Original Article

Prevalence of anaemia in females with type-II diabetes mellitus

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Abstract

It is a well-known fact and proven that industrialization and modernization has landed in sedentary lifestyle, obesity and higher risk of metabolic disorder, of which diabetes and hypertension are predominant, that are commonly reported in clinical medicine. In the present study prevalence of anemia in female patients with type II diabetes mellitus patients who had been followed for a median of seven years has been considered and classification of anemia based on wintrobe's constant and RDW along with the other common hematological parameters hailing from rural areas in and around Chidambaram, Cuddalore district, Tamilnadu, India has been made. A total of randomly selected 87 type II diabetes mellitus females aging above 20 years attending diabetic OPD regularly in Rajah Muthiah Medical College and Hospital during the period of July to December 2016 were included in this study. 57.62% of subject with female preponderance out of 151 cases reported during the above period. Normocytic normochromic anemia was the most common type anemia that is reported.

Key Words: Anaemia, gender, Type 2 diabetes mellitus, hematological parameters.

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INTRODUCTION

Diabetes mellitus is a metabolic disorder which is more prone for anaemia, has emerged as a major health problem due to changes in the lifestyle, food habits and development of the country like urbanization and industrialisation[1]. As per the statistical data, India is the diabetic capital of the world. Anaemia is a common finding in patients with Type II diabetes mellitus[2]. The prevalence of anaemia in cross- sectional studies of patients with diabetes mellitus range from 14-23%, where anemia defined with Hemoglobin < 13 g/dl in males and < 12g/dl in females[3]. The development of diabetes mellitus causes nephropathy which in turn cause a further decrease in the renal production of Erythropoietin that leads to anemia[4].Anaemia is associated with an increased risk of vascular complications of diabetes including retinopathy, neuropathy and impaired wound healing[5].

MATERIAL AND METHODS

The present study was conducted for a period of 6 months from July to December 2016, at Rajah Muthiah Medical College and Hospital, Chidambaram, Tamil Nadu. The investigation was done as a part of health checkup in diabetic patients attending the diabetic OPD regularly.

Instruments used are

- Automated Cell Counter (Model And Company: Mythic 18, Orphee Sa, C2 Diagnostics, France).
- Automated Clinical Chemistry- Colorimetric- Imola, Rx Series, Randox, Uk.
- Immulite 1006 Systems, Diagnostic Product Corporation, USA.

Sample collection

After getting informed written consent from the patients, under aseptic precautions, blood collected from antecubital vein and immediately transferred into sterile

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vacutainer tubes with di- potassium EDTA as anticoagulant. All the samples were analyzed for hematological parameters like hemoglobin (Hb), Hematocrit, Red Blood Cells (RBC), Mean Corpuscular Volume (MCV), Red cell distribution width (RDW) using automated cell counter.

Inclusion Criteria

The female patients aged above 20 years with Type II diabetes Mellitus were included in the present study.

Exclusion Criteria

Type I Diabetes Mellitus, Cases with Hematological diseases and pregnant female patients.

OBSERVATION

The present study was done on 151 cases of Type II Diabetes Mellitus, which included 64 males (42.38%) and 87 females (57.62%). The female patients were divided into groups based upon the age. 48 cases (31.78%) were present in group IV. Criteria for diagnosis of anaemia patients were classified as anaemic as per the WHO criteria, in non-pregnant females less than 12g/dl. Anaemia is further classified based on hematological parameters like Hb level and red blood cell indices. Based upon the hemoglobin values, the patients were subdivided into mild, moderate and severe anemia.[6].

Moderate anemia was the most common type which was found in 28 females (46.7%), followed by mild anemia which included 20 females (33.3%) and 12 females (20%) were in the severe anemia category. Hematocrit values were categorized as less than 36% which include 46 females (52.9%) and more than 36% which included 41 females (47.1%). MCV Values were ranged as less than 80fL which included 31 cases (35.6%), 80-95fL with 54 cases (62.1%) and 2 cases (2.3%) with more than 95fL. In the present study, RDW ranged from 11.5 to 14.5 which included 72 cases (82.8%) and more than 14.5 included 15 cases (17.2%). Based upon MCV and RDW the commonest type of anemia was Normocytic Normochromic followed by Microcytic Hypochromic anemia and then Macrocytic anemia.

Tables and Figures

I. Groups in Present Study

GROUP- I	21-30years
GROUP- II	31-40 years
GROUP- III	41-50 years
GROUP- IV	51-60 years
GROUP- V	61-70 years
GROUP- VI	>70 years

Table 1: Distribution of cases in the present study

No. of Cases	Male	Female
151 (100%)	64 (42.38%)	87 (57.62%)

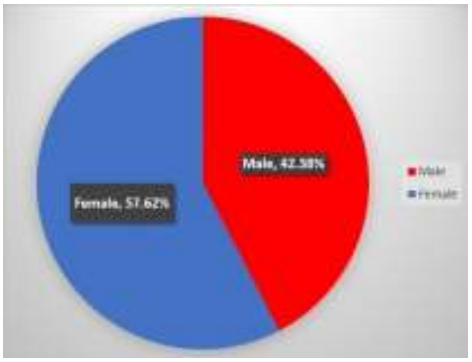

Figure 1

Table 2: Age wise distribution

GROUPS	GROUP- I (21-30)	GROUP- II (31-40)	GROUP- III (41-50)	GROUP- IV (51-60)	GROUP- V (61-70)	GROUP- VI (Above 70)	TOTAL
NO.OF. CASES and %	8 (5.29%)	17 (11.25%)	39 (25.82%)	48 (31.78%)	30 (19.86%)	9 (5.96%)	151 (100%)

Table 3: Sex wise distribution

AGE GROUP (in years)	MALE	PERCENTAGE	FEMALE	PERCENTAGE
GROUP- I (21-30)	4	6.3%	4	4.7%
GROUP- II (31-40)	8	12.5%	9	10.3%
GROUP- III (41-50)	10	15.6%	29	33.3%
GROUP- IV (51-60)	17	26.6%	31	35.7%
GROUP- V (61-70)	19	29.6%	11	12.6%
GROUP- VI (>70)	6	9.4%	3	3.4%
TOTAL	**64**	**42.38%**	**87%**	**57.62%**

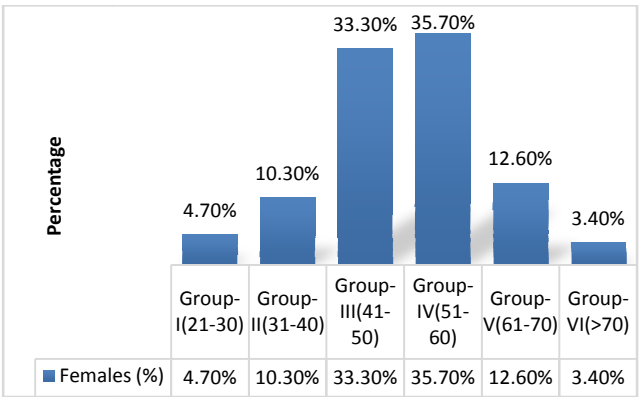

Figure 2

Table 4: Hemoglobin values in the study group

GROUPS RANGE (g/dl)	GROUP- I (21-30)	GROUP- II (31-40)	GROUP- III (41-50)	GROUP- IV (51-60)	GROUP- V (61-70)	GROUP- VI (Above 70)	TOTAL
11– 12 (Mild)	0 (0%)	3 (15%)	7 (35%)	8 (40%)	2 (10%)	0 (0%)	20 (33.3%)
8 – 11 (Moderate)	1 (3.6%)	1 (3.6%)	6 (21.4%)	12 (42.9)	6 (21.4%)	2 (7.1%)	28 (46.7%)
<8 (Severe)	0 (0%)	1 (8.3%)	4 (33.4%)	6 (50%)	1 (8.3%)	0 0%)	12 (20%)

Table 5: Hematocrit values in the study group

GROUPS RANGE	GROUP- I (21-30)	GROUP- II (31-40)	GROUP- III (41-50)	GROUP- IV (51-60)	GROUP- V (61-70)	GROUP- VI (Above 70)	TOTAL
<36	1 (2.2%)	4 (8.7%)	13 (28.3%)	19 (41.3%)	7 (15.2%)	2 (4.3%)	46 (52.9%)
>36	3 (7.3%)	5 (12.2%)	16 (39.0%)	12 (29.3%)	4 (9.8%)	1 (2.4%)	41 (47.1%)

Table 6: RBC count in the study group

GROUPS RANGE (million/cumm)	GROUP- I (21-30)	GROUP- II (31-40)	GROUP- III (41-50)	GROUP- IV (51-60)	GROUP- V (61-70)	GROUP- VI (Above 70)	TOTAL
<4.5	2 (4%)	5 (10%)	10 (20%)	23 (46%)	7 (14%)	3 (6%)	50 (57.5%)
4.5 – 5	2 (5.4%)	4 (10.8%)	19 (51.4%)	8 (21.6%)	4 (10.8%)	0 (0%)	37 (42.5%)

Table 7: MCV VALUES IN THE STUDY GROUP

GROUPS RANGE (fL)	GROUP- I (21-30)	GROUP- II (31-40)	GROUP- III (41-50)	GROUP- IV (51-60)	GROUP- V (61-70)	GROUP- VI (Above 70)	TOTAL
<80	2 (6.4%)	1 (3.2%)	12 (38.8%)	12 (38.8%)	4 (12.8%)	0 (0%)	31 (35.6%)
80-95	2 (3.7%)	8 (14.8%)	17 (31.5%)	17 (31.5%)	7 (12.9%)	3 (5.6%)	54 (62.1%)
>95	0 (0%)	0 (0%)	0 (0%)	2 (100%)	0 (0%)	0 (0%)	2 (2.3%)

Table 8: RDW VALUES IN THE STUDY GROUP

GROUPS RANGE	GROUP- I (21-30)	GROUP- II (31-40)	GROUP- III (41-50)	GROUP- IV (51-60)	GROUP- V (61-70)	GROUP- VI (Above 70)	TOTAL
11.5- 14.5	4 (5.6%)	5 (6.9%)	26 (36.1%)	26 (36.1%)	8 (11.1%)	3 (4.2%)	72 (82.8%)
>14.5	0 (0%)	4 (26.7%)	3 (20%)	5 (33.3%)	3 (20%)	0 (0%)	15 (17.2%)

DISCUSSION

In the present study, of the total 151 cases, 87 were females and 64 were males. Diabetic females are six times more prone to be anaemia than males which leads to earlier onset of kidney disease which in turn further aggravates anaemia. Hence in our study focus has been made to find out the prevalence of type II diabetes mellitus in female patients. The earliest duration of diabetes which would affects Hb significantly was 7 to 8 years in female. A large number of these females belong to group IV, the reason being that the female patients are from rural population. Causes for chronic blood loss which include menorrhagia, piles and fissures, if treated early could prevent development of anaemia. But, due to ignorance of the patients, they proceed to normocytic normochromic anaemia. Inadequate intake of nutrients could also be an added factor for the development of normocytic normochromic anaemia. The study defined anemia as less than 12g/dl and further categorized into mild with 20 cases (33.3%), moderate with 28 cases (46.7%) and severe with 12 cases (20%). Of these, maximum cases were found in the moderate category followed by mild and then severe. Bessman *et al* (1983) proposed, classification of anemia based upon mean corpuscular volume (MCV) and Red cell distribution width (RDW)[7] and is classified into six Types. They are:

1. Microcytic Heterogeneous.
2. Microcytic Homogeneous.
3. Normocytic Heterogeneous.
4. Normocytic Homogeneous.
5. Macrocytic Heterogeneous.
6. Macrocytic Homogeneous.

In the present study, according to the above classification, five types of anaemia were observed.

Sl. No	Types of Anaemia	No of cases
1	Microcytic Heterogeneous	11
2	Microcytic Homogeneous	20
3	Normocytic Heterogeneous	04
4	Normocytic Homogeneous	50
5	Macrocytic Heterogeneous	02

Among the 87 female patients, 11 patients had Microcytic Heterogeneous type of anaemia due to iron deficiency anaemia, 20 patients had Microcytic Homogeneous type due to chronic disease, 4 cases with Normocytic Heterogeneous type due to early iron deficiency anaemia.

In the present study, we have noticed 50 cases with Normocytic Homogeneous type. Increased incidence of this type may be due to acute or chronic blood loss, some associated disorders like renal failure, infections, liver diseases, bone marrow infiltration, endocrine disorders like hypothyroidism, hypopituitarism, malnutrition etc. Vitamin B_{12} deficiency anaemia is highly prevalent in type II diabetes mellitus. The probable reason being the usage of metformin in all cases of type II diabetes mellitus which is known to decrease the absorption of Vitamin B_{12}[8]. But in our study the incidence of Macrocytic anaemia in type II diabetes mellitus is noticed only in 2 cases probably due to the administration of oral B-complex vitamins as well as parenteral administration of B_{12} vitamin. Many factors have been suggested as the reason for anaemia in patients with diabetes mellitus, including autonomic neuropathy, systemic inflammation and changes in the renal tubulo-interstitium disrupting the interaction between interstitial fibroblasts, capillaries and tubular cells required for normal hemopoietic function. Autonomic neuropathy can decrease sympathetic stimulation for erythropoietin production through renal denervation. Moreover, the effect of diabetes mellitus on tissue responsible for synthesis of erythropoietin reduces kidney response to hypoxia[9]. Women with diabetes have increased incidence of anaemia than men**.** A previous study on adiabetic patient with normal renal function has shown that longstanding poorly controlled diabetes is associated with normocytic-normochromic anaemia. Most of the studies suggested that poor glycemic control and old age associated with the incidence of anaemia in diabetic patients with normal renal fuction[10]**.** Hyperglycemia has a direct relationship with increased expression of pro inflammatory cytokines such as IL-6, TNF-α and NFκB. By the elevation of proinflammatory cytokines, especially IL-6, antierythropoietic effect occurs. Since this cytokine changes the sensitivity of progenitors to erythropoietin and also promotes apoptosis of immature erythrocytes causing a decrease in circulating erythrocytes and consequently causing a reduction of circulating hemoglobin. Adding to that IL-6 also enhance the production and secretion of hepcidin, a hepatic protein that inhibits intestinal iron absorption and impairs iron transport from the reticuloendothelial system to bone marrow. The inflammatory situation created by

kidney diseases also interferes with intestinal iron absorption.

CONCLUSION

We conclude from our study that 69% of Type II diabetic females were anemic with hemoglobin less than 12 g/dl, mainly of normocytic normochromic anemia. Because of the prevalence of anemia, the hematological profile should be included as a routine screening investigation to diagnose the type of anemia and treat accordingly. Treating anemia in type II diabetic females will definitely improve the quality of life and retard the progress of diabetic complications thereby decrease the morbidity.

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