Original Research Article

To Study the Pattern of Anemia in Type 2 Diabetes Mellitus in Elderly Hospitalized Patients

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ABSTRACT

Background: Anemia found in diabetes patients is often unrecognized like many other chronic diseases. Anemia is more common in people with diabetes due to a variety of causes. The aim of this study was to determine the severity and morphological types of anemia among type II diabetic elderly hospitalized patients.

Methodology: The present study was a hospital based cross sectional study conducted at Father Muller Medical Collage Hospital, Mangalore Karnataka over a period of 6 months. The cases for the study included 129 elderly patients with having Type 2 Diabetes Mellitus (DM). 129 Hospitalized elderly patients over the age of 60 years who were confirmed to have type 2 DM patient's demographic data and the blood samples are analyzed for Complete blood count, Peripheral smear for type of anemia, Random blood glucose, Glycated hemoglobin.

Result: A total 129 Hospitalized elderly type 2 DM patients were included in the study. Out of 129 subjects, 55.03% were males and 44.97% were females. Of these 24.8% patients had mild anemia, 63.56% had moderate anemia and 11.64% had severe anemia according to clinical degree of anemia based on hemoglobin level. 67.76% patients had microcytic hypochromic anemia, and 30.24% patients had normocytic normochromic anemia. The prevalence of type 2DM is high in male than the female population.

Conclusion: The study results exhibit a higher level of the prevalence of anemia in Type 2 DM subjects. The findings of our study suggest that moderate degree of anemia is a common finding, and morphologically, the leading type of anemia was normocytic normochromic anemia.

Keywords: Diabetes Mellitus, Anemia, Hemoglobin, Hyperglycemia.

INTRODUCTION

Anemia, defined by World Health Organization criteria (WHO) as less than 130 g/L in men and less than 120 g/L in women, is a common blood disorder and a condition in which the red blood cell (RBC) count is insufficient to meet the physiological needs of the human body. [1-2] The prevalence of anemia is 27% worldwide. It is a public health problem that has the greatest impact on developing countries accounting for more than 89% of the disease burden. [3]

Nutritional iron deficiency anemia is the most prevalent anemia worldwide, affecting mainly children and women of childbearing age. [3-4] Anemia can occur in diabetes because the hormone that regulates red blood cell production, erythropoietin (EPO), is produced by the kidneys, and kidney damage at various levels is a known complication of diabetes. However, patients with type 2 diabetes may be more susceptible to the effects of anemia, as many also suffer from significant cardiovascular disease and organ damage caused by hypoxia.[5]

Diabetes mellitus is a group of metabolic disorders of varying etiology characterized

by chronically high blood glucose levels due to disturbances in carbohydrate, fat, and protein metabolism.[6] Worldwide, more than 400 million adults live with DM, a disease that caused 1.6 million deaths in 2015. It is estimated that the number of people with DM worldwide will increase from 382 million in 2010 to 592 million in 2035, and diabetes could affect one in ten people in the world by 2035.[7]

There are about 40 different types of diabetes mellitus. Type 1 DM, type 2 DM, Maturity-onset diabetes of the young (MODY), and Gestational diabetes mellitus (GDM), to name a few. Type 1 Diabetes Mellitus is the result of autoimmune destruction of pancreatic beta cells, resulting in an absolute lack of insulin. Type 2 Diabetes Mellitus is primarily due to insulin resistance. Diabetes resulting from genetic mutations is categorized as MODY.[8] GDM develops during pregnancy and improves or disappears after delivery, but 20%-50% of cases may develop type 2 DM later in life.[9]

Diabetes is considered a leading cause of premature death because it increases the risk of cardiovascular disease, which contributes to 50%-80% of deaths due to elevated serum cholesterol and triglyceride levels. Cardiovascular disease includes diseases of the circulatory system that encompass a wide spectrum of clinical syndromes. The main cause is atherosclerosis, which also increases the risk of acute coronary syndromes.[10] Diabetics are prone to multiple disorders as the disease progresses. Renal insufficiency leading to a deficiency of EPO is likely to lead to anemia in diabetics. Up-regulation of inflammatory cytokines is also likely to contribute to anemia.[11] Patients with diabetes also have nutrient deficiencies of cyanocobalamin, folate, and iron, which can lead to various types of anemia. Metformin may impair the absorption of cyanocobalamin, leading to vitamin B12 deficiency anemia.[12]

Diabetic patients' satisfaction increases when anemia is corrected, as evidenced by higher quality of life scores, improved sexual function, better cognition, less depression, and better socialization. Finally, correcting anemia has been found to reduce hospitalization and mortality rates. Consequently, early detection of anemia in patients with diabetes and monitoring of Hb levels in them is essential to prevent further complications.[5] In most diabetic patients, anemia remains undetected. Therefore, it is important to recognize anemia ant its type in diabetic patients.

MATERIALS & METHODS

The present study was a hospital based cross sectional study conducted at tertiary care hospital over a period of 6 months from November 2021 to April 2022. The study population consists of a total of 129 hospitalized elderly patients over the age of 60 years who were confirmed to have type 2 DM. Other types DM and patients less than 60 years of age were excluded from the study. The following variables were considered in the patients selected for the study.

- Age
- Gender
- Complete blood count
- Peripheral smear for type of anemia
- Random blood glucose
- Glycated hemoglobin

Age

Patients were categorized based on age as follows.

- 60 – 69
- 70 – 79
- 80 – 89
- > 90

All the relevant clinical and demographic data were collected from the patient's case sheet and laboratory related data were collected from the Hematology and Biochemistry laboratory and presented in the form of tables and figures.

RESULT

A total 129 hospitalized elderly type 2DM patients were included in the study. Of these

71 (55.03%) were males and 58(44.97%) were females. The prevalence of type 2DM is higher in the male population than in the female population. 44.97% of men were in the 60-69 age group and 35.66% of women were in the 70-79 age group (Table 1).

Table 1: Age and Gender distribution			
Age in years	Male	Female	Percentage
60-69	40	18	44.97%
70-79	21	25	35.66%
80-89	10	12	17.05%
>90	0	3	2.32%
	71	58	100%

Of the 129 diabetic patients, 11.62% were good controlled, 68.99% had poorly controlled diabetes and 10.85% had normal diabetes (Figure 1).
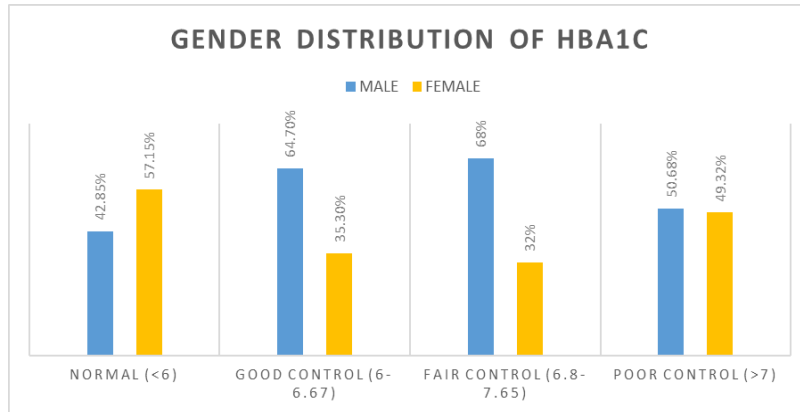

Figure 1: Gender wise distribution of HBA1C

The anemia was categorized as mild, moderate and severe anemia. Of the total number of anemic diabetic patients, 11.64% were severe and predominantly female, 63.56% were moderately anemic and males outnumbered females, and 24.80% were mildly anemic with a male predominance (Table 2).

Table 2: Gender wise distribution of degree of anemia			
Grade	Male	Female	Over all Percentage
Mild	18	14	24.80%
Moderate	46	36	63.56%
Severe	7	8	11.64%
	71	58	100%

The anemia was classified as normocytic normochromic anemia and microcytic hypochromic anemia. Of the total number of patients, 67.76% of cases were classified as normocytic normochromic anemia and 30.24% as microcytic hypochromic anemia (Figure 2).
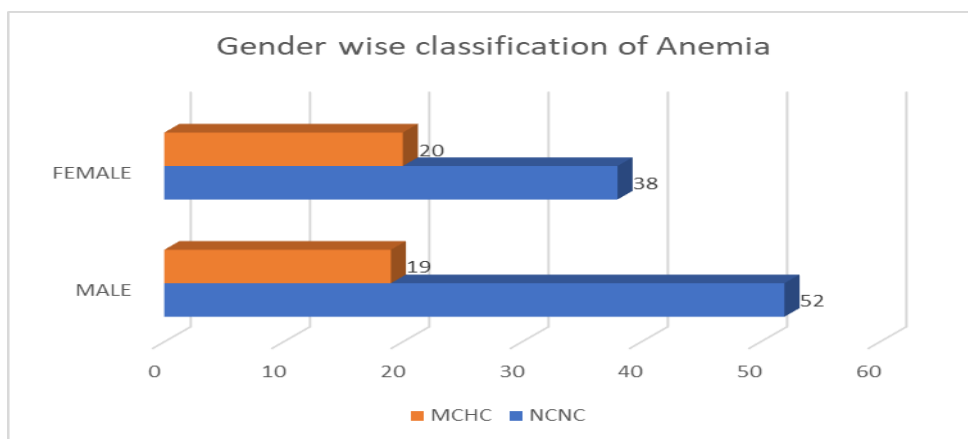

Figure 2: Gender wise classification of anemia

DISCUSSION

Anemia is an increasingly recognized condition in patients with type 2 diabetes mellitus. Anemia associated with diabetes is an alarming condition because of the increased risk of eye disease, heart disease or stroke. Therefore, the life expectancy of patients with anemia associated with diabetes is lower than that of people who have diabetes but no anemia.[9]

A study included 129 patients with type 2 diabetes. Of these, 55.03% were male and 44.97% were female. Other studies also showed a similar study population: 55.5%, 44.4% and 56.2%, 43.8% [15-16] The age group with the highest number was 60-69 years with a frequency of 58 (44.97%), while the lowest age group was over 90 years with a frequency of 3 (2.32%) in all elderly diabetic patients. In contrast, another study showed that 51-60 years was the highest number and 20-30 years was the lowest number.[13] Studies have shown that the incidence of anemia increases in the elderly, probably due to the long duration of chronic disease, loss of appetite, gastric problems, poor nutrition, etc.[14] In our study, we found that 68.99% had poorly controlled diabetes, which is confirmed by previous studies, according to which poor glycemic control was present in 71.5%, 68.6%, and 63.8%, respectively.[9,17-18] Diabetic autonomic neuropathy has been shown to be one of the major complications of poor glycemic control. Since the production and release of erythropoietin is regulated by the autonomic nervous system, the higher incidence of anemia in poorly controlled diabetics is due to impaired erythropoietin production.[9] The present study shows that a higher proportion of anemia was found in males than females, this statement is supported by other studies,[19-20] but this result is in contrast to other study reports in which the occurrence of anemia was more likely in female than in male diabetic patients.[21]

According to clinical classification based on Hb level, 24.8% had mild anemia, 63.56% had moderate anemia, and 11.64% had severe anemia. This result is similar to a study from Lucknow and Karachi. [11,14] In contrast to our study, the different studies showed 85.7%, 85%, 24.1% mild, 14.3%, 15%, 4.1% moderate and 1.5% severe anemia. [18,22-23]

The study attempted to reveal the common morphological features of anemia in T2DM patients. Normocytic normochromic blood picture was the most common morphological form of anemia found in this study. It is not surprising that normocytic normochromic blood picture of anemia was found in this study, as several previous studies showed similar results. [5,7,9,12,24] In contrast, another study showed that the majority of the study population had macrocytic anemia.[25]

Type 2DM can cause anemia through several pathophysiologic mechanisms. Symptomatic autonomic neuropathy is a complication of poor glycaemic control and can lead to denervation of the efferent sympathetic pathways of the patient's kidneys, resulting in loss of required erythropoietin production.[18] Vitamin B12 deficiency is common cause of macrocytic type of anemia. B12 deficiency was recognized many years ago as an important side effect in diabetics taking metformin for more than 5-10 years, 4 which was used by 149 (74.5%) of the study population.[25]

Anaemia in chronic disease is a mild to moderate anemia characterized by shortened red blood cell survival from 120 days to 80 days. This is due to hyperactivation of the mononuclear phagocyte system, which in turn is triggered by neoplastic,

inflammatory, or infectious conditions, followed by premature removal of red blood cells. Due to low secretion of EPO, decreased bone marrow response to EPO, and decreased erythropoiesis, an inadequate bone marrow response is observed.[26] Our observation is consistent with the previous studies and we also found that diabetic patients are more likely to be anemic and the severity of anemia in diabetes needs to be thoroughly investigated.

CONCLUSION

Anemia characterized by a decrease in erythrocyte and Hb levels is associated with diabetes, which in turn may lead to anemia through several pathophysiological pathways such as inflammation and a decrease in EPO. Most of the anemic patients had a moderate type of anemia. Morphologically, the leading type of anemia was normocytic normochromic anemia. Because a high incidence of anemia was observed in diabetes mellitus, we recommend that routine hematologic testing along with blood glucose levels should be mandatory in diabetic patients to make optimal therapeutic decisions for the management of anemia in type 2 diabetes mellitus.

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