

Original Research Article

Prevalence of anemia in patients with Type 2 Diabetes Mellitus at Gandhinagar, Gujarat, India

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Abstract

Introduction: Anemia is a common finding in diabetes. Number of factors contributes to an increased prevalence of anemia in diabetes.

Aim: To determine the prevalence of anemia in our patients with diabetes.

Material and methods: The present study was conducted at the Gayatri Hospital, Gandhinagar. The subjects for the study included 200 adult patients with age more than 30 years and having diabetes mellitus type 2, attending the outdoor patient department (OPD) or admitted in ward as indoor patient department (IPD) of Gayatri Hospital. Blood specimens were collected and processed for determination of blood glucose, serum creatinine, and hemoglobin, HbA1C.

Results: Anemia was present in 18% patients of diabetes. The prevalence of anemia was almost similar between women (18.60%) and men (17.54%). 74% of anaemic patients had a serum creatinine <110 µmol/l and 72% of anaemic patients had a calculated creatinine clearance of >60 ml/min.

Conclusion: Every fifth individual in a population of diabetes mellitus could be anemic. Identifying and treating anemia would make a great impact in managing various complications of diabetes mellitus.

Key words

Anemia, Diabetes mellitus, Prevalance.

Introduction

Lifestyle related diseases like diabetes mellitus, have emerged as a major public health problem due to rapid urbanisation and industrialisation [1]. Diabetes mellitus (DM) is a common metabolic disease, [2] which accounts for a high incidence of morbidity leads to various events including micro and macro vascular complications [3]. Anaemia is a frequent condition in patients with type 2 diabetes [4, 5]. This reflects the pivotal role of the kidney in the control of hemopoiesis, in sensing changes in tissue oxygenation, and subsequently in stimulating hemopoietic precursors in the bone marrow through the production of erythropoietin by peritubular interstitial fibroblasts of the renal cortex and outer medulla. Uremia is associated with a range of hemopoietic stressors including reduced red cell survival, occult blood losses, malnutrition, and systemic inflammation. However, the failure of the kidney to increase erythropoietin release in response to a decreasing hemoglobin (Hb) level appears to be the key contributor to the development of renal anemia [6, 7]. The prevalence of anaemia in cross-sectional studies of patients with diabetes is in the range of 14 to 23% (anaemia defined as Hb <13g/dl for men and <12g/dl for women) [4, 8, 9]. Anemia is associated with a more rapid decline in the GFR and is considered to be an important cardiovascular risk factor [10, 11, 12]. It is therefore important to diagnose and correct anemia. The aim of this study was to determine the prevalence of anemia in type 2 diabetics.

Material and methods

The present study was conducted at the Gayatri Hospital, Gandhinagar. The subjects for the study included 200 adult patients with age more than 30 years and having diabetes attending the outdoor patient department (OPD) or admitted in ward as indoor patient department (IPD) of Gayatri Hospital. Blood specimens were collected and processed for determination of

blood glucose, serum creatinine, and hemoglobin, HbA1C. The patients with the following diagnosis were excluded from the study: Age <30 years, taking drugs like ACE inhibitors, causes of chronic kidney disease (CKD) other than diabetes mellitus, Type 1 diabetes mellitus, malignancy, alcoholic, post surgery patient. HbA1C was determined by fully-autoanalyser (EM-200) through turbidometric method and serum creatinine was estimated by modified Jaffe's method. Hemoglobin was estimated by cell counter- SYSMEX through cyanmethemoglobin method. Diabetes was diagnosed by HbA1C >6.5%. Serum creatinine values were considered abnormal if values were >150 $\mu\text{mol/L}$ and considered as chronic kidney disease. Definition for anemia is hemoglobin values <13.0 g/dl for men and <12.0 g/dl for women [13]. Statistical analyses were performed with the SPSS version 20. Data expressed as mean (\pm SD) or median (range) if the variables were continuous and as percentage, if categorical.

Results

In the present study, total 200 patients with diabetes type 2 had mean age 58 years (\pm 14) and 62 years (\pm 12) in males and females respectively. 87% of patients (86% of males and 84% of females) had a normal serum creatinine (<110 $\mu\text{mol/l}$). 75% of patients (74% of males and 77% of females) had a normal urinary albumin/creatinine ratio (<24 mg/g). Mean Hb levels were 14.2 ± 1.3 g/dl in males and 13.6 ± 1.5 g/dl in females. (**Table - 1**) 36 patients (18%) were anemic by the WHO criteria including 20 males (17.54%) and 16 females (18.60%) with a median Hb level of 12.3 g/dl (range 10.9 to 12.9) and 11.5 g/dl (range 9.2 to 11.9) in males and females respectively. The average mean cell volume (MCV) for the 20 anemic males was $90.1 \text{ fl} \pm 5.4$, with only one patient with MCV <78. The average MCV for the 16 anemic females was $84.5 \text{ fl} \pm 7.8$ with three of 16 patients had

MCV <78, and no patient being macrocytic. Therefore the majority (85%) of patients had a normocytic anemia. Using the WHO criteria for anemia, 74% of anemic patients had a serum creatinine <110µmol/l and 72% of anemic patients had a calculated creatinine clearance of

>60ml/min. Of those with normal serum creatinine (<110µmol/), 7% of men and 14% of women were anaemic compared to 24% of men and 38% of women of those with an elevated creatinine (>110 µmol/L).

Table - 1: Findings among males, females and total group.

Data	Males (N=114)	Females (N=86)	Total group (N=200)
Age (years) (Mean ± SD)	58 (±14)	62 (±12)	59 (±13)
Hb (g/dl) (Mean ± SD)	14.2 (±1.3)	13.6 (±1.5)	13.4 (±1.5)
HbA1C (%)	7.1 (4.8-15.0)	6.6 (4.9-11.1)	6.9 (4.8-15.0)
Serum Creatinine (µmol/L)	86 (59-945)	75 (47-170)	83 (47-945)
Duration of diabetes mellitus			
<5 years	41 (35.9%)	42 (49.4%)	83
>5years	73 (64.4%)	44 (50.6%)	117
Urinary albumin/ Creatinine ratio (mg/g)	9.0 (0.8 ->1000)	9.9 (1.0->1000)	9.6 (0.8 ->1000)
Calculated Creatinine Clearance (ml/min) (Mean ± SD)	112 (±42)	86 (±33)	103 (±41)

Regarding duration of diabetes mellitus, 64.4% of males and 50.6% of females had the disease for more than 5 years. Out of the 36 patients of anemia with diabetes mellitus, 21 (58.33%) patients had diabetes mellitus for more than 5 years duration. Hb levels were not associated with glycaemic control as measured by HbA1C or urinary albumin excretion in either sex as measured by urinary albumin/ creatinine ratios, when the sexes were considered individually.

Discussion

The results of the present epidemiological study estimated the prevalence of anemia to be 18% in individuals with type 2 diabetes mellitus. Despite the finding that the factor with the strongest correlation with the presence of anaemia was calculated creatinine clearance, approximately 75% of anaemic patients had normal serum creatinine levels (<110µmol/l) and normal calculated creatinine clearance (>60 ml/min). The measured prevalence of anemia varies depending on both the population studied and the definitions used. One of the largest studies that

are most comparable to our study population is the Third National Health and Nutrition Examination Survey (NHANES) in which population based sample of 15,419 participants from the general public in the USA was included [14]. This study defined anemia as Hb level <12 g/dl in men and <11 g/dl in women and found that at the age of 60 years and with maintained renal function (estimated GFR of 60 ml/min per 1.73 m²) the prevalence of anemia is 1% [14]. Using this same definition of anemia our study found the prevalence of anemia to be 4%, despite relatively preserved renal function (mean calculated creatinine clearance of 103 ml/min). The degree of anemia in patients with diabetes has been associated with a number of factors including glomerular filtration rate, urinary albumin excretion rate and HbA1C levels [4]. In addition, the prevalence of anemia in patients with diabetes is two to three times higher than in patients with comparable renal impairment and iron stores in the general population [4, 14]. Our study is in accordance with these findings, although only associations with age, serum

creatinine and calculated creatinine clearance were found, and these were only significant in males. The lack of further associations may be due to the relatively small sample size.

Another salient finding was the association between the duration of diabetes and the prevalence of anemia. Individuals with duration of diabetes of more than 5 years have 1.56 times higher risk of developing anemia than those with diabetes for less than 5 years. These observations suggest that anemia evaluation should be considered in the routine management of persons with diabetes and should be treated to minimize the risk of microvascular complications such as nephropathy and retinopathy. There is evidence that the erythropoietin (EPO) levels in patients with diabetes and anemia are inappropriately low compared to patients with iron deficiency anemia [15]. It has been suggested that erythropoietin deficiency occurs earlier in diabetic nephropathy compared to other causes of nephropathy, and this may in part be due to autonomic nephropathy leading to sympathetic denervation of the kidney [15, 16, 17]. Whilst anemia related to renal impairment can be corrected by using erythropoietin, it is still not clear what effect this may have on morbidity and mortality. Studies such as the ACORD study (Anaemia CORrection in Diabetes) [18] may begin to answer these questions.

Conclusion

The relatively high prevalence of anemia in our population of patients with diabetes suggests the need for consideration of screening for anemia in the diabetes out-patient clinic. Furthermore, the relatively high prevalence of anemia amongst those with apparently normal renal function, as measured by serum creatinine, suggests that such screening should not be limited to those with overt nephropathy.

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