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RESEARCH ARTICLE

A prospective study on incidence of Anaemia in type 2 Diabetes Mellitus Patients

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ABSTRACT:

Aim and objective: This study is to determine the incidence of anaemia in type II diabetes mellitus patients. The study was carried out to determine the incidence of anaemia in type II diabetes mellitus patients, to identify the risk factors leading to anaemia associated with type II DM, to assess the Hb, Fasting Blood Glucose (FBG) and Glycosylated Haemoglobin (HbA1C) levels in diabetes mellitus patients. **Methods:** This prospective study was carried out in the general medicine and surgery department of a tertiary care hospital for a period of 6 months. The case reports of 112 patients with type 2 diabetes mellitus were collected. All statistical analysis was carried out using Graph pad Prism 6.0. **Results:** Anaemia with higher Hb level is observed in patients with type 2 diabetes mellitus. However statistical significant difference was only in Hb levels, Hba1c, FBG, Post-Prandial blood sugar (PPBS) was observed in anaemia with type 2 diabetes mellitus patients (P<0.001). **Conclusion:** A high incidence of anaemia was observed in diabetics without renal insufficiency. Our data also suggested that poor glycemic control and old age are associated with the incidence of anaemia in diabetic patients with normal renal function. Correction of anaemia may have a significant role in prevention of other diabetic complications, thus we recommend that treatment criteria for diabetes should include routine haematological 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.

KEYWORDS: Anaemia, Type 2 diabetes mellitus, risk factors, comorbid conditions.

INTRODUCTION:

Anaemia is a common finding in patients with diabetes and constitutes an additional burden to patients with advancing age and comorbid vascular disease [1]. It is also considered as a key indicator of chronic kidney disease and an important cardiovascular risk factor [2]. Thus, patients with diabetes have a greater degree of anaemia for their level of renal impairment than non-diabetic patients presenting with other causes of renal failure [1-5].

Factors suggested as the reason for the earlier onset of anaemia in patients with diabetes, include severe symptomatic autonomic neuropathy, causing efferent sympathetic denervation of the kidney and loss of appropriate erythropoietin; damage to the renal interstitium; systemic inflammation; and inhibition of erythropoietin release [6]. Patients were classified as anaemic according to the World Health Organization (WHO) criteria (Hb < 12 g/dl for females and <13 g/dl for males) [7]. A second definition of anaemia was also used based on the suggested threshold of Hb < 11 g⁄dl (for both sexes) for the initiation of treatment with erythropoietin for anaemia in chronic kidney disease[8]. The increasing prevalence of type 2 diabetes mellitus has become a major public health concern. The diabetic patient's number has been increasing due to population and urbanization growth increase in the prevalence of obesity and sedentary lifestyle, and the longer survival of

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patients with DM [6]. Diabetes is a highly disabling disease, which can cause blindness, amputations, kidney disease, anaemia, and cardiovascular and brain complications, among others, impairing the functional capacity and autonomy and individual quality of life[9]. Anaemia in diabetic person has a significant adverse effect on quality of life and is associated with disease progression and the development of co-morbidities [10], as obesity and dyslipidemia that are strongly associated with diabetic framework and significantly contribute to increasing the risk of cardiovascular diseases [11, 14]. It is also a leading cause of morbidity and mortality due to complications, including kidney disease, blindness, lower limb amputation, and coronary heart disease [12].

A number of studies have reported the prevalence of anaemia in people with diabetes and have suggested that up to 25% have previously unrecognized anaemia [13, 14]. Recent studies have identified anaemia as a risk factor for the need for renal replacement therapy in diabetes; in addition, lower Hb significantly associated with a more rapid decline in the glomerular filtration rate (GFR). Furthermore, treating anaemia early in renal failure has been demonstrated to slow the rate of decline of renal function [2]. In the present study therefore, we aimed at demonstrating the incidence and risk of anaemia in type 2 diabetic patients with normal renal function. The incidence and risk of anaemia in these patients were assessed according to gender, age, and glycemic control status of the patients.

MATERIALS AND METHODS:

This prospective study was carried out for a period of 6 months from November 2015 to April 2016. Patients selected for the study were inpatients from the General medicine and surgery department of a tertiary care hospital. Case report forms from 112 patients with type 2 diabetes mellitus were collected and assessed for the glycemic control and anaemia. The patient proforma was designed to include the patient demographic details such as age, sex, height, weight, BMI, diagnosis, duration of diabetes, family history of diabetes, occupational history. The lab parameters like HbA1C, HB levels, FBG and PPBS values are collected.

Patient Inclusion Criteria:

Patients with type 2 diabetes mellitus and above 18 years of age.

Patients who are hospitalized (in patients) of general medicine department

Patients with other co-morbid conditions such as hypertension, cardio vascular diseases, Diabetic nephropathy etc.

Patient Exclusion criteria:

Patients who were not willing to give the informed consent.

Patients with uterine bleeding.

Patients with those with chronic illnesses; those with recent blood loss or donated blood recently; those who have hemolytic anaemia or sickle-cell disease and other systemic disorders that could result in anaemia.

The values obtained were averaged for analysis. The collected data were analysed by using Microsoft excel and graph pad prism software. Using these softwares percentage, mean, standard deviation, p-values were calculated.

RESULTS:

The study was designed to assess the incidence of anaemia in type 2 diabetes mellitus. This study comprising of 112 patients with type 2 diabetes mellitus selected based on inclusion and exclusion criteria, the demographic details of the patients were collected. The distribution based on age and gender is shown in Table 1 and Table 2, respectively.

Table 1. Distribution based on age

S.NO.	AGE IN YEARS	NO. OF PATIENTS (n =112)	PERCENTAGE (%)
1	35-40	10	8.92
2	41-45	11	9.82
3	46-50	21	18.75
4	51-55	27	24.1
5	56-60	13	11.8
6	61-65	14	12.6
7	66-70	11	9.82
8	71-75	5	4.19

Table 2. Distribution based on gender

S.NO.	GENDER	NO.OF PATIENTS (n=112)	PERCENTAGE (%)
1	Males	59	53
2	Females	53	47

The distribution based on comorbid disease conditions and occupation is depicted in Table 3 and Table 4.

Table 3. Distribution based on comorbidity

Co morbidity	No. of patients (n=112)	Percentage (%)
Hypertension	23	20.53
cardiovascular patients	10	8.92
Dyslipidemia	21	18.75
Stroke	5	4.46
Gastrointestinal disease	6	5.35
Diabetic retinopathy	12	10.71
Diabetic neuropathy	11	9.86
Diabetic foot ulcers	9	8.04
Joint disorders	6	5.35
Liver impairment	7	6.25
Respiratory disorders	2	1.78

Table 4. Distribution based on occupation

S.NO.	Occupation	No. of patients (n=112)	Percentage (%)
1	Unemployed	37	33.04
2	Plumber	13	11.6
3	Tailors	8	7.14
4	Carpenter	15	13.39
5	Students	10	8.94
6	Employed in companies	29	25.89

The diabetic parameters such as age, Hba1c, Hb levels, FBG, PPBS, serum creatinine for all diabetes group is shown in Table 5. The clinical parameters compared between the controlled and poorly controlled diabetic people and the genders are shown in Table 6 and Table 7, respectively.

Table 5. Determination of parameters in all diabetics group

Clinical Parameters	All diabetics (n=112) (Mean±SD)	p value
Age	53.27±8.82	*<0.0001
Hba1c	9.518±1.826	*<0.0001
Hb levels	11.860±2.124	*<0.0001
FBG	154.90±26.94	*<0.0001
PPBS	234.81±41.60	*<0.0001
Creatinine	37.944(± 27.980)	*0.0036

Table 6. Determination of parameters in poorly controlled and controlled diabetics group

Parameters	Poorly controlled diabetics (n=45), (Mean±SD)	Controlled diabetes, (n=67) (Mean±SD)	P value
Age	54.82±8.03	51.59(±9.89)	*0.0584
Hba1c	10.639±1.290	7.771(±0.861)	*<0.0001
Hb levels	11.633±2.156	12.156(±2.167)	0.2120
FBG	164.24±27.44	139.96(±10.91)	*<0.0001
PPBS	257.46±35.08	208.11(±31.19)	*<0.0001
Creatinine	38.650(±26.479)	34.150 (±28.251)	0.7175

Table 7. Comparison of Clinical parameters between the genders

Parameters	Diabetic males (n=59) (Mean±SD)	diabetic females (n=53) (Mean±SD)	P value
Age	54.74(±9.02	51.83(±8.55)	*0.0844
Hba1c	9.619(±1.974)	9.462(±1.609)	0.6495
Hb levels	12.397(±2.392)	11.234(±1.711)	*0.0041
FBG	156.54(±29.77)	153.55(±23.30)	0.5576
PPBS	238.4(±40.82)	231.51(±40.20)	0.3658
Creatinine	26.90(±16.613)	31.125(±16.943)	0.7175

The comparison of clinical parameters between the age above >60years and below <60 years, The incidence of anaemia in type 2 diabetes mellitus patients of the study population is shown in Table 8 and 9, respectively.

Table 8. Comparison of Clinical parameters between the age above >60years and below <60 years

Parameters	Above >60 years (n=30) (Mean±SD)	Below <60 years (n=82) (Mean±SD)	p-value
Age	65.30(±3.51)	49.68(±6.49)	*0.0001
Hba1c	10.133(±1.881)	9.345(±2.058)	0.0692
Hb levels	11.477(±2.589)	12.045(±1.998)	0.2194
FBG	150.43(±21.89	157.32(±29.54)	0.2472
PPBS	230.97(±39.55)	238.22(±41.46)	0.4085
Sr. Creatinine	58.500 (±16.364)	33.917(±16.943)	0.1586

Table 9. The incidence of anaemia in diabetic patients according to glycemic control, gender and age categories

Parameters	All diabetics (n=112), (Mean±SD	Poorly controlled diabetics (n=45) vs. controlled diabetics (n=67), (Mean±SD)	Diabetic males (n=59) vs. diabetic females (n=53), (Mean±SD)	Diabetics >60yrs (n=30) vs. diabetics <60yrs (n=82), (Mean±SD)
Age	53.27(±8.82)	54.82 (±8.03) vs. 51.58(±9.89)	54.74(±9.02) vs. 51.83(±8.55)	65.3 (±3.51)vs. 49.68(±6.49)
Hba1c	9.51(±1.82)	10.63 (±1.29)vs. 7.78(±0.86)	9.62(±1.97) vs. 9.46(±1.69)	10.13(±1.88) vs. 9.35(±2.58)
Hb levels	11.86(±2.12)	11.63(±2.15)vs. 12.1(±2.16)	12.40(±2.39) vs. 11.23(±1.71)	11.48(±2.59) vs. 12.05(±1.99)
FBG	154.9(±26.94)	164.23 (±27.44)vs. 139.95(±10.91)	156.54 (±29.77)vs. 153.54(±23.30)	150.43(±21.89) vs. 157.32(±29.54)
PPBS	234.81(±41.6)	257.46(±35.08)vs. 208.11(±31.19)	238.47 (±40.82)vs. 231.50(±40.20)	230.96(±39.55) vs. 238.21(±41.46)

DISCUSSION:

In our study population, the mean Hb levels was high in persons with controlled diabetes compared to persons with poorly controlled diabetes and in patients of age < 60 yrs compared to those who are ≥60 yrs but was not significant as compared to the previous studies[15]. The mean Hb levels were significantly high in males when compared to females (*0.0041) in contrast to previous studies[15]. The Hba1c levels were 9.51 (±1.82) in all

diabetics, 10.63 (±1.29) in poorly controlled diabetics, 7.78 (±0.86) in controlled diabetics, 9.62(±1.97) in males and 9.46(±1.69) in females, 10.13(±1.88) in above >60 years and 9.35(±2.58) below <60 years were reported in concordance with the previous study[2, 16]. The FBG values showed significant difference between the controlled and poorly controlled diabetics group (*<0.0001) but there was no significant difference observed between the diabetic males vs. diabetic females and diabetics >60yrs vs. diabetics <60yrs. The PPBS values also showed significant difference between the controlled and poorly controlled diabetics group (*<0.0001) but there was no significant difference observed between the diabetic males vs. diabetic females and diabetics >60yrs vs. diabetics <60yrs. Our study shows that patients with diabetes may be more vulnerable to the effects of anaemia because many also have significant increase in comorbid conditions as stated in previous studies[17-19].

CONCLUSION:

A high incidence of anaemia was observed in diabetics without renal disorders. Poor glycemic control was associated with the incidence of anaemia in type 2 diabetic patients in our study population. Thus routine haematological tests are recommended for correction of anaemia in the diabetic patients of poor glycemic control.

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