



**PREVALENCE OF ANEMIA IN DIABETES MELLITUS IN THE ABSENCE OF
RENAL IMPAIRMENT**

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ABSTRACT

Background

Anemia is the most common blood disorder and a common finding in patients with diabetes mellitus. Low hemoglobin concentration in diabetics is associated with a more rapid decline in glomerular filtration (GFR) than that of other renal diseases. This study was conducted, so that actual burden of this problem can be elucidated.

Objective

To determine the prevalence of anemia in diabetes mellitus in the absence of renal impairment.

Methodology

Two hundred patients with known type 2 diabetes with normal renal function were included. Blood specimen was collected under aseptic conditions and processed for determining fasting blood sugar by hexokinase mediated reaction in laboratory. Creatinine estimated by modified Jaffe's method and complete blood picture using EDTA coated glass tubes.

Results

The mean age of patients was 49.62±5.07years. Prevalence of anemia was 21.5% in diabetic patients without renal impairment.

Conclusion

After careful consideration, it can be concluded that a high prevalence of anemia was observed in diabetics without renal insufficiency. Correction of anemia may have a significant role in prevention of other diabetic complications.

Keywords: Anemia, Diabetes Mellitus, Renal Diseases, Hemoglobin

INTRODUCTION

Anemia is the most common blood disorder and a common finding in patients with diabetes mellitus [1]. Where diabetes is regarded as a cause of significant morbidity and mortality due to associated complications, anemia is being recognized as one of the major contributors [2]. It is a key indicator of chronic kidney disease (CKD) and is an important cardiovascular risk factor in diabetics; also due to anemia quality of life is severely compromised [3]. Low hemoglobin concentration in diabetics is associated with a more rapid decline in glomerular filtration (GFR) than that of other renal diseases [4].

Thus, patients with diabetes have a greater degree of anemia for their level of renal impairment than non-diabetic patients with other causes of renal failure [5]. Furthermore, treating anemia early in renal failure has been demonstrated to slow the rate of decline of renal function [6]. There are several mechanisms of anemia development in diabetes including decreased synthesis and release of erythropoietin, systemic

inflammation, iron deficiency, sympathetic autonomic neuropathy, damage to renal interstitium, transferrinuria in impaired renal function and depressed androgen levels [7-9]. Many studies have been done on anemia in diabetes with renal insufficiency but sparse data is available on prevalence of anemia in diabetics prior to significant nephropathy [10-14].

Previous studies conducted worldwide, on anemia in diabetes mellitus irrespective of renal status show differing magnitude of this problem among different populations ranging from 7.9%-22.8% [15-17]. Even recently a study conducted in Pakistan showed 63% prevalence of anemia among diabetics. This also reflects variable sample sizes used by these studies. Therefore, this study is designed to measure prevalence of anemia in diabetic patients without renal impairment, so that actual burden of this problem can be elucidated in our locality and risk of developing this complication can be minimized by early intervention [18].

METHODOLOGY

Two hundred patients with known type 2 diabetes with normal renal function were included. Blood specimen was collected under aseptic conditions and processed for determining fasting blood sugar by hexokinase mediated reaction in laboratory. Creatinine estimated by modified Jaffe's method and complete blood picture using EDTA coated glass tubes.

Inclusion Criteria: Patients of age 40-60 years of either gender with known type 2 diabetes (BSR>186mg/dl) with normal renal function (creatinine <1.5mg/dl and no albuminuria on 24 hr urinary collection for albumin)

Exclusion Criteria: Patients with chronic kidney disease, alcoholics, unstable cardiovascular or peripheral vascular disease, recent or chronic blood loss or donations, chronic illnesses, hemolytic anemias, hemoglobinopathies, worm infestations and morbidly obese (BMI > 40kg/m²).

RESULTS

The mean age of patients was 49.62±5.07years. There were 55% male and 45% female. Mean duration of diabetic mellitus was 3.61±0.88yrs Mean Hb was 12.53±1.46 g/d. In the sample, 39 (19.5%) illiterate, 61 (30.5%) had education upto

primary, 71 (35.5%) had education upto secondary, 20 (10%) had education upto intermediate while 9 (4.5%) graduate. There were 103 (51.5%) belonged to low socioeconomic status while 97 (48.5%) belonged to middle class family. There were 29 (44.5%) patients with normal BMI while 111 (55.5%) were obese. In the sample, 99 (49.5%) controlled glycemic control while 101 (50.5%) had uncontrolled glycemic level (**Table 1**).

In the study, anemia was present in 43 (21.5%) diabetic patients in absence of renal impairment (**Figure 1**).

In patients of age ≤45years, anemia was present in 8 (21.2%) cases, in patients of age 46-50years, anemia was present in 19 (21.1%) cases, in patients of age 51-55years, anemia was present in 9 (32.1%) cases and in patients of age 56-60years, anemia was present in 7 (15.9%) cases. The difference was insignificant (p>0.05). In males, anemia was present in 17 (15.5%) cases while in 26 (28.9%) females. The difference was significant (p<0.05). In patients with controlled diabetes, anemia was present in 22 (22.2%) cases while in 21 (20.8%) patients with uncontrolled diabetes. The difference was insignificant (p>0.05) (**Table 2**).

Table 1: Characteristics of patients

Characteristic	Finding
Age (Years)	49.62±5.07
Gender (M / F)	110 (55%) / 90 (45%)
Duration of DM (Years)	3.61±0.88
HB (g/dl)	12.53±1.46
Education	
Illiterate	39 (19.5%)
Primary	61 (30.5%)
Secondary	71 (35.5%)
Intermediate	20 (10%)
Graduate	9 (4.5%)
Economic Status	
Low	103 (51.5%)
Middle	97 (48.5%)
BMI	
Normal	29 (44.5%)
Obese	111 (55.5%)
Glycemic Control	
Controlled	99 (49.5%)
Uncontrolled	101 (50.5%)

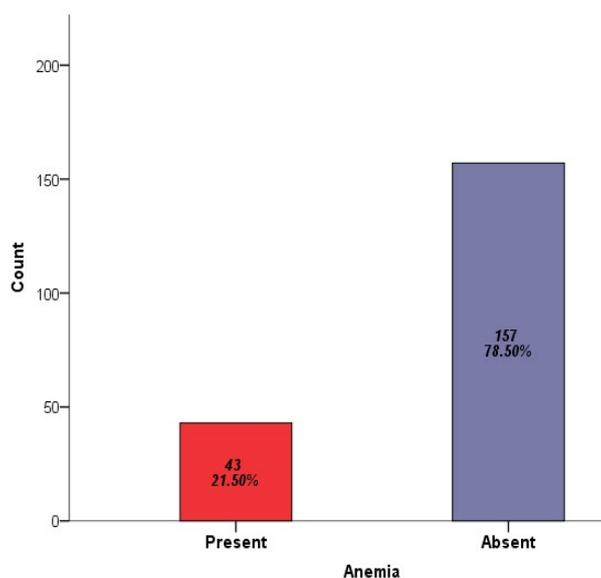


Figure 1: Presence of anemia in diabetics with normal renal function (n=200)

Table 2: Comparison of anemia in difference ages, gender and control of sugar level

Age (Years)	Anemia		P-Value
	Yes	No	
Age ≤ 45 Years	8(21.1%)	30(78.9%)	0.439
Age = 46 to 50 Years	19(21.1%)	17(78.9%)	
Age = 51 to 55 Years	9(32.1%)	19(67.9%)	
Age = 56 to 60 Yeas	7(15.9%)	37(84.1%)	
Male	17(15.5%)	93(84.5%)	0.021
Female	26(28.9%)	64(71.1%)	
Sugar Controlled	22(22.2%)	77(77.8%)	0.806
Sugar Uncontrolled	21(20.8%)	80(79.2%)	

DISCUSSION

Anemia has significant effect on quality of life of diabetic patients. While patients are aware of anemia, their awareness of being tested for anemia is low. A significant number of those in whom anemia was detected received no treatment. It is likely that anemia in patients with diabetes is unrecognized, undetected and untreated. Anemia is a key indicator of chronic kidney disease (CKD) but occurs earlier in the course of diabetic kidney disease and may be more severe than recognized previously [18, 19].

In patients with diabetes, anaemia may be the result of diminished erythropoietin production by the failing kidney. Diabetes mellitus is a risk factor for chronic kidney insufficiency and is the leading cause of ESRD. Diabetes-related anemia has been observed in the advanced uremia of diabetic nephropathy; however, diabetes affects the hematologic system in several ways

Nevertheless, anemia in diabetes likely represents a complex interplay between diabetes, level of kidney function, and medication exposures. Anemia is a treatable condition that has been linked to left ventricular hypertrophy, cardiovascular morbidity, diabetic retinopathy, more rapid

loss of kidney function, and poor quality of life [20-23].

In our study, two hundred patients by recognized form 2 diabetes by with normal renal function were included. Out of 200 cases, 55% were male and 45% female. Tarek *et al.*, in their study revealed that, Both men and women with diabetes had increased prevalence of anemia; however, diabetes conferred greater odds of anemia in men than in women. There are some possible ways that can describe relation between diabetes and anemia, as well as the differential diabetes related anemia risk in men compared with women. Renal denervation attributable to diabetic autonomic neuropathy can reduce splanchnic sympathetic stimulation of erythropoietin production [5, 24-25].

Also, diabetes may adversely affect peritubular and interstitial structures in the renal cortex, the site of erythropoietin production, even prior to the development of overt nephropathy. This may attenuate the release of erythropoietin in response to the hypoxic stimuli of anemia. Furthermore, both diabetes and reduced kidney function have been linked to depressed androgen levels. Androgens stimulate erythropoiesis by increasing erythropoietin production and by direct augmentation of marrow stem cells [26].

Our study showed high incidence of anemia among females, which may depict a poor nutritional state due to poverty and cultural taboos, and also due to gynecologic blood losses (menses, child birth, abortions, etc). In our study overall prevalence of anemia in diabetic patients in absence of renal impairment was 21.5% (43/200) cases. Prevalence of 20% and 19.6% have been reported respectively in diabetics with renal insufficiency by other studies. A previous study on diabetic patients with normal renal functions has shown that longstanding poorly controlled diabetes is associated with normocytic normochromic anemia [26].

The higher incidence of anemia in our study may be due to small number of studied subjects, which was largely those who had poorly controlled diabetes, who may be susceptible to impaired erythropoietin production and release due to diabetic neuropathy. In contrast a previous study by Bonakdara *et al.*, reported that 7.2% of diabetics with normal renal function had anemia [27].

Our study has few limitations. First, we cannot rule out the possibility that other co morbid conditions, such as iron-deficiency or other etiologies of anemia, may have been differentially distributed across the population according to gender and diabetes

status. This might be viewed as a major limitation of our study given that angiotensin converting enzyme (ACE) inhibitors are recommended treatments for persons with diabetes, and are known to depress erythropoiesis. [28]

CONCLUSION

In conclusion, a high prevalence of anemia was observed in diabetics without renal insufficiency. Our data also suggested that poor glycemic control and old age are associated with the incidence of anemia in diabetic patients with normal renal function. Correction of anemia may have a significant role in prevention of other diabetic complications, thus we recommend that treatment criteria for diabetes should include routine hematological tests and take into consideration the inevitable consequences of aging, and poor glycemic control, in order to make optimal therapeutic decisions for the treatment of diabetes mellitus in adults.

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