;42:S10-S5.
4. Stoltzfus RJ, Dreyfuss ML. Guidelines for the use of iron supplements to prevent and treat iron deficiency anemia: Ilsi Press Washington, DC; 1998.
5. Geneva S, Organization WH. Haemoglobin Concentrations for the Diagnosis of Anaemia and Assessment of Severity. Vitamin and Mineral Nutrition Information System. Document Reference WHO. NMH/NHD/MNM/11.1. <http://www.who.int/entity/vmnis/indicators/haemoglobin>; 2011.
6. Antwi-Bafour S, Hammond S, Adjei JK, Kyeremeh R, Martin-Odoom A, Ekem I. A case-control study of prevalence of anemia among patients with type 2 diabetes. *Journal of medical case reports*. 2016;10(1):1-8.
7. El-Achkar TM, Ohmit SE, Mccullough PA, Crook ED, Brown WW, Grimm R, et al. Higher prevalence of anemia with diabetes mellitus in moderate kidney insufficiency: The Kidney Early Evaluation Program. *Kidney international*. 2005;67(4):1483-8.
8. Mahjoub AR, Patel E, Ali S, Webb K, Astrow A, Kalavar M. Anemia in Diabetic Patients without Underlying Nephropathy. a Retrospective Cohort Study. *Blood*. 2016;128(22):4809.
9. Angelousi A, Larger E. Anaemia, a common but often unrecognized risk in diabetic patients: a review. *Diabetes & metabolism*. 2015;41(1):18-27.
10. Fava S, Azzopardi J, Ellard S, Hattersley AT. ACE gene polymorphism as a prognostic indicator in patients with type 2 diabetes and established renal disease. *Diabetes care*. 2001;24(12):2115-20.
11. Craig KJ, Williams JD, Riley SG, Smith H, Owens DR, Worthing D, et al. Anemia and diabetes in the absence of nephropathy. *Diabetes care*. 2005;28(5):1118-23.
12. Montemarano N, Guttman J, McFarlane SI. Anemia of Chronic Kidney Disease—A Modifiable Risk Factor in a Growing High Cardiovascular Risk Population. *Type 2 Diabetes*. 2013:253.
13. Vickers NJ. Animal communication: when i'm calling you, will you answer too? *Current biology*. 2017;27(14):R713-R5.
14. Ryan Zarychanski M. CMAJ Analysis. *CMAJ*. 2008;179(4).
15. Durrani AM. Prevalence of anemia in adolescents: a challenge to the global health. *Acta Sci Nutr Health*. 2018;2(4).
16. Fayed HM, Elsaied A, Alsenbesy MA, Moubark IA. Proportion of anemia in type 2 diabetic patients in qena governorate Case-Control Study: clinical correlates and prognostic significance. *Int J of Diabet Res*. 2013;2(4):64-75.
17. WHO U. Focusing on anaemia: towards an integrated approach for effective anaemia control. WHO, Geneva, Switzerland. 2004.
18. Swarnkar P, Kumar N, Verma K, Kumar P. The study of hematological profile of anemia in type 2 diabetes mellitus patients with normal renal function. *J Contemp Med*. 2015;3(1):55.
19. Adejumo BI, Dimkpa U, Ewenighi CO, Onifade AA, Mokogwu AT, Erhabor TA, et al. Incidence and risk of anemia in type-2 diabetic patients in the absence of renal impairment. *Health*. 2012;4(6):304-8.
20. Al-Salman M. Anemia in patients with diabetes mellitus: prevalence and progression. *General Medicine: Open Access*. 2015:1-4.
21. Thomas M, Tsalamandris C, MacIsaac R, Jerums G. Anaemia in diabetes: an emerging complication of microvascular disease. *Current diabetes reviews*. 2005;1(1):107-26.
22. Thomas MC, MacIsaac RJ, Tsalamandris C, Power D, Jerums G. Unrecognized anemia in patients with diabetes: a cross-sectional survey. *Diabetes care*. 2003;26(4):1164-9.
23. Hosseini MS, Rostami Z, Saadat A, Saadatmand SM, Naeimi E. Anemia and microvascular complications in patients with type 2 diabetes mellitus. *Nephro-urology monthly*. 2014;6(4).

24. Hailu NA, Tolessa T, Gufue ZH, Tsegay EW, Tekola KB. The magnitude of anemia and associated factors among adult diabetic patients in Tertiary Teaching Hospital, Northern Ethiopia, 2019, cross-sectional study. *PloS one*. 2020;15(11):e0240678.
25. Baird AD, editor *Exstrophy in the adolescent and young adult population*. Seminars in pediatric surgery; 2011: Elsevier.
26. Abdulrahman H, Haridas N. Anemia in type 2 diabetes patients with and without nephropathy in Anand-Gujarat, India. *International Journal of Advanced Research*. 2017;5(6):367-74.
27. Panda AK, Ambade RA. Prevalence of anemia and its correlation with HBA1c of patients in type-II diabetes mellitus: a pilot study. *National Journal of Physiology, Pharmacy and Pharmacology*. 2018;8(10):1409-13.
28. Sharif A, Younus S, Baig K, Ali NH. Prevalence and risk of anemia in type-2 diabetic patients. *Health*. 2014;2014.
29. Bekele A, Teji Roba K, Egata G, Gebremichael B. Anemia and associated factors among type-2 diabetes mellitus patients attending public hospitals in Harari Region, Eastern Ethiopia. *PloS one*. 2019;14(12):e0225725.
30. Health Nlo. *Diabetes, metabolic syndrome and obesity: targets and therapy*. 2008.
31. Keane WF, Lyle PA. Recent advances in management of type 2 diabetes and nephropathy: lessons from the RENAAL study. *American Journal of Kidney Diseases*. 2003;41(3):S22-S5.
32. Organization WH. *The world health report 2002: reducing risks, promoting healthy life*: World Health Organization; 2002.
33. Thomas MC, MacIsaac RJ, Tsalamandris C, Molyneaux L, Goubina I, Fulcher G, et al. The burden of anaemia in type 2 diabetes and the role of nephropathy: a cross-sectional audit. *Nephrology Dialysis Transplantation*. 2004;19(7):1792-7.
34. Solomon A, Hussein M, Negash M, Ahmed A, Bekele F, Kahase D. Effect of iron deficiency anemia on HbA1c in diabetic patients at Tikur Anbessa specialized teaching hospital, Addis Ababa Ethiopia. *BMC hematology*. 2019;19(1):1-5.
35. Murphy J. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System. Geneva, World Health Organization, 2011 (WHO/NMH/NHD/MNM/11.1; <http://www.who.int/vmnis/indicators/haemoglobin.pdf>, accessed 1 December 2012). 4. International Anemia Consultative Group. Report of the 2001 International Anemia Consultative Group Symposium. Why is iron important and what to do about it: a new perspective. Washington, DC, INACG Secretariat, 2002: 1-50. 5. Lozoff B, Jimenez E, Smith JB. Double burden of iron deficiency in infancy and low socioeconomic status: a longitudinal analysis of cognitive test scores to age 19 years. *Archives of Pediatrics and Adolescent Medicine*. 2006; 160: 1108–1113.[PubMed: 17088512]. 2011.
36. Balducci L. Anemia, cancer, and aging. *Cancer Control*. 2003;10(6):478-86.
37. Miller CB, Jones RJ, Piantadosi S, Abeloff MD, Spivak JL. Decreased erythropoietin response in patients with the anemia of cancer. *New England Journal of Medicine*. 1990;322(24):1689-92.
38. Tesfaye TS, Tessema F, Jarso H. Prevalence of anemia and associated factors among “apparently healthy” urban and rural residents in Ethiopia: a comparative cross-sectional study. *Journal of Blood Medicine*. 2020;11:89.
39. Kebede SA, Tusa BS, Weldesenbet AB, Tessema ZT, Ayele TA. Incidence of Diabetic Nephropathy and Its Predictors among Type 2 Diabetes Mellitus Patients at University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia. *Journal of Nutrition and Metabolism*. 2021;2021.
40. Abnet Gezahegn Berhe DBE, Imam Mahmoud Hassen, Tsion Lemma Mamaru, Soressa YA. City Profile of Addis Ababa. Report prepared in the SES (Social Inclusion and Energy Management for Informal Urban Settlements) project, funded by the Erasmus+ Program of the European Union. 2017.
41. Girma F, Abeje Y, Tamrat G. The effectiveness of private services in public hospitals: The case of St. Paul Hospital, Addis Ababa, Ethiopia. *Journal of healthcare quality research*. 2021;36(6):333-9.
42. Health FMO. *Guideline for program and clinical management of drug resistant tuberculosis*. FMOH Addis Ababa; 2009.
43. Defar A, Molla G, Abdella S, Tessema M, Ahmed M, Tadele A, et al. Knowledge, practice and associated factors towards the prevention of COVID-19 among high-risk groups: a cross-sectional study in Addis Ababa, Ethiopia. *PLoS One*. 2021;16(3):e0248420.
44. Abdissa D, Hirpa D. Poor glycemic control and its associated factors among diabetes patients attending public hospitals in West Shewa Zone, Oromia, Ethiopia: An Institutional based cross-sectional study. *Metabolism Open*. 2022;13:100154.
45. Guariguata L, Whiting DR, Hambleton I, Beagley J, Linnenkamp U, Shaw JE. Global estimates of diabetes prevalence for 2013 and projections for 2035. *Diabetes research and clinical practice*. 2014;103(2):137-49.
46. Fiseha T, Alemayehu E, Kassahun W, Adamu A, Gebreweld A. Factors associated with glycemic control among diabetic adult out-patients in Northeast Ethiopia. *BMC research notes*. 2018;11(1):1-6.

47. Farid Z, Patwardhan V, Darby W. Parasitism and anemia. The American journal of clinical nutrition. 1969;22(4):498-503.

### **Assurance of Principal Investigator**

I the undersigned agree to accept all responsibilities for the scientific and ethical conduct of the research project. I will provide a 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: Habtamu Ayalew

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

### **Approval of the Primary Advisor**

Name of the primary advisor: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

### **Approval of the Co-Advisor**

Name of the primary advisor: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

### **Approval of the Examiner**

Name of the Examiner \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## 9Annex I

### 9.1 Consent Form

Questionnaire to assess the prevalence of anemia and associated factors among the selected governmental hospital in Addis Ababa.

Hello, My Name is-----, I am one of the members of the research team, The purpose of this questionnaire is to gather information about anemia and associated factors among DM patients among selected governmental hospitals in AA.

I have identified you as a study participant hoping that you will be willing to help me by providing some important information. I have several questions, which I would like to ask you if you have the time and are willing. All information you would provide kept be confidential. I will not include any identifiers such as your name and an exact address. Only honest answers would contribute to the improvement of health planning. Your role in the success of research is important and I appreciate your contribution to the research. Would this be okay with you? I understood the purpose of the research and the roles I will have in the research.

I have agreed to participate in the purpose of the research.

A) Yes

B) No

If the Respondent agrees to be informed

- Starting time-----
- End time-----

Questionnaire Code-----

Date of Data collection-----

Name of Data Collector----- Signature-----

Name of Supervisor ----- Signature-----

## 9.2 English version questionnaire

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Good morning/Afternoon?</b></p> <p><b>My Name is -----,</b></p> <p><b>Are you ok if I ask you some questions regarding your health and Lives?</b></p> <p><b>Thank you!!!</b></p> <p><b>Sociodemographic Factor</b></p> <p><b>1)Age</b></p> <p><b>2) Sex</b></p> <p>A) Male B) Female</p> <p><b>3) Residence</b></p> <p>A) Urban B) Rural</p> <p><b>4) Educational Status</b></p> <p>A) Unable read and write</p> <p>B) Able to read and write</p> <p>C) Elementary school</p> <p>D) Secondary School</p> <p>E) College/University or above</p> <p><b>5) Marital Status</b></p> <p>A) Single</p> <p>B) Married</p> <p>A) Yes B) No</p> | <p>C) Divorced</p> <p>D) Windowed</p> <p><b>6) Occupation</b></p> <p>A) Self Employed</p> <p>B) Government Employed</p> <p>C) Private Employed</p> <p>D) Unemployed /Farmer</p> <p>E) Daily Laborer</p> <p><b>Health &amp; Comorbidity Related Characteristics</b></p> <p><b>7)Is the patient Hypertensive?</b></p> <p>A) Yes B) No</p> <p><b>8)BMI</b></p> <p>A) Below 18.5<br/>(Underweight)</p> <p>B) <b>18.5—24.9(Healthy)</b></p> <p>C) 25.0—29.9(Overweight)</p> <p>D) 30.0 and Above(Obese)</p> <p><b>9)Glycemic Control?</b></p> <p>A) Poor Glycemic control</p> <p>B) Controlled DM</p> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>10) Does the Patient develop CKD?</p> <p>A) Yes B) No</p> <p>11) How long is the duration of DM?</p> <p>A) &lt;5Yrs B) 6-10 Yrs C) &gt;10 Yrs</p> <p>12) Does the patient developed Microvascular Complication of DM?</p> <p>A) Yes B) No</p> <p>13) Does the patient hasa recent history of blood lose</p> <p>A) Yes B) No</p> <p>14) Does the patient have Parasitic infection?</p> <p>A) Yes B) No</p> <p>15) Have you ever been diagnosed having Cancer before?</p> <p>A) Yes B) No</p> <p>16) is the patient diagnosed as having Cancer currently?</p> <p>A) Yes B) No</p> | <p>17)Is the patient has heart disease?</p> <p>A) Yes B) No</p> <p>18) Does the patient is diagnosed for anemia?</p> <p>A) Yes B) No</p> <p><b>Drug Related</b></p> <p>19)Is the patient on Metrofine therapy?</p> <p>A) Yes B) No</p> <p>20) Is the Patient on ACIH therapy?</p> <p>A) Yes B) No</p> <p>21) Have you taken chemotherapy before or on chemotherapy currently?</p> <p>A) Yes B) No</p> <p>22) Is the patient is on insulin therapy?</p> <p>A) Yes B) No</p> <p><b>Behavioral Factor</b></p> <p>23) Is there any sign/symptom of depression</p> <p>A) Yes B) No</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

24) Have you ever smocking  
before?

A) Yes    B) No

25) Are you smocking now/  
Currently?

A) Yes                  B) No

26) Ayr you chewing chat now  
/Currently?

A) Yes                  B) No

### 9.3 Amharic Version questionnaire

#### ሰላም ጤና ይስጥልኝ

እኔስሜ \_\_\_\_\_ ይባላል።

ስለእርስዎ ጤና እና አኗኗር የተወሰኑ ጥያቄዎች አሉኝ ስለዚህ ምብጠይቀዎት ፍቃደኛነዎትን አመሰግናለሁ።

#### ማህበራዊ ጤና (sociomographic factor)

1. እድሜዎት ስንት ነው?  
ሀ) 18 - 30      ለ) 30- 40 አመት      ሐ) ከ40 አመት በላይ
2. ፆታ  
ሀ) ወንድ ለ) ሴት
3. የመኖሪያ ቦታ  
ሀ) ከተማ      ለ) ገጠር/ክ/ሀገር
4. የትምህርት ደረጃ  
ሀ) ማንበብና መጻፍ የማይችል  
ለ) ማንበብና መጻፍ የሚችል  
ሐ) የመጀመሪያ ደረጃ ት/ት ያጠናቀቀ  
መ) የ2ኛ ደረጃ ት/ት ያጠናቀቀ  
ሠ) ኮሌጅ/ዩኒቨርሲቲ ድረስ ያጠናቀቀ
5. የጋብቻ ሁኔታ  
ሀ) ያላገባ ለ) የገባ ሐ) ፍች መ) በሞት የተለዩ
6. ስራዎት ምን ዓይነት ነው?  
ሀ) የመንግስት ሠራተኛ  
ለ) የግል ተቀጣሪ  
ሐ) ስራ አጥ/ግብርና  
መ) ንግድ  
ሠ) የቀን ሠራተኛ  
ረ) ሌላ

#### ስለ ግል ጤና አስመልክቶ (Health related factor)

7. ደም ግፊት ታካሚ ነዎት / አለበት  
ሀ) አዎን ለ) አይደለም
8. የምግብ እጥረት  
ሀ) 218.5 (ዝቅተኛ)

- ለ) 18.5 - 24.9 (ጤናማ)
- ሐ) 25.0 - 29.9 (መጠነኛክብደትጭማሪ)
- መ) 30 እናበላይ (ከልክያለፈክብደትጭማሪ)

9. የደምስኳርመጠን

- ሀ) በአግባቡመጠንያለ (Normal range)
- ለ) በቁጥጥርውስጥያልሆነ (uncontrolled DM)

10. ጨንፈርናከጨንፈርጋርየተያያዘየጤናችግርወይ

- ሀ) አዎን
- ለ) የለም

11. ታካሚውየቆየየኩላሊትበሽታ (CKD) አለውወይ

- ሀ) አዎን
- ለ) የለም

12. የስኳርህመሙለስንትጊዜ/አመትየቆየነው ?

- ሀ) 5 ዓመት
- ለ) ከ6 - 10 አመት
- ሐ) ከ10 አመትበላይታካሚ

13. ከስኳርበሽታጋርተያያዥነትያለውሌላየጤናችግርአለዎወይ?

- ሀ) አዎን
- ለ) የለውም

14. ታካሚውበቅርቡየደምመፍሰስየጤናችግር/አደጋነበረውወይ?

- ሀ) አዎን
- ለ) የለውም

15. ታካሚውየአንጀትጥገኛትላትልአለው/ነበረው ?

- ሀ) አዎን
- ለ) የለውም

16. ታካሚውየካንሰርበሽታቀደምሲልእንዳለበትበምርመራተረጋግጧልወይ?

- ሀ) አዎን
- ለ) አይደለም

17. አሁንታካሚውየካንሰርበሽታእንዳለበትተመርምሯል ?

- ሀ) አዎን
- ለ) አይደለም

18. ታማሚውየልብበሽታአለበትወይ?

- ሀ) አዎን
- ለ) የለበትም

19. ታካሚውበምርመራየተረጋገጠየደምማነስ (Anemia) የጤናችግርአለበትወይ?

- ሀ) አዎን
- ለ) የለውም

### ከመድኃኒትጋርየተያያዘ(Drug Related)

20. አሁንታካሚውበኢንሱሊንህክምናላይነውወይ?

- ሀ) አዎን
- ለ) አይደለም

21. አሁንታካሚው በ metformin የስኳርበሽታመዳኒትህክምናላይነውወይ?

- ሀ) አዎን
- ለ) አይደለም

22. አሁንታካሚው በ Angiotensin converting enzyme inhibitor መዳኒትህክምናላይነውወይ?

- ሀ) አዎን
- ለ) አይደለም

23. ታካሚውከዚህበፊትየካንሰርህክምናወስዶያውቃል ? ወይስአሁንየካንሰርህክምናላይነው ?

ሀ) አዎን

ለ) አይደለም

**የስነባህሪንበተመለከተ (behavioral before)**

24. ከዚህ በፊት ሲጋራ ያጨሰኑ ነበር?

ሀ) አዎን

ለ) አላጨሰም

25. አሁን ሲጋራ ያጨሰሱ ወይ

ሀ) አዎን

ለ) አላጨሰም

26. አሁን ጫት ይቅማሉ ወይ ሀ) አዎን

ለ) አልቅምም

27. ታካሚ ውድብርት (depression) ምልክት አለው ወይ?

ሀ) አዎን

ለ) የለውም

**አመሰግናለሁ !!**