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# A Retrospective Study on the Hematological Parameters of Diabetic and Non Diabetic Individuals

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### ABSTRACT

Diabetes is seen to be a common endocrine disorder that is also associated with cardiac disease. Diabetes is also called a metabolic disorder associated with increased risk of vascular disease and hyperglycemia. One of the classical inflammatory marker associated with diabetes and cardiovascular disease is the elevation in the white blood cell count. This study aimed to find out the difference in the hematological parameters of the diabetic and non diabetic individual. The hematological parameter includes WBC(White blood cells), PCV(Packed cell volume), MCV(Mean corpuscular volume), and Platelet count. The complete blood count values of a sample of 42 patients was collected from the record, that consisted of 21 diabetic and 21 non diabetic patients. The data was collected from the laboratory and was analysed and then statistical analysis was given. The results showed that the hematological parameters showed the increase in the WBC and platelet count in diabetic patients than the non diabetic patients. We also found that there is no significant difference in the Packed cell volume and Mean corpuscular volume of the diabetic and non diabetic patients.

**KEY WORDS:** DIABETIC, NON DIABETIC, HEMATOLOGICAL, BLOOD, REPORTS..

# INTRODUCTION

Retrospective study is a comparative study between 2 group individuals in this study the groups are the diabetic and non diabetic. Cardiac disease is caused by diabetes in some cases (Nanda et al., 2009). The primary cause for diabetes is cardiac disease. One main component of diabetes is inflammation (Nada, 2015). Diabetes is an endocrine health disorder which is predominantly seen in

### ARTICLE INFORMATION

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NAAS Journal Score 2020 (4.31) SJIF: 2020 (7.728) A Society of Science and Nature Publication, Bhopal India 2020. All rights reserved. Online Contents Available at: http://www.bbrc.in/ Doi: http://dx.doi.org/10.21786/bbrc/13.8/108 the individuals. Carbohydrate, fat and protein are produced from the living cells of plants and animals. Decreased production of insulin secretion causes changes in the metabolism of these substances (Alam et al., 2015). Blood is defined as a connective tissue with cellular elements suspended in plasma. Glycemic control is the prevention for the development of diabetic complication (Milosevic and Panin, 2019). Diabetes is a non communicable disease. The decrease in the hemoglobin concentration of the blood is anemia. The diabetic capital of the world is India. Mostly patients with diabetes and renal insufficiency are anemic (S., Srinivasa and K., 2017). Diabetes and Hyperglycemia play an important role in cardiovascular diseases. Hematological parameters include White blood cells (WBC), mean platelet volume (MPV), platelet to lymphocyte ratio (PLR) and neutrophil



to lymphocyte ratio (NLR). Increase in the White blood cell count gives an inflammatory marker associated with Cardiac diseases (Demirtas et al., 2015).

Routinely measured parameters are White blood cells count and hematocrit level was associated with insulin resistance. Blood glucose was analyzed using a hexokinase method (M and Christa M, 2014). According to the Epidemiology pattern several factors play an important role in the distribution of Type 1 diabetesgeographic, cultural, demographic, vitamin D exposure, obesity and environmental pollutants (Iz and Isaac IZ, 2012). Diabetes Mellitus are classified under 2 categories-Type 1 and Type 2 diabetes. Type 2 diabetes patients have increased risk of cardiovascular diseases. Diabetes when poorly treated causes various complications like retinopathy, nephropathy and oxidative stress that causes damage to the tissue and cell (Antwi-Baffour et al., 2018).

Table 1. Shows the WBC value of diabetic and non diabetic individuals, mean value of diabetic patients was 8115 cells/ mm3 and non diabetic patients was 6210 cells/mm3.

Group Statistics									
	VAR00001	Ν	Mean	Std. Deviation	Std. Error Mean				
VAR00002	diabetic	21	8115.0476	2811.96448	613.62096				
	non diabetic	21	6210.5714	2184.90340	476.78501				

Diabetes mellitus patients are monitored by laboratory tests by finding the glycated proteins, insulin, urinary proteins, fructosamine, glucose in urine, C-peptide and kidney function (Milosevic and Panin, 2019). During pregnancy women develop high blood sugar levels and this condition is called Gestational diabetes. Mothers with gestational diabetes with poorly treated causes risk like low blood sugar and jaundice in born babies. Diabetes complication can cause morbidity and mortality (Hope and Ifeanyi, 2019). The changes in the hematological parameters are seen in patients with anemia. (Shukla, 2016). This study was done to compare the hematological parameters among diabetic and non diabetic patients.

# **MATERIAL AND METHODS**

**Sample collection:** From the laboratory digital record system, 21 were diabetic individuals and 21 non diabetic individuals with a total of 42 patients were selected and their hematological parameters were noted down. This study was done in Saveetha dental college, clinical laboratory in the month of November 2019. This study was commenced after the approval by the institutional ethical committee, Saveetha Institution of Medical and Technical Science.

**Sampling Method:** Sampling method followed in our study was Random sampling method.

**Inclusion Criteria:** Random blood sugar level of more than 200 mg/dl was considered for diabetic individuals and less than 200 mg/dl was considered for non diabetic individuals. Age and sex were not considered.

Table 2. Shows the independent T test value of the comparison of the mean values of WBC count in diabetic and non diabetic patients. The WBC count of the diabetic patients was higher than the non diabetic patients of our study and the difference was also statistically significant. The P value of the comparative data was [P=0.019 (<0.05)].

independent Samples Test										
	Levene's Test Varia	for Equality of ances	t-test for Equality of Means							
			Mean	Mean	ean Std. Error	95% Confidence Interval of the Difference				
	F	Sig.	t	df	Sig. (2-tailed)	Difference	Difference	Lower	Upper	
Equal variances assumed	2.691	.109	2.451	40	.019	1904.47619	777.08083	333.93724	3475.01514	
Equal variances not assumed			2.451	37.698	.019	1904.47619	777.08083	330.94484	3478.00754	
	Equal variances assumed Equal variances not assumed	Equal variances not assumed	Equal variances assumed 2.691 .109	Levene's Test for Equality of Variances     t       F     Sig.     t       Equal variances assumed assumed     2.691     .109     2.451	Independent samples       Levene's Test for Equality of Variances     t       F     Sig.     t     df       Equal variances assumed     2.691     .109     2.451     40       Equal variances not assumed     1     1     2.451     37.698	Independent samples reaction       Levene's Test for Equality of Variances     t     df     Sig. (2-tailed)       Equal variances assumed     2.691     .109     2.451     40     .019       Equal variances not assumed     1     1     2.451     37.698     .019	Independent samples reaction       Levene's Test for Equality of Variances     t-test for Equality of Variances       F     Sig.     t     df     Sig. (2-tailed)     Mean Difference       Equal variances not assumed     2.691     .109     2.451     40     .019     1904.47619	Independent samples rest       Levene's Test for Equality of Variances     t-test for Equality of Means       F     Sig.     t     df     Sig. (2-tailed)     Mean Difference     Std. Error Difference       Equal variances not assumed     2.691     .109     2.451     37.698     .019     1904.47619     777.08083	Independent samples rest       Levene's Test for Equality of Variances     State of Equality of Means       F     Sig.     t     off     Sig.     Mean     Std. Error Difference     95% Confidence Difference       Equal variances assumed     2.691     .109     2.451     40     .019     1904.47619     777.08083     333.93744	

Table 3. Shows the PCV value of diabetic and non diabetic individuals, mean value of diabetic patients was 38% and non diabetic patients was 36%.

#### Group Statistics Std. Deviation Std. Error Mean VAR00001 Ν Mean VAR00003 diabetic 21 6.10152 38.1429 1.33146 21 non diabetic 36.7619 1.86828 40769

**Exclusion Criteria:** Pre-diabetic and hypertensive diabetic individuals were excluded.

### **RESULTS AND DISCUSSION**

The tables below comparatively show that, higher value of WBC, PCV, MCV and platelets value in diabetic patients than non diabetic patients. It is associated with predicts the development of type 2 diabetes and sensitivity of insulin. Chronic low grade inflammation may be involved in pathogenesis of insulin resistance type 2 diabetes. People with diabetes particularly type 2 diabetes exhibit platelet reactivity. Hyperglycemia contributes to greater platelet reactivity through direct effect and by promoting glycation of platelet. Inflammation promotes platelet activation. Table 1 and 2 shows the comparative mean and independent t test values of the WBC count in diabatic and non diabetic patients. Table 3 and 4 shows the comparative mean and independent t test values of the PCV in diabatic and non diabetic patients. Table 5 and 6 shows the comparative mean and independent t test values of the MCV in diabatic and non diabetic patients. Table 7 and 8 shows the comparative mean and independent t test values of the platelet count in diabatic and non diabetic patients.

Table 4. Shows the independent T test value of the comparison of the mean values of PCV in diabetic and non diabetic patients. The PCV of the diabetic patients was higher than the non diabetic patients of our study. However, the difference was not statistically significant. [P=0.327 (>0.05)].

	Independent Samples Test											
Levene's Test for Equality of Variances				t-test for Equality of Means								
							Mean	Mean Std. Error		95% Confidence Interval of the Difference		
		F	Sig.	t	df	Sig. (2-tailed)	Difference	Difference	Lower	Upper		
VAR00003	Equal variances assumed	28.862	.000	.992	40	.327	1.38095	1.39248	-1.43336	4.19526		
	Equal variances not assumed			.992	23.718	.331	1.38095	1.39248	-1.49480	4.25670		

Table 5. Shows the MCV value of diabetic and non diabetic individuals, mean value of diabetic patients was 85fl and non diabetic patients was 84fl.

### **Group Statistics**

	VAR00001	N	Mean	Std. Deviation	Std. Error Mear
VAR00004	diabetic	21	85.5238	4.28508	.93508
	non diabetic	21	84.8571	3.46822	.75683

Table 6. Shows the independent T test value of the comparison of the mean values of MCV in diabetic and non diabetic patients. The MCV count of the diabetic patients was higher than the non diabetic patients of our study and the difference was also statistically significant. The P value of the comparative data was [P=0.583 (>0.05)]. 4.85m

-	Independent Samples Test										
Levens's Test for Equality of Variances			t-test for Equality of Means								
				Mean Std. Error						nce interval of the fference	
		F	Sig.	t	df	Sig. (2-tailed)	Difference	Difference	Lower	Upper	
VAR00004	Equal variances assumed	1.125	.295	.554	40	.583	.66667	1.20298	-1.76465	3.09798	
	Equal variances not assumed			.554	38.335	.583	.66667	1.20298	-1.76794	3.10128	

Cardiovascular complications are closely related to increase in platelet activation and aggregation. Platelet sizes are analyzed and the reactivity was seen (Varol et al., 2010). Insulin acts as a co factor of erythropoiesis (Ellinger et al., 2006). WBC plays an important role in the inflammatory response when the WBC is increased. Pre-diabetic and diabetic has increased in the WBC count. DM status has correlation with biomedical parameters (Worachartcheewan et al., 2013). Several studies show association with insulin resistance (Hanley et al., 2009). Insulin is the main substance which helps in the decrease and control of diabetes. According to the article the diabetes individual had a lower amount of hemoglobin, RBC count and HCT. These similar lower concentrations were seen in the type 2 diabetes (Farooqui, Afsar and Afroze, 2019). Patients with type 2 diabetes had less hemoglobin content. One of the causes for the cardiovascular disease is low hemoglobin concentration.

Table 7. Shows the Platelet count of diabetic and non diabetic individuals, mean value of diabetic individuals was 259307 per microliter and non diabetic individuals was 321220 per microliter.

	Group Statistics									
	VAR00001	Ν	Mean	Std. Deviation	Std. Error Mear					
VAR00007	diabetic	21	259307.6190	79727.86219	17398.04588					
	non diabetic	21	321220.0000	95257.01911	20786.78574					

Table 8. Shows the independent T test value of the comparison of the mean values of platelet count in diabetic and non diabetic patients. The platelet count of the diabetic patients was higher than the non diabetic patients of our study and the difference was also statistically significant. The P value of the comparative data was [P=0.028 (<0.05)].

	Independent Samples Test											
Levene's Test for Equa Variances		for Equality of ances		t-test for Equality of Means								
							Mean Std. Error		95% Confidence Interval of the Difference			
		F	Sig.	t	df	Sig. (2-tailed)	Difference	Difference	Lower	Upper		
VAR00007	Equal variances assumed	2.656	.111	-2.284	40	.028	-61912.38095	27106.87112	-116697.411	-7127.35083		
	Equal variances not assumed			-2.284	38.797	.028	-61912.38095	27106.87112	-116750.386	-7074.37599		

Diabetic nephropathy leads to cardiovascular disease (Salhen, Al Salhen and Mahmoud, 2017). In diabetes microvascular complications are high. The PLCR, PCT, PC and MPV were high in the diabetes individual when compared with the non diabetic individuals (Agarwal et al., 2018). The insulin resistance syndrome can be caused by elevation in the erythrocyte criteria. Changes in the glucose of the body even causes liver damage (Kamil, 2015). The hematological parameters are not associated with BMI and obesity. In the non obese people the hemoglobin, hematocrit and high RBC helps in identifying insulin resistance (Barazzoni et al., 2014). In the diabetic individuals the WBC level was high. Diabetes mellitus shows an increased level of platelets which are activated, young or large circulating in the blood. (Khudhur and Al-Ani, 2019). When the WBC level in the blood is elevated it is closely related to Multiple sclerosis (Vivek et al., 2018).

The oxygen carrying capacity can be predicted by using packed cell volume (Biadgo et al., 2016). Glucose lowers the amount of hemoglobin content in the blood (Varim et al., no date). According to the discussion found with the other articles it is clear that the hematological parameters of the diabetic individuals are seen to be high or more when compared to the non diabetic individuals. Limitations of our study include small sample size, patients with anemia and other disorders were not included in the study. future studies may rectify these limitations.

# **CONCLUSION**

Within the limitations of our study, the hematological parameters showed the increase in the WBC and platelet count in diabetic patients than the non diabetic patients. We also found that there is no significant difference in the Packed cell volume and Mean corpuscular volume of the diabetic and non diabetic patients.

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Conflict of Interest: None to declare

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