

## Prevalence of Anaemia and Abnormality in Absolute Blood Count in Type 2 Diabetes Mellitus Patients

**Alice JayaPradha Cheekurthy\***

Research Scholar, Department of Biochemistry, Acharya Nagarjuna University, Guntur, Andhra Pradesh, India

**\*Corresponding Author:** Alice JayaPradha Cheekurthy, Research Scholar, Department of Biochemistry, Acharya Nagarjuna University, Guntur, Andhra Pradesh, India.

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### Abstract

Anemia is a common blood disorder that is defined by World Health Organization (WHO) as hemoglobin less than normal amounts. Anemia is a common accompaniment of diabetes. Diabetes can drop of the protein hemoglobin levels, Type 2 diabetes mellitus is a common metabolic disease that is increasing on daily basis. It gets worse over time leading several short and long term complications. The study aims to determine the prevalence of anemia in patients with type 2 diabetes mellitus and to evaluate of the elements of absolute RBC and WBC count as a risk factor for diabetes among the discrete male and female population of Telangana and Andhra Pradesh states in India. The non-diabetics served as controls for the study. Statistical data was obtained for the data.

**Keywords:** Risk Factors; Anemia; Complete Blood Count (CBC); Type 2 Diabetes Mellitus (T2DM); Telangana; Andhra Pradesh; India

### Abbreviations

CBC: Complete Blood Count; RBC: Red Blood Cell count; WBC: White Blood Cell Count

### Introduction

Anemia is a common finding that is characterized by deficiency of iron, an essential mineral content. Haemoglobin It an iron rich protein that delivers oxygen from lungs to rest of the body by means of red blood cells. The sample of blood is tested to measure the level of Haemoglobin in the blood. results in anaemia. Oxygen carrying capacity of the hemoglobin is also decreased by increased blood sugar levels. The World Health Organization (WHO) Sex-specific definition of anemia defines female subjects as anemic those with < 12 g/dl and male subjects as anemics those with Hb < 13 g/dl [1]. Many factors are responsible for anemia. It is a common finding in diabetes [2-4] and its related complications [6-13].

There are about 69.2 million who are bearing the burden of diabetes.

It increases overall burden of family members. Its incidence and prevalence is increasing day by day [14,15] and is estimated to reach 529 million by 2035 (International Diabetes Federation). Earlier the disease was predominantly related to only in affluent elderly people. It is now affecting the children and adults equally that to irrespective of socioeconomic status. Peculiar characters of Indians make them more susceptibility to diabetes [16,17].

The prevalence of chronic illness type 2 diabetes mellitus is high in almost every part of the world. It is characterized by hyperglycemia due to underutilization glucose due to insulin resistance [18,19].

This leads a number of complications as it affects not only glucose metabolism but also disturbs the functioning of eyes, kidneys, heart and feet.

Various markers [20-22] can predispose the future outcome of diabetes. The complications related to diabetes are risk factors for each other and also diabetes.

### Methodology

This is a part of case control study in discrete population of Andhra Pradesh and Telangana States of India. This rationale of study is to evaluate the absolute count of cells as risk factor for T2DM and to know the prevalence of Anemia in the studied population.

The study was carried out among the 90 healthy subjects and complications in 90 diabetic subjects. The total enrolled population was screened for diabetes based on WHO diagnostic criteria for diabetes (The FBS value of more than 126 mg/ dl and PPBS value of more than 200 mg/dl). Those with normal sugars and with no family history of diabetes served as controls. Subjects with other infectious diseases were excluded. The subjects enrolled were either self-motivated or prescribed by the doctor for the screening of diabetes.

### Experimental details

The left over Fasting and Postprandial whole blood samples were collected from subjects between 15 - 85 years from Andhra Pradesh and Telangana States of India. The samples were collected in both EDTA [23] in accordance to the protocol. Information related to age, sex, life style and history was collected from the subjects prior to collection of Blood sample. Blood samples were collected from the vein on the opposite side of elbow. The blood samples were investigated for biochemical data on complete blood count i.e. for absolute count of RBC and WBC, Hb along with the FBS and PPBS. The Blood sugar levels (FBS, PPBS) were estimated to screen diabetics from the population. This was done by glucose oxidase and peroxidase [24] (GOD-POD) method and were analyzed using Star 21 plus auto-analyzer

### Evaluation of absolute cell count

Total count of RBC, Total count of WBC was done for absolute cell count. The blood diluted in ammonium oxalate was added to the hemocytometer chamber. The blood diluted with Hayem's solution is added to counting chamber of the Neubauer slide. Hemoglobin estimation was done by cyanmethemoglobin method for both cases and controls.

### Statistical analysis

The table given below shows the data of fasting blood sugar and post prandial blood sugar and that of total RBC count and total WBC count in form of mean  $\pm$  standard deviation of total count of RBC is given in millions and WBC is expressed as /cmm. The units of measurement of Hb is in grams and that of differential count of WBC is expressed as percent (%).The values were compared to the normal range.

### Results and Discussion

The inability of the cells to utilize the available glucose due to resistance shown to a hormone called insulin secreted by the  $\beta$ -cells of pancreas. Imbalance between the insulin sensitivity and the insulin secretion result in hyperglycemic condition known as T2DM. No single factor is responsible for this chronic disorder. There are several predisposing factors.

The study showed that there is prevalence of anemia in the population studied. This can be the blood sugar levels were found to be high in both male and female patients as per the WHO diagnostic criteria for diabetes. attributed to the low values of total RBC count. Anaemia contributes to tiredness in 74% of the diabetic people than those without anaemia. An increase in the values of total WBC count was also observed in the T2DM cases when compared to the control values but within the normal range.

Biochemical Parameter	T2DM Cases Mean $\pm$ SD	Controls	Normal Range	p value
FBG	152 $\pm$ 92.8	92 $\pm$ 11.7	70 - 110	0.8
PPBG	229.3 $\pm$ 67.6	131.2 $\pm$ 18.8	170 - 200	0.7
RBC Count	3.9 $\pm$ 0.4		M = 4.7 to 6.1 F = 4.2 - 5.4 million	
WBC Count	8116.6 $\pm$ 1196.3	7785 $\pm$ 1759	4000 - 11000	4000 - 11000
Hemoglobin	11.9 $\pm$ 1.8	12 $\pm$ 1.2	M = 13.5 - 18g F = 12 - 15g	0.2

**Table 1:** Characteristics of study participants.

## Conclusion

From the above we can conclude that the diabetes population is having low absolute count of RBC increased WBC count are the important markers for prediction of diabetes. The low RBC count accounts for the anemia in diabetic cases.

## Future Directions

Further, this study can be continued on large sample size and also including genetic risk factors which influence the RBC count, WBC count and Hemoglobin levels.

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