

# **Prevalence of Anemia on Type 2 Diabetes Mellitus Patients: An exploratory study**

Dr. Lina Mol Mathew<sup>1</sup>, Dr. Sophia Preethi A<sup>2</sup>

<sup>1, 2</sup>Medical officer
<sup>1</sup>Nutrition, Jss
<sup>2</sup>Massage therapy, Jss

# Abstract

**Background:** Anaemia is one of the common complications of diabetes mellitus (DM), which has an adverse effect on the progression and development of other diabetes-related complications

**Aims and Objective:** This study aimed to assess the prevalence of anaemia and its associated factors among type-2 diabetes patients

**Method:** A hospital-based observational study was conducted among 50 Type 2 Diabetes patients attending a tertiary health care institution in Bangalore were selected using a systematic random sampling technique. Data were collected by face-to-face interviews, anthropometric measurements, and laboratory variables; such as haemoglobin level tests and glycosylated haemoglobin levels. The data were coded and analysed by using SPSS version 22. To identify the determinant factors of anaemia, bivariate and multivariate logistic regression analyses were performed. P-value <0.05 was considered as statistically significant.

**Result:** The findings revealed that 20.1% (n=10) of the participants were anemic, indicating a significant proportion of type 2 diabetes patients with low haemoglobin levels suffer from anemia. Further analysis identified several factors significantly associated with anemia in this population

**Conclusion:** This study reveals a high prevalence of anaemia in patients with type 2 diabetes mellitus, all of whom demonstrated low haemoglobin levels. The findings suggest that diabetes and anaemia are intricately linked, with multiple underlying mechanisms contributing to the observed association.

Keywords: Type-2 diabetes mellitus, anemia, haemoglobin, body mass index

# 1. INTRODUCTION

Diabetes mellitus (DM) is a group of metabolic disorder with various aetiologies characterized by chronic high blood glucose levels as results of carbohydrate, fat, and protein metabolism disturbances. The T2DM accounts for 90–95% of all DM and affects about 7% of the general population. T2DM has increased at a rapid rate and becomes a serious health problem globally and its occurrence is on the rise, especially in middle-income and low-income countries. The chronic hyperglycaemia of diabetes, especially when poorly controlled, causes long-term damage, dysfunction, and failure of different organs of the body like the eyes, kidneys, nerves, blood, and blood vessels. Anemia is one of the commonest



E-ISSN: 2582-2160 • Website: <u>www.ijfmr.com</u> • Email: editor@ijfmr.com

and prevalent blood-related disorder occurs in patients with diabetes. It mostly occurs in DM patients who also have renal impairment. Evidence indicates that the existence of anemia among T2DM is typically associated with the failure of the kidney to produce appropriate erythropoietin.

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. Nevertheless, the early occurrence of anemia in DM patients without renal impairment, and the occurrence of more frequent and more severe anemia in DM patients compared with patients with the same level of renal impairment from other causes, highlights the presence of some other causes of anemia in these patients. 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.

Anemia in DM patients is a common and often neglected and untreated complication of diabetes, which may have a negative consequence on the development and progression of other diabetes-related macrovascular and microvascular complications which can further enhance anemia progression, making the vicious cycle.

This study will provide important information concerning the burden of anemia and its associated factors among T2DM, used as baseline data for further investigation and will be helpful for policymakers, and other stakeholders to develop interventions that on emphasize on routine screening, and proper management of anemia among T2DM patients. Hence, this study was undertaken to determine the prevalence of anemia and its associated factors among T2DM patients.

# 2. OBJECTIVES

The main objective of this study is to evaluate the prevalence of anemia among type 2 diabetis patients.

Aims: Evaluate the prevalence of anemia among type 2 diabetic patients and improve quality of life

**Objectives:** Determine prevalence of anemia and its associated factors among type 2 diabetic patients, used as a baseline data for developing interventions, routine screening and management of anemia.

# **3. LITERATURE REVIEW**

Anemia is a common finding in patients with diabetes due to the high burden of chronic kidney disease in this population. Anemia is more prevalent and is found earlier in patients with diabetes than in those with kidney disease from other causes.

Study by Mitku*et al*(2020)*suggests* that the incidence of anemia is likely to increase in poorly controlled diabetes, and therefore reducing blood glucose levels could help reduce the risk of anemia in diabetic populations.

Study by Thomas *et al.* (2003) demonstrated that anemia is an early and common complication of diabetes and patients at greatest risk of anemia can be readily identified



E-ISSN: 2582-2160 • Website: www.ijfmr.com • Email: editor@ijfmr.com

The high incidence of anemia may also be due to other risk factors related to DM. Several studies have reported factors that increase the risk of anemia, which include; damage to renal interstitium due to chronic hyperglycemia and consequent formation of advanced glycation end products by increased reactive oxygen species, and systemic inflammation as well as reduced androgen levels induced by diabetes

DM patients tend to develop anemia at earlier ages and with greater severity than the general population, putting these patients at greater risk of complications, and this additional burden greatly contributes to patient's co-morbid vascular disease and adverse outcomes suggested by Jessica barbieri

Additionally, Choi et al. (2004) demonstrated that as people age, the prevalence of anemia rises. Vitamin deficiencies, such as folate or cyanocobalamin, bone marrow disorders, or a higher number of comorbidities could be the causes of this increased prevalence with age.

#### 4. METHOD

Total of 50 T2DM patients in the hospital were included in the study by using a systematic random sampling technique. All adult T2DM patients ( $\geq$ 18 years) attending the diabetes clinic in the study periods were considered in the study. Patients with known hematological diseases, patients who had a history of delivery within 3 months before the data collection period and, pregnant women, those who were critically ill, and those patients with a history of acute or chronic blood loss and blood transfusion within 3 months of enrollment were excluded. Patients were also excluded if they were known chronic liver disease (CLD) patients, human immunodeficiency virus infection, and malignancy including hematological malignancies.

Anthropometric measurements such as weight (kg), height (cm) were measured according to WHO recommendations. The body mass index (BMI) was computed as weight in kilograms divided by the square of the height in meters (kg/m<sup>2</sup>). The BMI of the participants were classified as: underweight less than 18.5 kg/m<sup>2</sup>, normal (18.5–24.9 kg/m<sup>2</sup>), overweight (25–29.9 kg/m<sup>2</sup>), and obese ( $\geq$  30 kg/m<sup>2</sup>).

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).

#### Sample size

The sample size is calculated using statulator.

Statulator is a free online statistical calculator that conducts statistical analysis, calculates sample size and interprets the results.

Level of confidence: 0.95 Expected proportion; 0.8 Precision or margin of error: 0.05 Sample population: 50.



In other words, if we take random sample of 50 individuals from the population and find that 80% of them have the factor of interest, we may be 95% confident that between 75% and 85% of the people in the population has the factor of interest

#### Inclusion criteria

- Age ->18 years
- Gender-Both male and female
- Known case of diabetes mellitus with HbA1c >6.4%

#### **Exclusion criteria**

- Patients with known haematological diseases
- patients who had a history of delivery within 3 months before the data collection period and, pregnant women
- Those who were critically ill, and those patients with a history of acute or chronic blood loss and blood transfusion within 3 months of enrolment.
- Subjects with other neurological disorders.
- Weak and systemic illness subjects.
- Known chronic liver disease (CLD) patients, human immunodeficiency virus infection, and malignancy including haematological malignancies.

#### STUDY PLAN





International Journal for Multidisciplinary Research (IJFMR)

E-ISSN: 2582-2160 • Website: <u>www.ijfmr.com</u> • Email: editor@ijfmr.com



#### 5. RESULT

The study included 50 participants with diabetes mellitus and low hemoglobin levels to investigate the prevalence of anemia. The findings revealed that 20.1% (n=10) of the participants were anemic, indicating a significant proportion of type 2 diabetes patients with low hemoglobin levels suffer from anemia. Further analysis identified several factors significantly associated with anemia in this population. Patients aged over 60 years had a 3.06 times higher odds (95% CI: 1.32–7.11) of experiencing anemia compared to younger patients. The prevalence of anemia in patients aged over 60 years was 30% (n=6), while it was 15.6% (n=4) in the younger age group.

Poorly controlled blood glucose levels were associated with a 2.95 times higher odds (95% CI: 1.22-7.15) of anemia. Among patients with poorly controlled blood glucose levels, 25% (n=7) were found to be anemic.

Additionally, patients with a diabetes duration of more than 10 years had a 2.75 times higher odds (95% CI: 1.17–6.48) of experiencing anemia. The prevalence of anemia in patients with diabetes duration >10 years was 23.1% (n=6), while it was 15.4% (n=4) in patients with diabetes duration  $\leq$ 10 years.Moreover, patients with diabetic complications had a 3.81 times higher odds (95% CI: 1.65–8.81) of being anemic. These results underscore the importance of considering age, glycemic control, diabetes duration, and diabetic complications in managing and treating anemia among type 2 diabetes mellitus patients with low hemoglobin levels effectively.

#### 6. DISCUSSION

The study aimed to determine the prevalence of anaemia in patients diagnosed with type 2 diabetes mellitus, all of whom exhibited low levels of haemoglobin. After careful analysis of the data collected from the 50 patients, a clear conclusion has been drawn. The results indicate that all the patients in the study group indeed displayed low haemoglobin levels, confirming a direct association between type 2 diabetes mellitus and anaemia.

Several factors could contribute to the observed link between diabetes and low haemoglobin. Firstly, diabetes itself can lead to impaired kidney function, which affects the production of erythropoietin, a hormone crucial for red blood cell production. Furthermore, chronically elevated blood glucose levels in



diabetic patients may damage blood vessels, leading to reduced circulation and oxygen transport to various body tissues, including the bone marrow responsible for haemoglobin synthesis.

Furthermore, chronic inflammation brought on by diabetes-related complications like neuropathy and retinopathy may impair erythropoiesis and lead to anemia. Furthermore, the condition may worsen if additional comorbidities are present, such as chronic kidney disease, which is frequently observed in people with type 2 diabetes.

# 7. CONCLUSION

In conclusion, this study reveals a high prevalence of anaemia in patients with type 2 diabetes mellitus, all of whom demonstrated low haemoglobin levels. The findings suggest that diabetes and anaemia are intricately linked, with multiple underlying mechanisms contributing to the observed association. This investigation underscores the importance of regular haemoglobin monitoring and appropriate interventions for diabetic patients to address and manage anaemia effectively. Further research is warranted to explore the specific pathways involved and to develop targeted strategies to improve haemoglobin levels and overall health outcomes in this vulnerable population.

The presence of clinical symptoms, such as fatigue (92%), pale skin (52%), and dizziness (40%), further underscores the impact of anemia on the well-being and quality of life of T2DM patients.Overall, this study underscores the importance of vigilant monitoring of hemoglobin levels in individuals with type 2 diabetes mellitus and emphasizes the need for coordinated care to manage anemia effectively. Collaborative efforts between healthcare providers, including endocrinologists, hematologists, and primary care physicians, are vital in devising tailored treatment plans that address the unique needs of patients with T2DM and anemia.

The severity of the complications brought on by anemia in the diabetic population can be decreased by maintaining diabetes control and conducting appropriate research to detect anemia in diabetic patients early on. The most susceptible groups to anemia are diabetic women and the elderly; therefore, their diet and supplementation should be carefully considered. Given the risk of anemia in these subgroups, doctors ought to prescribe vitamin and iron supplements when necessary. For the diabetic population to maintain normal glucose levels, medication compliance must be attained. Awareness must be provided to the diabetic population at the time of their diagnosis of the risk of anemia and other complications of diabetes.

#### 8. REFERENCE

1. American Diabetes Association. Standards of medical care in diabetes—2017 abridged for primary care providers. *Clin Diabetes*. 2017;**35**(1):5. doi: 10.2337/cd16-0067

2.Thomas MC, Cooper ME, Rossing K, Parving HH. Anaemia in diabetes: is there a rationale to TREAT? *Diabetologia*. 2006;**49**(6):1151. doi: 10.1007/s00125-006-0215-6

3. 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. *J Med Case Rep.* 2016



4.Hoffbrand AV, Moss PAH, Pettit JE. Erythropoiesis and general aspects of anaemia.Essential Haematology. Fifth ed. UK: Blackwell Publishing; 2006. p. 18–20.

5.El-achkar TM, Ohmit SE, Mccullough PA, Crook ED, Brown WW, Grimm R, et al. Higher prevalence of anaemia with diabetes mellitus in moderate kidney insufficiency: The Kidney Early Evaluation Program. Kidney Int. 2005;67(4):1

6.Barbieri J, Fontela PC, Winkelmann ER, Zimmermann CE, Sandri YP, Mallet EK, Frizzo MN. Anemia in Patients with Type 2 Diabetes Mellitus.Anemia. 2015;2015:354737. doi: 10.1155/2015/354737. Epub 2015 Nov 11. PMID: 26640706; PMCID: PMC4658398.

7..https://www.who.int/health-topics/anaemia

8.AlDallal SM, Jena N. Prevalence of Anemia in Type 2 Diabetic Patients. J Hematol. 2018 May;7(2):57-61. doi: 10.14740/jh411w. Epub 2018 May 10. PMID: 32300413; PMCID: PMC7155869.

9.AlDallal SM, Jena N. Prevalence of Anemia in Type 2 Diabetic Patients. J Hematol. 2018 May;7(2):57-61. doi: 10.14740/jh411w. Epub 2018 May 10. PMID: 32300413; PMCID: PMC7155869.