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Original Research Paper

Pathology

A STUDY TO EVALUATE THE EFFECT OF ANAEMIA IN TYPE-2 DIABETIC PATIENTS

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ABSTRACT

Introduction: As the tribulation of diabetes escalates, developing countries like India is expected to be the diabetic capital in the world in coming years. Diabetes Mellitus progressively results in various complications including both microvascular and macrovascular disorders. The nephropathy undermines the renal production of erythropoietin, positively contributing to an increased anaemic framework. However, anaemia in type 2 diabetic patients is often untended.

Aims And Objectives:

- To correlate the levels of haemoglobin with the degree of glycaemic control (HbA1c>6.5% vs HbA1c<6.5%)
- To determine the morphology and severity of anaemia in type 2 diabetic patients.
- To know prevalence of other comorbidities as a result of anaemia and diabetes.

Materials And Methods: A prospective observational study was conducted in 100 type 2 diabetic patients visiting the Out Patient Department in Acs Medical College and Hospital, Chennai.

Haemoglobin and red cell indices were estimated.

Comorbidities like hypertension, chronic kidney disease, arthritis and retinopathy were recorded.

Peripheral blood smear examination was done using leishman's stain.

Ion exchange chromatography was used to measure the HbA1c levels.

Results: In the poor glycaemic control group, a significant decrease in the haemoglobin levels was noted especially in females and elderly population. Microcytic Hypochromic Anaemia was the most prevalent which was of mild to moderate severity. Predominantly reduced iron stores in Microcytic Hypochromic Anaemia were attributed to increased HbA1c levels. The poor control of diabetes when associated with anaemia, were also found to have comorbidities like hypertension, chronic kidney disease, arthritis and retinopathy.

Conclusion: To conclude, though anaemia is significantly prevalent in diabetic patients, it is often neglected. In accordance with the study, poor glycaemic control is the result of increased glycation of haemoglobin A1c (HbA1c) due to reduced iron stores. Hence in diabetic patients, it would be beneficial to assess haemoglobin levels often, for better quality of life.

KEYWORDS : Anaemia, Type 2 Diabetes Mellitus, Poor glycemic control, Comorbidities.

INTRODUCTION

Anaemia is defined as a reduction in the haemoglobin concentration of blood, which consequently reduces the oxygen carrying capacity of red blood cells such that they are unable to meet the body's physiological needs.[1]

Anaemia in diabetic person has a significant adverse effect on quality of life and is associated with disease progression.[2] The diabetic framework along with anaemia is strongly associated with the development of comorbidities as obesity and dyslipidaemia and significantly contributes to increased risk of cardiovascular diseases.[3]

Diabetes is fast gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease.[4] In 2000, India (31.7 million) topped the world with the highest number of people with diabetes mellitus followed by China (20.8 million) with the United States (17.7 million) in second and third place respectively.[5] Several studies suggest that anaemia is twice as common in diabetics compared with nondiabetics.[4] Though anaemia develops earlier and is more severe in patients with diabetes, anaemia is unrecognized in 25% of the diabetic patients. [6] Thus, the present study is to evaluate the prevalence of anaemia in a sample of patients with type 2 diabetes.

METHOD AND MATERIALS

A prospective observational study conducted in 100 type 2 diabetic patients visiting the Out Patient Department in ACS Medical College and Hospital, Chennai. All patients' demographic features (age, sex, and residency) were recorded.

After obtaining informed written consent, all diabetics were subjected to detailed history taking and investigations as follows: glycated haemoglobin, complete blood count, peripheral smear for type of anaemia using Leishman's stain, Hb% and red cell indices. Ion exchange chromatography was used to measure the HbA1c levels. All the collected data was analysed using Google Data Studio.

The presence of anaemia was considered as the dependent variable; the patient was considered anaemic, when the blood count haemoglobin was < 12 g/dl.

Patients were then placed in two groups on the basis of their glycated haemoglobin values as one with good control (HbA1c <6.5 %) and other with poor control (HbA1c >6.5%).

The independent variables analysed were as follows:

(a) Sociodemographic characteristics:

- Age (in years); Sex (female/male).

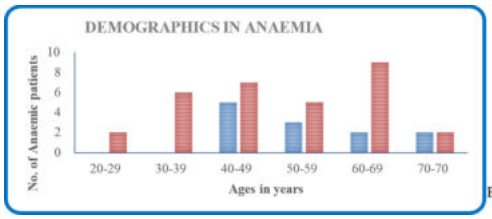
(b) Health condition:

- Diabetic control (on the basis of HbA1c values)
- Advanced age (over 60 years).

© Comorbidities (Yes/No)
- Hypertension
- Chronic Kidney Disease
- Arthritis
- Retinopathy

RESULTS

- In the poor glycaemic control group, a significant decrease in the haemoglobin levels was noted especially in females and elderly population as demonstrated in Bar-diagram-01.

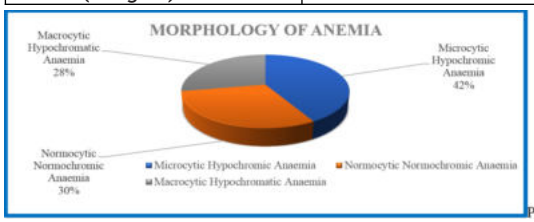


Bar-diagram-01

- Microcytic Hypochromic Anaemia was the most prevalent which was of mild to moderate severity concluded from the given table and illustrated in Pie-Chart Pie-chart.

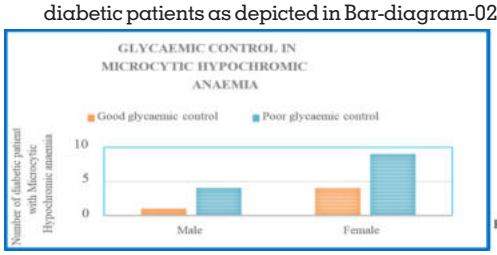
Severity Of Anaemia In Diabetic Patients

(Hb in g/dl)	Number of diabetic patient
No anaemia (> 12 g/dl)	57
Mild (11-11.9 g/dl)	17
Moderate (8-10.9 g/dl)	21
Severe (< 8 g/dl)	5



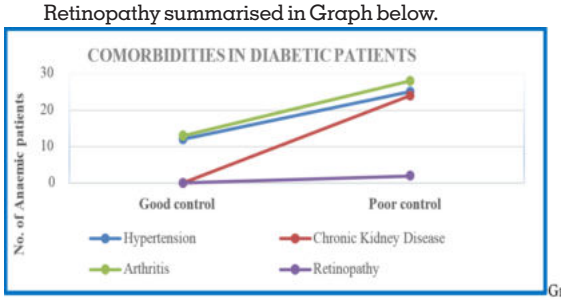
Pie-chart

- Predominantly reduced iron stores in Microcytic Hypochromic Anaemia were attributed to increased HbA1c levels resulting in poor glycaemic control in diabetic patients as depicted in Bar-diagram-02



Bar-diagram-02

- The poor control of diabetes when associated with anaemia, were also found to have comorbidities like Hypertension, Chronic Kidney Disease, Arthritis and Retinopathy summarised in Graph below.



Graph

DISCUSSION

Diabetes is spiking in India at the rate of a potential epidemic. Alarmingly, India is expected to be the Diabetic Capital of the World.[4] The etiology of diabetes is multifactorial. It not only alters the physiology of the human body but is also accompanied by renal insufficiency, inflammation, and oxidative stress which leads to unsatisfactory prognosis of the diseases. Anemia is expected to be present in 11–65% of diabetics which is also known as anemia of chronic disease or anemia of inflammation.[7]

In the present study, of 100 type 2 diabetic patients, 43 people were diagnosed with anaemia. Of this 43% anaemic population, 17% had mild anaemia, 21% with moderate anaemia and severe anaemia was seen in remaining 5% people. This results are in accordance with earlier studies stating that anaemia of chronic disease is predominantly of mild to moderate type.[8] Similarly, correlation of the severity of anaemia with glycemic control as indicated by glycated hemoglobin is required, as poor glycemic control in diabetes further contributes to the development of anaemia and upregulates it's severity.[2]

Anaemia is more prevalent in elderly and female diabetic patients as concluded by our study. These results are in accordance with reports which have suggested that in developing countries, the majority of patients with diabetes are of age group ranging from mid-forties to mid-sixties.[9] Earlier studies also state that prevalence of anaemia is higher in females due to inadequate dietary intake in women of developing countries like India and also less importance given to their own health due to lack of empowerment.[10]

The morphology of anaemia was analysed by MCV, MCH and MCHC values and confirmed by peripheral blood smear study. The most common morphology found was Microcytic Hypochromic (42%), followed by Normocytic Normochromic (30%). As mentioned earlier, diabetes affect the iron metabolism and absorption thus resulting in Iron Deficiency Anaemia. Also, inadequate dietary intake of iron rich food as subjects were mostly from rural areas, adds up to culminate in Iron Deficiency Anaemia. The most common cause of Microcytic Hypochromic Anaemia is Iron Deficiency Anaemia, therefore our result of Microcytic Hypochromic RBCs being the most common morphology is justified despite this results are not in concurrence with previous studies in India stating that Normocytic Normochromic RBCs are more common in diabetic patients.[11,12]

The study subjects were placed in two groups – good glycemic control group (HbA1c <6.5%) and poor glycemic control group (HbA1c >6.5%). It was observed that anaemia was more prevalent in poor glycemic control group. In patients with poorly controlled diabetes, the erythrocyte precursors of the none marrow are prone to prolonged direct toxicity from glucose excess or the mature erythrocytes can be affected by oxidative stress leading to disturbances in the erythrocyte function.[13] Also due to reduced iron stores, there is increased glycation of haemoglobin A1c (HbA1c), resulting in poor control of diabetes.[14]

A recent international study reported that diabetes control in individuals worsened with longer duration of disease [15] and usually accompanies with other diabetic complications.[16] In current study, comorbidities like Arthritis (41%), Hypertension (37%), Chronic Kidney Disease (24%) and Retinopathy (2%) were noted with their prevalence more in poor diabetic control group.

CONCLUSION

Anaemia is a common accompaniment with diabetes and it is seen early even in the absence of renal impairment. So, it may have further role in the development and progression of both micro and macrovascular complications. To conclude, though anaemia is significantly prevalent in females and elderly diabetic patients, it is often neglected. In accordance with the study, poor glycaemic control is the result of increased glycation of haemoglobin A1c (HbA1c) due to reduced iron

stores. The poor glycaemic control in diabetic patients can also incite other comorbidities. Hence in diabetic patients, it would be beneficial to assess haemoglobin levels often, for better quality of life.

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Conflicts of Interest :

There are no conflicts of interest.

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