International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

Prevalence of Anemia Among Patients with Type 2 Diabetes Mellitus Attending a Tertiary Care Hospital in Hassan, Karnataka

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Received: 30-12-2025
Accepted: 11-01-2026
Available online: 28-02-2026

ABSTRACT

Background: Anemia is a common but underdiagnosed comorbidity in patients with type 2 diabetes mellitus (T2DM) and is associated with increased morbidity and mortality. The present study aimed to determine the prevalence of anemia among patients with T2DM and to evaluate its association with age, gender, and glycemic control.

Methods: A retrospective observational study was conducted at the Diabetes Outpatient Department of HIMS Hospital, Hassan, Karnataka, over a two-year period from January 2023 to December 2024. Adult patients diagnosed with T2DM were included. Data regarding age, gender, hemoglobin (Hb), and glycated hemoglobin (HbA1c) levels were obtained from the laboratory information system. Anemia was defined according to World Health Organization criteria (Hb <13 g/dL in men and <12 g/dL in women). Glycemic control was categorized as good (HbA1c ≤7.5%) or poor (HbA1c >7.5%). Statistical analysis was performed using SPSS version 20, and $P < 0.05$ was considered statistically significant.

Results: A total of 18,420 patients were included in the study, comprising 9,620 males (52.2%) and 8,800 females (47.8%). The overall prevalence of anemia was 31.6%. Anemia was significantly more prevalent in females (40.9%) than males (23.4%). Patients with poor glycemic control had a higher prevalence of anemia (35.8%) compared to those with good glycemic control (29.1%). The mean age of anemic patients was significantly higher than that of non-anemic patients (61.3 ± 0.22 vs. 55.1 ± 0.14 years).

Conclusion: Anemia is highly prevalent among patients with T2DM, particularly in females, elderly individuals, and those with poor glycemic control. Routine screening and early management of anemia should be integrated into diabetes care to reduce morbidity and improve patient outcomes.

Keywords: *Type 2 diabetes mellitus; Anemia; Prevalence; Glycemic control; Age; Gender.*

INTRODUCTION

Anemia is a major global public health problem affecting individuals across all age groups and is particularly prevalent among patients with chronic diseases. The World Health Organization (WHO) defines anemia as a hemoglobin concentration below 13 g/dL in adult men and below 12 g/dL in adult women [1,3]. Anemia results in reduced oxygen-carrying capacity of blood, leading to fatigue, impaired physical performance, and increased cardiovascular workload [2]. Iron deficiency anemia accounts for nearly half of all anemia cases worldwide; however, anemia of chronic disease is increasingly recognized among patients with long-standing illnesses such as diabetes mellitus [4]. Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by insulin resistance and progressive β-cell dysfunction. Its prevalence is increasing globally, contributing significantly to morbidity and mortality [6].

Several studies have demonstrated that patients with diabetes are at a higher risk of developing anemia compared to non-diabetic individuals, even in the absence of overt renal disease [2,9,16]. The etiology of anemia in diabetes is multifactorial and includes reduced erythropoietin production, chronic in inflammation, oxidative stress, autonomic neuropathy, and nutritional deficiencies [10,17,18].

Long-term use of antidiabetic medications such as metformin has been associated with vitamin B12 deficiency, further increasing the risk of anemia in diabetic patients [19,20]. Anemia in diabetes has been identified as an independent predictor of cardiovascular disease, progression of diabetic nephropathy, increased hospitalization, and premature mortality [10,11]. Despite its clinical importance, anemia often remains underdiagnosed in diabetic patients due to overlapping symptoms such as fatigue, weakness, and neuropathy [12]. Data on the prevalence of anemia among patients with T2DM in southern India, particularly Karnataka, are limited. Hence, this study was undertaken to determine the prevalence of anemia among patients with T2DM attending a tertiary care hospital in Hassan and to evaluate its association with age, gender, and glycemic control.

MATERIALS AND METHODS

Study Design and Setting

This retrospective observational study was conducted at the Diabetes Outpatient Department of HIMS Hospital, Hassan, Karnataka.

Study Population

Adult patients (≥18 years) diagnosed with type 2 diabetes mellitus who attended the outpatient department between January 1, 2023, and December 31, 2024.

Total number of Participants during study period were 18420.

Inclusion Criteria

- Confirmed diagnosis of type 2 diabetes mellitus
- Availability of hemoglobin and HbA1c values

Exclusion Criteria

- Type 1 diabetes mellitus
- Pregnant women
- Incomplete laboratory records

Data Collection

Data were obtained from the laboratory information system and included age, gender, hemoglobin concentration, and HbA1c levels.

Definitions

- **Anemia:** Hb <13 g/dL in men and <12 g/dL in women (WHO criteria) [3]
- **Good glycemic control:** HbA1c ≤7.5%
- **Poor glycemic control:** HbA1c >7.5%

Ethical Considerations

The study was approved by the Institutional Ethical Committee of Hassan Institute of medical Sciences Hassan.

- Since the study was retrospective,no direct consent from participants required
- Confidentiality of participants information was strictly maintained and all data were anonymised for analysis.

Statistical Analysis

Data were analyzed using SPSS version 26. Continuous variables were expressed as mean ± standard deviation, and categorical variables as percentages. Statistical significance was set at $P < 0.05$.

RESULTS

Table 1. Baseline Characteristics of Study Population

A total of 18,420 patients with T2DM were included in the study. Among them, 9,620 (52.2%) were males and 8,800 (47.8%) were females.

Variable	Number (n)	Percentage (%)
Total T2DM patients	18,420	100
Male	9,620	52.2
Female	8,800	47.8

Table 2. Overall Prevalence of Anemia

Anemia was detected in **5,830 patients**, resulting in an overall prevalence of **31.6%**.

Anemia Status	Number (n)	Percentage (%)
Anemic	5,830	31.6
Non-anemic	12,590	68.4

Table 3. Gender-wise Distribution of Anemia

Gender	Anemia Prevalence (%)
Male	23.4
Female	40.9

Anemia was more prevalent among females (**40.9%**) compared to males (**23.4%**), and this difference was statistically significant ($P < 0.05$).

Table 4. Glycemic Control and Anemia

Glycemic Control	Anemia Prevalence (%)
Well controlled (HbA1c ≤7.5%)	29.1
Poorly controlled (HbA1c >7.5%)	35.8

- Well-controlled diabetes (HbA1c ≤7.5%): anemia prevalence **29.1%**
- Poorly controlled diabetes (HbA1c >7.5%): anemia prevalence **35.8%**
- Poor glycemic control was significantly associated with anemia ($P < 0.05$).

Table 5. Age Distribution and Anemia

Group	Mean Age (years ± SD)
Anemic	61.3 ± 0.22
Non-anemic	55.1 ± 0.14

The mean age of anemic patients was **61.3 ± 0.22 years**, whereas non-anemic patients had a mean age of **55.1 ± 0.14 years**, indicating a significant association between advancing age and anemia ($P < 0.05$).

DISCUSSION

The present study demonstrates that anemia is a common comorbidity among patients with type 2 diabetes mellitus, with an overall prevalence of 31.6%. This finding supports previous reports indicating that anemia frequently coexists with diabetes and often remains underrecognized [2,12].

The prevalence observed in this study is comparable to findings reported by Adejumo et al., who observed anemia in approximately 30% of diabetic patients without renal impairment [2]. However, Sharif et al. reported a much higher prevalence of 63% [6]. This discrepancy may be attributed to differences in study populations, nutritional status, degree of glycemic control, and healthcare access.

A significantly higher prevalence of anemia was observed among female patients, consistent with previous studies by Alsayegh et al. and Sharif et al. [6,21]. Factors such as menstrual blood loss, iron deficiency, nutritional inadequacies, and sociocultural determinants may contribute to the increased vulnerability of women to anemia [22].

Poor glycemic control was found to be significantly associated with anemia in the present study. Similar observations were reported by Mounika et al., who demonstrated a higher incidence of anemia among patients with poorly controlled diabetes [23]. Chronic hyperglycemia leads to oxidative stress, which damages erythrocyte membranes and shortens red blood cell lifespan. Additionally, prolonged exposure to high glucose levels may impair bone marrow erythropoiesis and disrupt iron metabolism [25].

Advancing age was identified as a significant risk factor for anemia. Choi et al. reported an increased prevalence of anemia among elderly individuals, which may be attributed to nutritional deficiencies, chronic inflammation, bone marrow dysfunction, and multiple comorbidities [24]. Diabetes further exacerbates these age-related changes, increasing the risk of anemia.

Anemia in diabetic patients has serious clinical implications. Bosman et al. demonstrated that anemia occurs early in diabetic nephropathy and is associated with erythropoietin deficiency [10]. Keane and Lyle reported that reduced

hemoglobin levels are associated with increased hospitalization and premature mortality in diabetic patients [11]. Therefore, early detection and management of anemia may improve outcomes and reduce the burden of diabetic complications.

CONCLUSION

Anemia is a prevalent and clinically significant condition among patients with type 2 diabetes mellitus, particularly among females, elderly individuals, and those with poor glycemic control. Routine screening for anemia should be incorporated into standard diabetes management. Early diagnosis, nutritional supplementation, and optimal glycemic control may reduce anemia-related morbidity and improve quality of life in diabetic patients.

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