


COMPARATIVE HEMATOLOGICAL STUDY OF TYPE 2 DIABETIC AND NON-DIABETIC PATIENTS IN ERODE DISTRICT, TAMIL NADU

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ABSTRACT **Background And Objectives:** Previous studies have shown that hematological alterations are a common finding in patients with diabetes. To aim of our study was to explore the hematological indices in type 2 diabetic patients compared with non-diabetic individual. Establish the role of haematological parameters as an early prevention strategy.

Materialand Method: Two hundred and forty-six subjects were recruited for this study, one hundred and fourteen with type 2 diabetes and One hundred and thirty-two non-diabetics, were evaluated for haematological parameters using hematologic analyzer. All the information's about the disease was collected with the knowledge of the patients form the concern hospital and laboratory.

Results And Conclusions: Results were compared with the same measurements in 132 subjects without diabetes mellitus. The haematological profile associated with Type2 diabetic patients significantly reduced Hb, RBCs, PCV and MCV than Non diabetes. Increased MCHC and WBCs were noted in Type2 diabetes. Our findings suggest the need of screening for routine hematological tests in type 2 diabetes mellitus.

KEYWORDS : T2DM, Non-Diabetes, Evaluation of RBCs, HematologyParametes

INTRODUCTION

Diabetes mellitus (DM) is the leading global epidemic of the 21st century with over 422 million diabetics worldwide. The prediction of prevalence of diabetes mellitus patients by 2035 according to the World Health Organization (WHO) is 592 million patients (Milosevic and Panin, 2019). Diabetes mellitus is the major health problem affecting both developed and developing countries (Tabish, 2007). Healthcare interventions or lifestyle changes, diabetes mellitus number has been increasing due to population and urbanization growth, increase in the prevalence of obesity and smoking, high consumption of alcohol, or lack of exercise , sedentary lifestyle (Hu,2011; Pacheco et al., 2016).

Hematology – Type2 Diabetes Mellitus (T2DM)

Elevated blood glucose level in T2DM contributes to disturbance of blood cells and its indices (Ziaeet al., 2017). Parameters obtained from hematologic counter scan provide insight into changes that occur in haematological indices such as white blood cells (WBC), red blood cells (RBC), platelets (PLT), and the other parameters. The quantitative and qualitative analysis of red cell parameters as measured by the red blood cell count, Hematocrit, Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH) and Mean Corpuscular Hemoglobin Concentration (MCHC) gives the indication of red cell deformability (Evans and Jehle, 1991). Blood platelets play a pivotal role in the blood clotting process by mediating the primary phase of hemostasis (Davi and Patrono, 2007).

Anemia is a decrease in the total amount of red blood cells (RBCs) or hemoglobin in the blood or a lowered ability of the blood to carry oxygen. It may have a major impact on their sense of well being, as well as impairing their ability to work and affecting their social and sexual lives (Thomas et al., 2006). Patients with type2 diabetes mellitus are twice more likely to be prone to anemia than the patients without diabetes (Wright et al., 2014).

The aim of this study was therefore to explore the haematological indices and peripheral smear study of patients with type2 diabetes and to correlate control subjects. It is believed this study will uplift awareness for the need of both haematological and peripheral smear study in patients with diabetes so the necessary steps can be taken to optimize their management.

MATERIALS AND METHODS

In this study, people consisted of 246 subjects (T2DM & NDM), Type 2 Diabetic patient 114 subjects (male-54, female-60) and non-diabetic 132 subjects (male-63, female-69) The purpose of the study was explained to the participants, all participants gave their written consent prior to inclusion in the study. Information concerning age, gender, family history of diabetes, level of education and occupational was collected by questionnaire. All study subjects were asked to fill out the

questionnaire. The participants included in the study were from various hospitals at Erode districts of Tamilnadu State, South India. The following data was collected from the patients: Fasting Blood Glucose, Red blood cell count, Hemoglobin level, PCV, MCV, MCH, and MCHC. The blood parameters were analyzed using by Automated Hematology Analyzer Beckmon Coulter 750 using impedance method.

RESULTS
Demographic And Clinical Characteristics Of Study Participants

A total of 246 (114 T2DM patients and 132 controls) study subjects were included in this study. Of the total T2DM patients, 54 (47.4%) were males and 60 (52.6%) were females. Similarly, of the total 132 healthy controls, 63 (47.7%) and 69 (52.3%) were males and females, respectively. The mean age (mean \pm SD) of the Group I is 42.62 ± 5.18 & 40.77 ± 4.97 and Group II is 59.70 ± 8.80 & 57.48 ± 7.70 years for T2DM patients and controls, respectively. The mean duration of illness since diagnosis was Group I is 4.94 ± 2.23 and Group II is 12.15 ± 7 years for T2DM patients. (Table 1 & 2).

Table 1. Clinical Characteristics Of Patients With Diabetes Mellitus Type 2

S.no	Characteristics	Type 2 Diabetes Mellitus (T2DM)	Non-Diabetes (NDM)	Percentage (%)
1	Age GI>50 GII<50	42.62 \pm 5.18	40.77 \pm 4.97	43.02%
		59.70 \pm 8.80	57.48 \pm 7.70	60.27%
2	Male	54 (47.4%)	63 (47.7%)	47 %
3	Female	60 (52.6 %)	69 (52.3%)	53%
4	Smoking	24	36	30%
5	Non-Smoking	66	54	60%
6	Alcoholic	18	32	25%
7	Non-Alcoholic	72	58	65%

Table 2. The Comparison Of Haematological Profiles Between Type 2 Diabetics Mellitus And Non-diabetics Mellitus Groups.

Parameters	Type 2 Diabetes Mellitus (T2DM) Mean \pm SD	Non-Diabetes (NDM) Mean \pm SD
Haemoglobin (g/dl)	10.12 4.02	14.75 4.02
RBCs (x106/ μ l)	4.62 1.50	5.60 1.25
PCV (%)	34.45 5.58	38.30 4.80
MCV (fL)	82.22 15.33	87.37 12.80
MCH (pg)	29.31 8.34	27.15 7.20
MCHC (%)	35.12 6.89	31.15 3.60
WBCs (million/mm ³)	9.76 3.59	7.50 2.12
Neutrophils (%)	53.45 12.97	59 3.90
Lymphocytes (%)	35.50 6.70	29.12 3.54
Monocytes (%)	5.5 1.7	3.2 1.1

Eosinophils (%)	2.7 1.9	2.9 1.3
Platelets (x103 µl)	216.54 23.10	222.40 20.43

Comparison Of Haemoglobin And Anemia Of The Study Participants

Regarding the Haemoglobin indices, significant decrement in mean \pm SD is 10.12 ± 4.02 (g/dl) and 14.75 ± 4.72 (g/dl). The mean value of RBC is 4.62 ± 1.50 ($\times 10^6/\mu l$) and 5.60 ± 1.25 ($\times 10^6/\mu l$) were observed in the T2DM patients as compared to the control group. Anemia is based on haemoglobin distribution and its divided into mild, moderate and severe. Type 2 diabetes patients are very increment of mild & moderate anemia 34.4% & 28%, compare to non-diabetics patients 25.6% & 17.8% respectively. Also observed severe anemia 7.8% in type 2 diabetic patients, it is significant increment of non-diabetics (3.3%). There was very increased percentage of no anemia conditions were noticed, that 53.3% in non diabetes and 29.08% in type 2 diabetes subjects.

Table 3. Distribution Of Haemoglobin Level And Severity Of Anemia Between Type 2 Diabetics Mellitus And Non-diabetics Mellitus Groups.

Category	Variations	Type 2 Diabetes Mellitus (T2DM) (%)	Non-Diabetes (NDM) (%)
Grade of anemia	Mild	31 (34.4 %)	23 (25.6 %)
	Moderate	25 (28 %)	16 (17.8%)
	Severe	7 (7.8 %)	3 (3.3%)
	No anemia	27 (29.08%)	48 (53.3 %)

Comparison Of Haematological Profile Of The Study Participants

The WBC indices, increase in total count, 9.76 ± 3.59 (million/mm 3), neutrophil 53.45 ± 12.97 , and lymphocyte 59 ± 3.90 counts were observed in the T2DM patients as compared to the control group. Among the mean of PCV 34.45 ± 5.58 and 38.30 ± 4.80 ; mean of MCV 82.22 ± 15.33 and 87.37 ± 12.80 were lower in participants with T2DM. Though there was no significant difference in MCH, MCHC and Platelet values between the group.

DISCUSSION

Present study showed that T2DM patients had mean haemoglobin of too low to compare non-diabetics. Similar observations, T2DM had lower haemoglobin concentrations (Al Salhen et al., 2017). This difference in severity of anemia between two groups was significant. In T2DM patients had increased percentages of mild, moderate and severe anemia, its significant higher percentage of non diabetes subjects. Hence it can be concluded that anemia is relatively common in patients with T2DM (Kwon and Ahn, 2012). From various literatures, it is known that low haemoglobin concentration may contribute to complications and progression of diabetes. Al-Khoury et al observed in their study that for each chronic kidney disease stage, haemoglobin is 1 g/dl lower in patients with diabetes than in the non-diabetic population (Al-Khoury et al., 2006). This shows that diabetes is prone for anemia, leucocytosis and lymphocytosis (Behera and Bulliyya, 2016).

Our study shows a significant association between the risk of type 2 diabetes for both sexes and some haematological factors including: RBCs, PCV, and MCV were lower than in non-diabetics. MCHC and WBCs was slightly higher in diabetics compared to non-diabetics. We note, that in our population the risk of exposure to type 2 diabetes increases after the age of 50 years. Total white blood cell count, lymphocytes and neutrophils counts were higher in the diabetic patients than in the controls. However, no significant differences were observed in MCH and platelet counts between patients and controls (Rossing et al., 2004). A limitation of our study is represented by the relatively small number of patients enrolled.

CONCLUSIONS

Our results lead to concludes that, for the selected patients, even though the distribution of the haematological indices is significantly wider compared to the control group. Our results should also be completed with manual and fully automated cell counter analysis, which could be a very useful tool in evaluating the efficacy of treatment in diabetes patients as well as different associated risks, since the red blood cell status is crucial to the overall wellness of the diabetic patient.

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