

# Research Journal of Pharmaceutical, Biological and Chemical Sciences

## Prevalence of Anaemia in Uncontrolled Type 2 Diabetes Mellitus.

Noorul Ameen<sup>1</sup>, Aafrin Shabbir<sup>2</sup>, and S Habeeb Ahmed Abdul Kaiyoom<sup>2\*</sup>.

<sup>1</sup>Department of Medicine, Sree Balaji Medical College & Hospital, Bharath University, Chrompet, Chennai, Tamil Nadu, India.

<sup>2</sup>Department of General Medicine, Sree Balaji Medical College & Hospital, Bharath University, Chrompet, Chennai, Tamil Nadu, India.

### ABSTRACT

Anemia is the most common blood disorder and a very common finding in patients with diabetes or in patients having poor control of HbA1c. Coagulation disorders, hematological changes may occur as a consequence of disease affecting any system, and measurement of hematological parameters is an important part of routine clinical assessment. A study comprising of 100 Type 2 diabetes mellitus patient was done in balaji medical college and hospital and the patients hemoglobin and hba1c levels were recorded. The patient selected had no history of renal diseases and were diabetics with no other co morbid state. The study was done to correlate between hemoglobin and hba1c. According to the study 70% of individuals with bad control of HbA1c had mild anemia and 25% of people with bad control of HbA1c had moderate anemia. Patients with decreased hemoglobin (mild to moderate anemia) have high glycated hemoglobin. Therefore, anemia is a common accompaniment to diabetes.

**Keywords:** anaemia, Type 2 Diabetes mellitus.

*\*Corresponding author*

## INTRODUCTION

Anemia refers to a state in which the level of hemoglobin (Hb) in the blood is below the normal range appropriate for age and sex. HbA<sub>1c</sub> is measured primarily to identify the average plasma glucose concentration over prolonged periods of time. It is formed in a non enzymatic glycation pathway by hemoglobin exposure to plasma glucose. In diabetes mellitus the higher the glycated hemoglobin, the poorer the indicator of blood glucose levels. HbA<sub>1c</sub> estimates may be erroneously diminished in anemia and pregnancy.

## MATERIALS AND METHODS

### Study Design

The design of the present study is cross sectional. This study is aimed to observe the hemoglobin levels in Type 2 Diabetes Mellitus in connection with HbA<sub>1c</sub>.

### Study area

Diabetic outpatients attending the Department of General Medicine, SreeBalaji Medical College and Hospital (Tertiary Care), Chromepet, Chennai, India.

### Study Duration

August 2013 to September 2013

### Study population

This study was conducted in the Department of Medicine and Department of Diabetology, SreeBalaji Medical College, Chennai, Tamil Nadu. The Type 2 Diabetes patients were included based on the selection criteria. Out of 100 patients selected, there were 33 males and 67 females whose age was ranging from 35 years and above.

### Inclusion criteria

- Individuals were classified as having diabetes if any of the following criteria were met:

Fasting glucose level of atleast 7.0 mmol/l (126 mg/dl)  
Non fasting glucose level of at least 11.1 mmol/l (200 mg/dl)  
Current use of anti-diabetes medication.

- Type 2 diabetic patients of duration more than 5 years.
- On oral hypoglycemic agents.
- Diabetic nephropathy ruled out. Normal renal function.
- Age more than 35 years.

### Exclusion criteria

- Patients on insulin.
- Type 2 DM less than 5 years.
- Age less than 35 years.
- Patients with known renal disease.

## RESULTS

In the present study 100 type 2 diabetes mellitus patients were selected who were on regular treatment with oral hypoglycemic agents. The study population comprised of 100 patients out of which 67

were females and 33 were males. The patients selected were between 35 years to 60 years and the duration of diabetes ranged between 5 to 10 years. According to the study it has also been clear that mild to moderate degree of anaemia exist among people who have poor control of HbA1c. 70% of patients with bad control of HbA1c had mild anaemia. And 25% of patients with bad control of HbA1c had moderate anaemia. Therefore, it is proved that Hemoglobin values were significantly higher when compared to persons with poor control of HbA1c. Therefore, poor control of diabetes was associated with anemia and HbA1c was increased with patients with anemia.

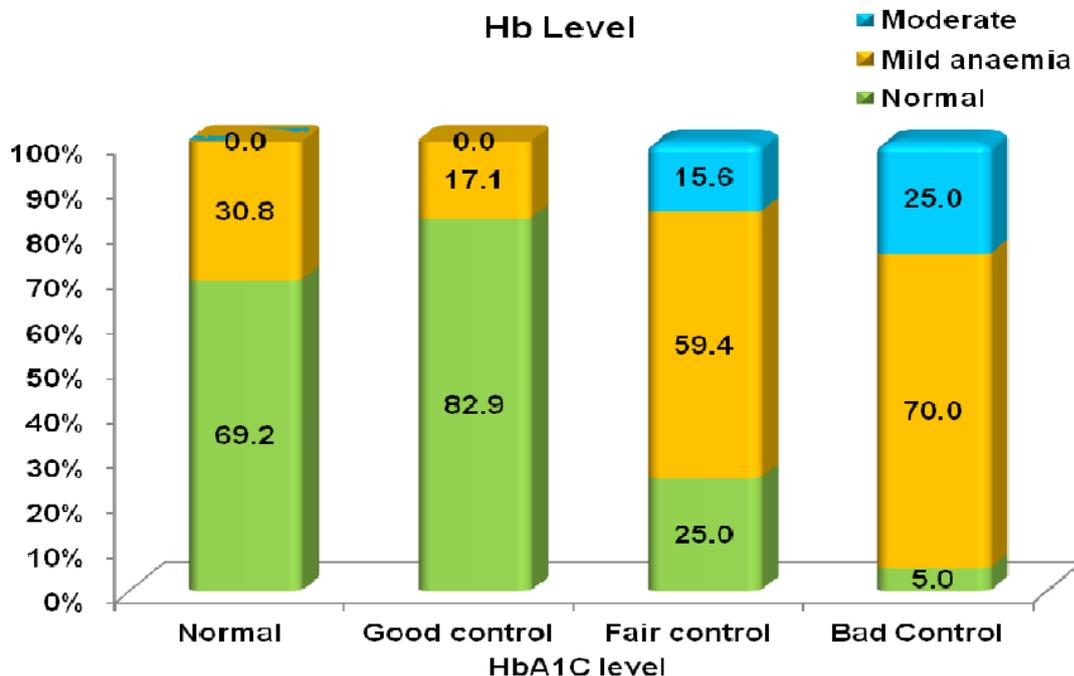
**Table 1: Correlation between the HbA1C levels and Hb levels**

Hb Level (g/dl)	HbA1C level at visit 1								Total	
	Normal		Good control		Fair control		Bad Control			
	N	%	N	%	N	%	N	%	N	%
Normal	9	69.2	29	82.9	8	25.0	1	5.0	47	47.0
Mild anaemia	4	30.8	6	17.1	19	59.4	14	70.0	43	43.0
Moderate	0	0.0	0	0.0	5	15.6	5	25.0	10	10.0
Total	13	100.0	35	100.0	32	100.0	20	100.0	100	100.0

**Chi-Square test to compare the HbA1c levels and Hb Levels**

Chi-Square Test	P-Value
Fisher's Exact Test	<0.001

1. The table shows 70% of individuals with bad control of HbA1c and mild anemia.
2. 25% of people with bad control of HbA1c had moderate anemia



**DISCUSSION**

Anemia refers to a state in which the level of hemoglobin (Hb) in the blood is below the normal range appropriate for age and sex. Other factors, including pregnancy and altitude, also affect Hb levels. The clinical features of anemia reflect diminished oxygen supply to the tissues. The symptoms of anemia will be more severe if the onset is rapid or if there is coexisting cardio respiratory disease.

According to the previous studies, about 25% of people with diabetes have some level of anemia,

potentially contributing to pathogenesis of diabetic complication. In anemia, there are fewer red blood cells than normal, resulting in less oxygen being carried to the bodies cell. People with anemia present with tiredness and weakness and may have difficulty doing other regular activities. Other symptoms include paleness, poor appetite, dizziness, light headedness, tachycardia, pedal edema, low murmurs, tachypnea, and shortness of breath. These symptoms can also be associated with diabetes. Therefore at times they are not recognized as anemia.

Anemia may occur with poor control of glycated hemoglobin because the hormone that regulates the RBC production, erythropoietin (EPO) is produced in kidneys. Kidney damage at several level is a complication of diabetes and poor control of glycated hemoglobin. Changes in the kidney start as diabetic nephropathy and leads to chronic kidney disease. Early detection and treatment is essential to prevent or delay disease progression [4].

Early onset of anemia may be due to

- Systemic inflammation causes increased production of cytokines, which suppress erythrocyte stem cell proliferation. Overt inflammation associated with diabetes contributes to erythropoietin unresponsiveness before onset of nephropathy. Inhibition of erythropoietin release: there is a low erythropoietin response to hypoxia in patients with diabetic autonomic neuropathy as well [5].
- Iron, folate and B12 deficiency.
- Angiotensin converting enzyme inhibitors impair erythropoiesis and promote anemia.
- Low hemocrit level can increase glucose measurements. Low hematocrit is a common side effect of many illnesses and of drug therapies like metformin [6].
- A lower hemoglobin is significantly associated with a more rapid decline in glomerular filtration rate [1, 2].

#### **Types of anemia and high glycated hemoglobin**

- Iron deficiency anemia, a major public health problem in developing countries, is associated with higher HbA1c and higher fructosamine.
- Vitamin B12 deficiency
- Folate deficiency anemia
- Splenectomy

#### **CONCLUSION**

Diabetic patients should be screened for anemia and treatment should be given to prevent complications of diabetes. Anemia is a common accompaniment to diabetes, Additional factors present in diabetes may contribute to the development of increased risk for anemia in patients with diabetes [3].

#### **ACKNOWLEDGEMENT**

I would like to thank Professor Dr. KH Noorul Ameen, MD, for his constant guidance and support.

#### **REFERENCES**

- [1] Mohanram A, Zhang Z, Shahinfar S, Keane WF, Brenner BM, Toto RD. *Kidney Int* 2004; 66: 1131–1138.
- [2] Thomas MC. *Nat Clin Pract Nephrol* 2007; 3: 20– 30.
- [3] Thomas MC, Tsalamandris C, Maclsaac RJ, Jerums G. *Am J Kidney Dis* 2006; 48: 537– 545.
- [4] Rossert J, Froissart M. *Semin Nephrol* 2006; 26: 283– 289.
- [5] Joss N, Patel R, Paterson K, Simpson K, Perry C, Stirling C. *Q J Med* 2007; 100: 641– 647.
- [6] Worldworld Health Organization: Definition, diagnosis and classification of diabetes mellitus and its complications. Report of WHO Consultation. Part 1: Diagnosis and Classification of Diabetes Mellitus. Geneva WHO; 1999.