Original Article

Prevalence of Anemia in Type II Diabetic Patients

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ABSTRACT

Objective: To determine the prevalence of anemia and its associated factors among T2DM patients at CMH Nowshera.

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at the department of medicine, CMH hospital, Nowshera, from June 2021 to January 2022.

Materials and Methods: A total of 300 patients suffering from type 2 diabetes mellitus were included in the study. Patients having type II diabetes, with age > 18 years were included while any history of blood disorder, pregnant, critically ill, or history of acute or chronic blood loss, or blood transfusion within in the last 3 months were excluded. Patients' blood sample was also be taken for CBC estimation. All the data was recorded in a predefined proforma. All the data was collected and entered in the SPSS version 24. The data was then processed using descriptive statistics like cross-tabulation and frequency distribution. Statistical significance was defined as a p value less than 0.05.

Results: Regarding the average blood sugar level fasting of the patients in our study, it was found out that the mean fasting blood sugar level ranged from 112-321 mg/dl with a mean value of 150 ±47.21 mg/dl. As per definition, the incidence of anemia in our study was found to be 26% (n=78).

Conclusion: There is need to start a regular screening program for anemia in diabetics in the already present diabetic clinic across the country. Timely intervention can help resolving the morbidity and mortality associated with anemia in diabetic patients.

Key Words: Type II diabetes mellitus, Anemia, Associated factors, Pakistan

INTRODUCTION

Diabetes mellitus (DM) is a disease of metabolism. It is caused due to the disturbance in metabolism of carbohydrates, fats, proteins, which results into high levels of blood glucose [1]. Around the globe, more than 400 million people lives with DM and according to reports about 1.6 million mortality was caused in 2015 [2]. Approximately 382 million individuals worldwide were estimated to have diabetes in 2010, and that number is expected to rise to 592 million by 2035, affecting one in ten people worldwide by that time [3]. Most of 90-95% of all Diabetes mellitus is Type 2 Diabetes mellitus, which affects 7% of all population[1].

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Number of cases of T2DM is increasing rapidly all over the world and is becoming a serious health issue [4]. The rate is rising rapidly especially in 3rd world countries [5]. Poorly controlled hyperglycemia in diabetes causes long terms organ dysfunction leading to organ failure like eyes, nerves, blood vessels and kidneys [6]. Anemia is a most commonly prevalent in diabetic patients with renal impairment [7-9]. This issue arises due to the kidney failing to produce sufficient erythropoietin [10, 11]. The risk of anemia in diabetic patients is sufficiently higher with kidney disease as compared to the other patient with same renal impairment with different etiologies[12]. When compared to other causes with the same level of renal impairment, anemia can also arise early in diabetic individuals without renal impairment, and more frequent and severe episodes with renal involvement indicate the presence of additional causes of anaemia in these patients [13].

Other possible causes of anemia in diabetic patients may include diabetic neuropathy, chronic inflammatory activities, increased levels of AGEs, anti-diabetic medications, oxidative stress effects and erythropoietin hypo-responsiveness [14]. Prevalence of anemia which is unrecognized in diabetic patients is two to three times greater than general population, as shown by recent studies. Diabetic patients which tends to develop

anemia at early stages of disease, with a severe form, leading to a higher risk of complications, along with co-morbid vascular disease with adverse outcomes [15, 16].

The prevalence rate of anemia in T2DM patients varies in different populations; 20% in Australia [17], 46.5% in Caribbean [18], and 63% in Egypt [19]. Anemia is a most common and neglected complication in DM patients, if it is ignored and left untreated, it may lead to the development and progression of other diabetic-related macro-vascular and micro-vascular complications, leading to a vicious cycle which further enhances anemia[20]. Anemia in patients of T2DM is itself a strong and independent indicator of high risk macro and micro-vascular complication [10]. Complications arise early with rapid progression leading to diabetic neuropathy, diabetic vasculopathy, diabetic retinopathy, diabetic nephropathy, non-healing diabetic foot ulcers with wet or dry gangrene and ischemic heart disease.

Due to increasing incidence of DM as occurring in Pakistan [21], it is necessary and highly recommended to be aware of its co-morbidities as early as possible. Despite all the facts and information on the frequency of anaemia in south Asian nations, including Pakistan, other contributing variables, such as nutritional inadequacies or viral diseases that are quite widespread, are anticipated to exacerbate anemia and its effects. This study will provide very basic and informative data based on anemia and its complications, using important information for further investigation.

MATERIALS AND METHODS

This cross-sectional study was conducted at CMH Hospital Nowshera. Prior to commencement of the study, ethical approval was sought from the hospital management. This study was conducted for a period from June 2021 to January 2022. A total of 300 patients suffering from type 2 diabetes mellitus were included in the study. All the patients having type II diabetes, with age > 18 years, were included in the study. Any patient with any history of blood disorder, pregnant, critically ill, or history of acute or chronic blood loss, or blood transfusion within in the last 3 months were excluded. All patients were obtained from OPD of the hospital. After giving the informed consent each patient was asked to give three samples of blood for measuring fasting blood sugar level on three consecutive days. The socioeconomic characteristics and clinical data of the patients was also recorded. Weight height and the BMI were also calculated. Hypertension will be defined as having SBP >130 and DBP >90 mmhg. Patient who had hemoglobin level as less than 10 mg/dl was considered as anemic. The details of MCV and MCHC were also recorded. According to the findings, it was divided into four categories: mild renal impairment (eGFR 60-89.9 mL/min/1.73 m2), moderate kidney impairments (eGFR 60 mL/min/1.73 m2), and (eGFR 60 mL/min/1.73 m2) were considered as severe renal

impairments. Patients' blood sample was also be taken for CBC estimation. All the data was recorded in a predefined proforma. All the data was collected and entered in the SPSS version 24. The data was then processed using descriptive statistics like cross-tabulation and frequency distribution. Statistical significance was defined as a p value less than 0.05.

RESULTS

Table No.1: Showed demoghraphic characteristics of the study patients

Variable		Frequency	Percentage
Gender	Male	122	40.7%
	Female	178	59.3%
Age	<45	65	21.67%
	45-60	185	61.66%
	>60	50	16.67%
Marital status	Single	55	18.3%
	Married	187	62.3%
	Divorced or widowed	58	19.3%
Employment status	Government employee	135	45%
	Private employee	55	18.3%
	Unemployed	110	36.6 %
Residence	Urban	119	39.66
	Rural	181	60.3%

Table No.2: Showed the clinical characteristics of the study patients

Variable		Frequency	Percentage
Duration of DM	Less than 5 years	78	26 %
	5-10 years	153	51 %
	Greater than 10 years	69	23 %
BMI	Less than 18.5	15	05 %
	18.25-24.9	155	51.6 %
	Greater than 25	130	43.3 %
Serum creatinine level	High	58	19.3 %
	Normal	242	80.67 %
eGFR (mL/min/1.73 m2)	> 90	226	75.3 %
	60–89.9	50	16.67 %
	< 60	24	08 %
Type of diabetic treatment	Oral hypoglycemic	165	55 %
	Insulin	87	29 %
	Combined	48	16 %

Out of 300 patients, the females patients were in majority in our study 178 (59.3%). The mean age of patients in our study was found to be 53.71 ± 10.41 years with a maximum age of 85 years and minimum age of 36 years. Out of the 300 patients, 156 were

married and rest was single. Regarding the residence of patients. 119 (39.66%) were urban residents whereas 181 (60%) were residents of rural areas. In terms of the participants' job situation, 135 (5%) were employed by the government, 55 (18.3%) by a private company, and 110 (36.6%) were unemployed. (Table: 1) the clinical characteristics of the patients are shown in the table 2.

Regarding the average blood sugar level fasting of the patients in our study, it was found out that the mean fasting blood sugar level ranged from 112-321 mg/dl with a mean value of 150 ±47.21 mg/dl and the hypertension status of the patients in our study it was found that 128 (42.67%) patients were hypertensive as per operational definition, out of these 128, 67(22.3%) had > 130 SBP and 61 (20.3%) had > 90 DBP. The hemoglobin level of the patients in our study, the minimum level was found to be 8.9 g/dl to a maximum of 14 .5 g/dl with a mean value of 12.31±1.75. As per definition, the overall incidence of anemia in our study was found to be 26% (n=78). Out of anemic patients 24 (30.7%) had mild and 54 (69.2%) patients had moderate anemia none had severe anemia. The binary logistic regression was used to ascertain association of anemia with the variables as shown in table 3. Strong association was established between anemia and the level of renal eGFR and serum creatinine level.

Table No.3: Showed the association of anemia with different variables of our study cases.

Variable		Anemia	Anemia		P-value
			Yes	No	
Duration of DM	Less than 5 years	78	36	42	0.003
	5-10 years	153	85	68	
	Greater than 10 years	69	36	33	
BMI	Less than 18.5	15	6	9	0.065
	18.25-24.9	155	89	66	
	Greater than 25	130	56	74	
Serum creatinine level	High	58	35	28	0.089
	Normal	242	74	168	
eGFR (mL/min/1.73 m²)	> 90	226	18	208	0.002
	60–89.9	50	23	27	
	< 60	24	16	8	

DISCUSSION

Our study discovered that 26% of type 2 diabetic patients had anemia. Patient age, diabetes duration, eGFR, glycemic control, and complications from diabetes were all linked to anemia prevalence. The study found that anaemia was prevalent in 26% of T2DM patients (95% CI=15.7-25.3%). According to a study from Australia [22] that discovered a prevalence of 23.3%, China [23] that discovered a prevalence of 22.0%, and Iran 19.6% of type 2 diabetic patients were anemic[3]. The change in figures may be due to age, ethnicity, length of diabetes in study participants, geographical distribution above sea level, and other factors. However, the economic development of the nation has a significant impact on the provision of healthcare services. The investigation among T2DM patients showed both common and unique morphological markers of anaemia. The study included almost three-fifth of the participant from the rural population, who has no proper nutrition availability and accessibility to the health services. As dietary status was not assessed in the study, so it is least likely to say that the anemia was due to dietary deficiency. Majority of participants had mild anemia which may also due to the chronic disease such as diabetes.

This study provides the statistical data and co-relation between occurrence of anemia and complication related to diabetes. In patients with long-standing and uncontrolled diabetes micro vascular complications most commonly occur. In terms of odd ratio of developing anemia at least one patient out of four is more likely to develop diabetic complication as compared to those without complications. This study shows the odd ratio that there is three times more chance of developing anemia with poor glycemic control as compare to those with good glycemic control. These findings are comparable to those of Kuwait, Pakistan, Nigeria, and India.[22] As autonomic nervous system controls the synthesis and release of erythropoietin, poorly controlled glucose levels results into diabetic neuropathy, this shows that synthesis of erythropoietin is permanently inhibited in patients with poor glycemic control. More over; due to prolonged poor glycemic control, erythrocytes precursors present in the bone marrow or mature red blood cells might be exposed to the oxidative stress resulting disturbance in their normal functions.

This study is strengthened as it is one of the few studies conducted in developing countries, where chronic diseases and its complications are becoming more common. The limitation of this study is faced due to its study design, difference in age and sex control groups, cause and effect relationship not identified, proper dietary pattern were not assessed, false adjustments of Hb levels with altitude, and above all glycemic levels were assessed on FBG rather than HbA1c. One more limitation was faced based on cutoff point of anemia which was not validated among Pakistani population.

CONCLUSION

Total 26% patients were anemic among the type 2 diabetics. Majority of the patients had mild to moderate anemia. The results of this study, have clearly shows that there is need to start a regular screening program

for anemia in diabetics in the already present diabetic clinic across the country. Timely intervention can help resolving the morbidity and mortality associated with anemia in diabetic patients.

Author's Contribution:

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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