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A Hematological and Physiological Study of Diabetes Mellitus Male Patients

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ABSTRACT

Objective: Over 25 million Americans and an estimated 285 million individuals worldwide suffer with diabetes mellitus, which is linked to a heavy burden of problems. This study's goal was to assess how fasting blood glucose interacted with leukocyte counts, platelet counts, blood pressure, and body mass index.

Methods: This study involved a control group of 40 individuals who appeared to be in good health and 180 male diabetic patients (70 type 1 and 70 type 2) who were randomly chosen from the diabetes mellitus center in Al-Sadder Teaching City in the province of Al-Najaf in Iraq. The age range of the control and patient groups was 35 to 65 years.

Results: The results revealed a significant difference (P>0.05) in WBCs and platelet count in both type 1 and type 2 patients when compared with control groups, but a significant rise (P>0.05) in FBG in both type 1 and type 2 patients. The findings also demonstrated a significant rise in BMI and blood pressure (DBP & SBP) (P<0.05) in both type 1 and type 2 patients in comparison to the control groups, as well as a significant difference in DBP and SBP (P<0.05) between patients and control groups at various ages.

Conclusion: Diabetes mellitus has been linked to higher BMIs than normal weight, and the majority of patients are obese. One of the causes of high blood pressure is DM. Patients with type 1 and type 2 diabetes do not significantly differ in their WBC and platelet counts from the control group.

Key words: Diabetes mellitus, Fasting blood glucose, White blood cells, Blood pressure, Body mass index

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INTRODUCTION

Diabetes mellitus, also referred to as diabetes, is a collection of metabolic illnesses defined by persistently elevated blood sugar levels (hyperglycemia), which are highly related with cardiovascular disease [1]. Hyperglycemia caused by deficiencies in insulin secretion, insulin action, or both characterizes diabetes mellitus [2].

The immune system's leukocytes are responsible for protecting the body from both infectious diseases and external objects. All parts of the body, including the blood and lymphatic system, include leukocytes [3]. Leukocyte counts in the blood are frequently used as illness indicators. In the United States, inflammation is most frequently to blame for this increase in leukocytes activated by advanced glycation end products [4], oxidative stress, and angiotensin II [5] in a state of hyperglycemia [6].

Small enucleate discoid cell fragments known as platelets are released by megakaryocytes in the bone marrow. Patients with diabetes mellitus have platelets with dysregulated signaling pathways, which increases their propensity to activate and aggregate in response to a specific stimulus (platelet hyper reactivity) [7].

BP, or blood pressure Every regular clinical care visit should include a blood pressure check [8] Patients with diabetes frequently have hypertension, with frequency varying based on characteristics such the type and length of diabetes, age, sex, race/ethnicity, BMI, history of glycemic control, and the presence of kidney disease [9,10].

MATERIALS AND METHODS

Patients and healthy groups: 80 participants who were enrolled in the study at the Center for Diabetes Mellitus and Endocrinology at Al-Sader Medical City were split

into three groups based on their clinical examination and medical history: I patients with type 1 diabetes (n=70); (ii) patients with type 2 diabetes (n=70); and (iii) non-diabetic subjects (control; n=40). Doctors on staff made the diagnosis of diabetes mellitus. The name, age, weight, and height of the patients were collected by a questionnaire. The age range of the controls and patients.

Measurements

Measurements of serum glucose: A glucose (GOD-PAP) kit was used to measure the level of serum glucose (Biolabo SA, France).

Body Mass Index (BMI) The following equation was used to compute body mass index values: (m2). It was measured using a height and electrical balancing device. The BMI levels for healthy weight are 18.5-24.9 kg/m2 and 25-29.9 kg/m2 for overweight people. A person is obese when their BMI is greater than 30 kg/m2 [11]. Blood pressure: Following a 30-minute period of rest, blood pressure was checked using a Mercury sphygmomanometer. White Blood Cells and Platelets count: using Hematology analyzer/cbc analyser.

Statistical analysis

On the home computer, data analysis was done using SPSS (Version 17). The results were presented in terms of mean and standard error. The measured parameters were compared between the patient and control groups using a paired t-test. To measure the correlation between factors, correlation coefficients were determined. The figures were created using the EXEL tool of Microsoft Office 2007 and the Graph Pad Prism 5 program. The statistically significant level was set at a P-value of 0.05 or below [12].

RESULTS

According to the results of (Figures 1 and 2), type 1 and type 2 diabetic patients' fasting blood glucose (FBG) levels significantly increased (P 0.05) when compared to the healthy control group's level of 97.942.27 mg/dl. Additionally, the data demonstrate a significantly higher BMI (P 0.05) in type 1 and type 2 diabetic patients as compared to the healthy control group, which had a BMI of 22.11 0.81 kg/m2. Normal weight 12 percent (n=11), overweight 32 percent (n=19), and obese 56 percent (n=50) were the percentages of BMI groups in type 1 diabetes, while normal weight 5 percent (n=4), overweight 9 percent (n=7), and obese 100 percent (n=86) were the percentages in type 2 diabetes Figures 3 to Figure 6. Shows no significant difference (P>0.05) in white blood cells concentration between diabetic (type 1 and type 2) and control groups they were (7.671 ± 0.4607 X 109/l and 7.402 ± 0.4008 X 109/l in diabetic type 1 and type 2 respectively) and 7.244 ± 0.2409 X 109/l in control groups, also Figures 7 to Figure 10, shows no significant difference (P>0.05) in platelet concentration between diabetic(type 1 and type 2) and control groups they were (273.6 ± 23.83 X 109/l and 233.8 ± 13.13 X

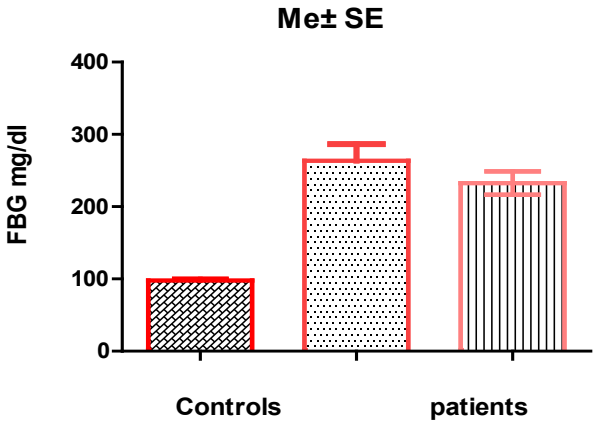

Figure 1: FBG level in diabetic patients and control groups. *means significant difference at (P<0.05).

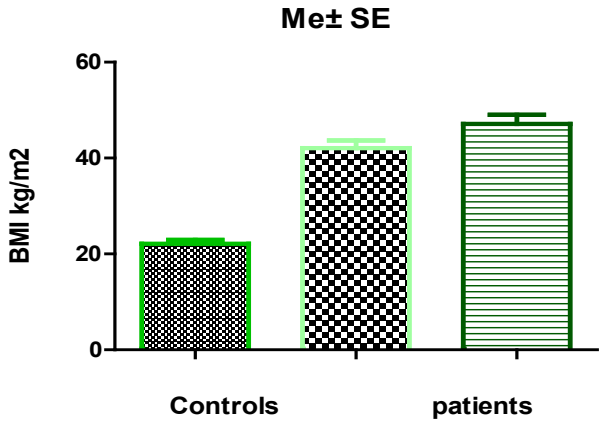

Figure 2: BMI in diabetic patients and control groups. *means significant difference at (P<0.05).

109/l in diabetic type 1 and type 2 respectively) and 262.4 ± 16.76 X 109/l in control groups. The results of the blood pressure show a significant difference (P0.05) in diastolic blood pressure in (type 1 and type 2 diabetic patients) (821.2mmHg, 81.332.58mmHg respectively) when compared with healthy control group 79.710.90mmHg, while the results of the systolic blood pressure show a significant increase (P<0.05) in (type 1 and type 2 diabetic patients) (133.0 ± 2.843 mmHg, 134.0 ± 3.055 mmHg respectively) in comparing with healthy control group 121.9 ± 1.08 mmHg Tables 1 to Table 3. In comparison to control groups at various ages, the data shown in Tables 4 and Table 5 show no statistically significant difference (P>0.05) in W.B.C. and P.L.T. for the patient groups. Tables 6 and 7. Demonstrate significant(P<0.05) differences in DBP and SBP between patient groups at various ages and control groups There is no significant link (P>0.05) between FBG level and BMI, WBC count, PLT count, DBP, or SBP in type 1 D.M patients, according to the results of correlation and linear regression between FBG and other parameters.

Also The following are the findings of the correlation and linear regression between FBG and other parameters in patients with type 2 diabetes mellitus: The relationship between FBG level and (BMI, WBC count, PLT count, DBP and SBP) is not statistically significant (P>0.05) (Figures 10-14).

Table 1: BMI groups in type 1 DM patients.

BMI groups	No.	Percent's
Normal weight	11	0.12
Over weight	19	0.32
Obese	50	0.56

Table 2: BMI groups in type 2 DM patients.

BMI groups	No.	Percent's
Normal weight	4	0.05
Over weight	7	0.09
Obese	69	0.86

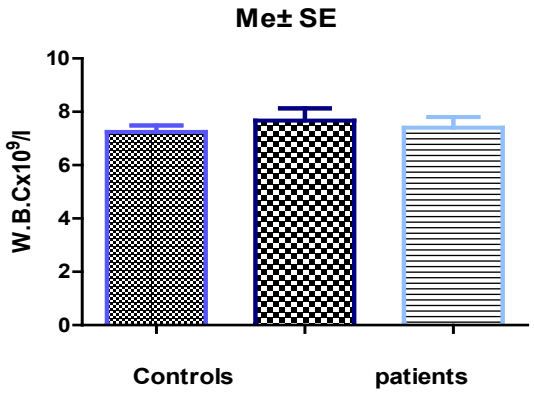

Figure 3: W.B.C concentration in diabetic patients and control groups.

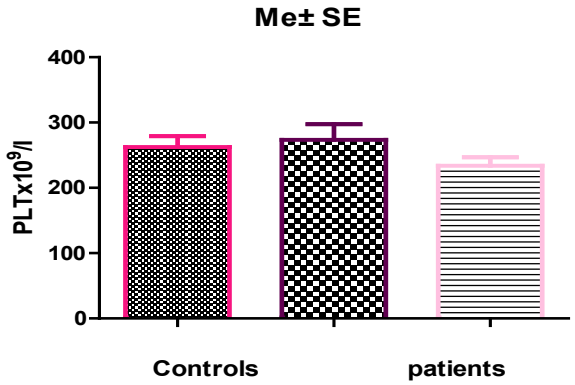

Figure 4: P.L.T concentration in diabetic patients and control groups.

Table 3: Blood pressure (Diastolic & Systolic) in patients and control groups.

Groups/ Blood pressure	Me ± SE	Patients n=140	
	Control n=40	Type 1 n=70	Type 2 n=70
Diastolic B.P.(mmHg)	79.71 ± 0.90	82 ± 1.2*	81.33 ± 2.58*
Systolic B.P.(mmHg)	121.9 ± 1.080	134.0 ± 3.055*	133.0 ± 2.843 *

*means significant difference at (P<0.05)

Table 4: W.B.C count of patients and control groups in different age stage.

Criteria Age (year)	W.B.C count X 109/l		
	Controls N=40	Patient n=140	
		Type1 n=70	Type 2 n=70
35-45y	6.881 ± 0.31	6.396 ± 0.36	6.383 ± 0.61
46-55y	7.482 ± 0.5	8.058 ± 0.41	7.381 ± 0.36
56-65y	8.06 ± 0.19	9.986 ± 2.25	7.739 ± 0.79

Table 5: P.L.T count of patients and control groups in different age stage.

Criteria Age (year)	P.L.T count X 109/l		
	Controls N=40	Patient n=140	
		Type1 n=70	Type 2 n=70
35-45y	277 ± 28.02	243.8 ± 20.39	236.8 ± 23.89
46-55y	248 ± 17.75	243.3 ± 29.47	242.3 ± 26.51
56-65y	248.7 ± 31.22	440.6 ± 104	233.8 ± 17.25

Table 6: Diastolic Blood pressure of patients and control groups in different age stage

Criteria Age (year)	DBP mmHg		
	Controls N=40	Patient n=140	
		Type1 n=70	Type 2 n=70
35-45y	70.50 ± 0.5	73.33 ± 6.072	77.50 ± 2.5*
46-55y	80.00 ± 3.742	83.33 ± 2.108	82.09 ± 0.9*
56-65y	80.33 ± 3.33	82 ± 2	83.57 ± 2.31*

Table 7: Systolic Blood pressure of patients and control groups in different age stage.

Criteria Age (year)	SBP mmHg		
	Controls	Patient n=140	
	N=40	Type1 n=70	Type 2 n=70
35-45y	119.5 ± 0.5	130± 5.5*	130 ± 5.77*
46-55y	126.0 ± 2.44	140 ± 5.16*	128.2 ± 3.77*
56-65y	123.3 ± 3.33	140 ± 4.47*	138.6 ± 5.33*

*means significant difference at (P<0.05)

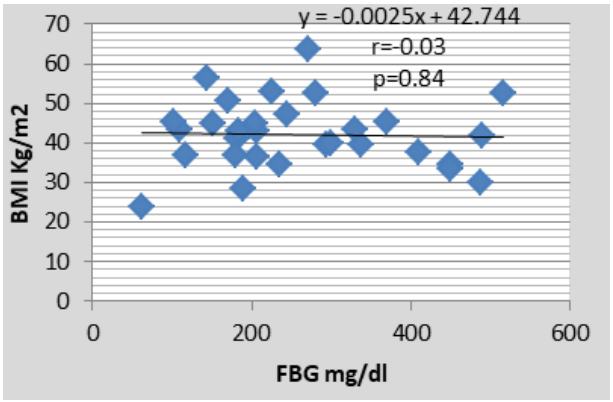

Figure 5: Correlation between FBG and BMI in type1DM patients.

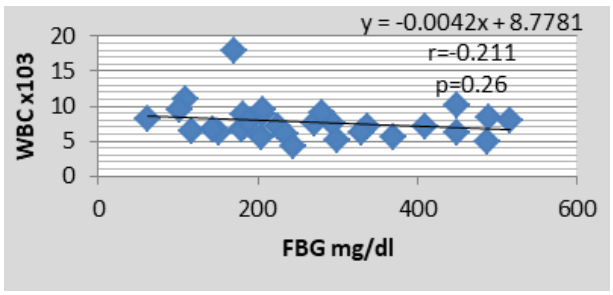

Figure 6: Correlation between FBG and WBC count in type1DM patients.

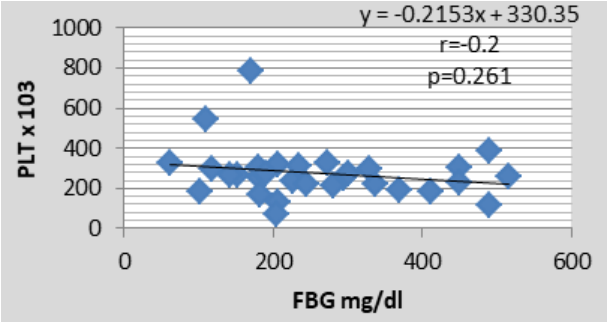

Figure 7: Correlation between FBG and PLT count in type1DM patients.

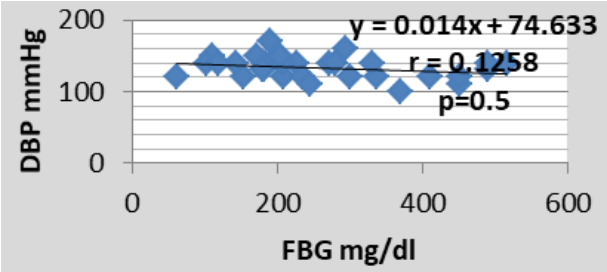

Figure 8: Correlation between FBG and DBP in type1DM patients.

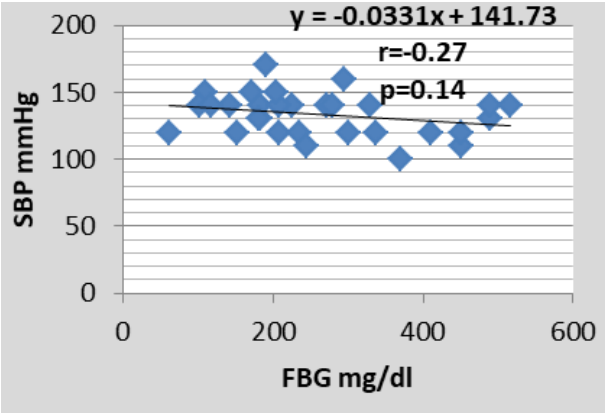

Figure 9: Correlation between FBG and SBP in type1DM patients.

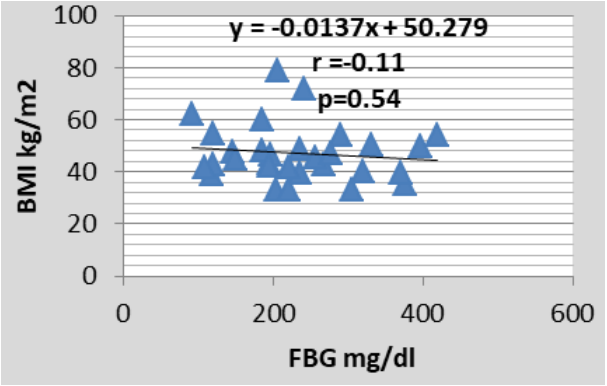

Figure 10: Correlation between FBG and BMI in type2DM patients

DISCUSSION

According to the study, type 1 and type 2 diabetic patients had significantly higher fasting blood glucose

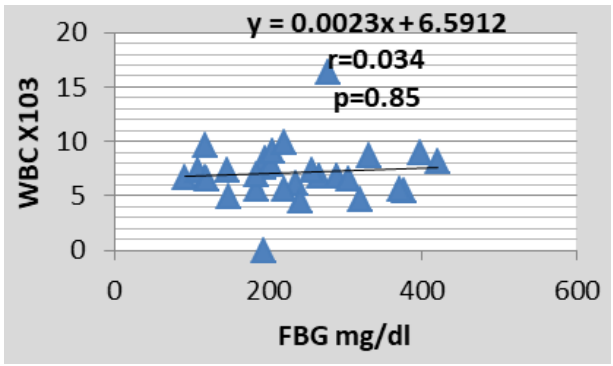

Figure 11: Correlation between FBG and WBC count in type2DM patients.

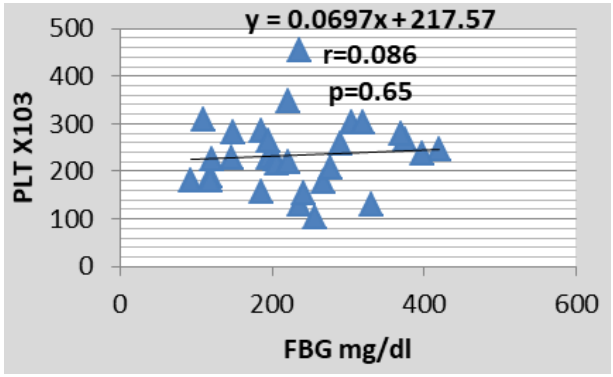

Figure 12: Correlation between FBG and PLT count in type2DM patients.

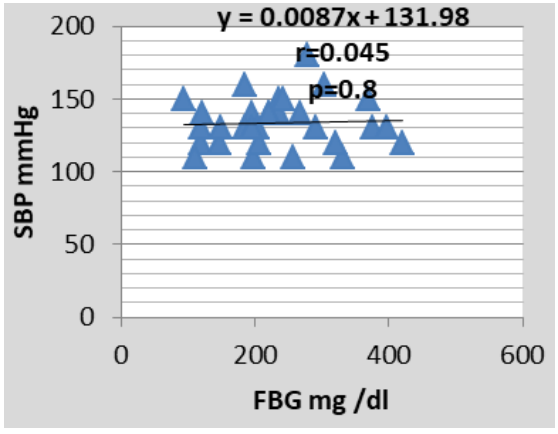

Figure 13: Correlation between FBG and DBP in type2DM patients

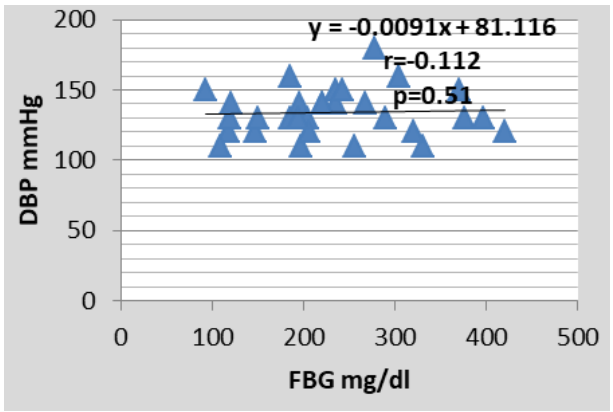

Figure 14: Correlation between FBG and SBP in type2DM patients.

levels than the control group. Given that hyperglycemia is the primary defining trait of DM, these findings are predicted. Two crucial processes strictly regulate blood glucose: - the production of insulin by pancreatic beta cells in response to a nutrient and the impact of insulin on the body's main target organs, such as skeletal muscle, the liver, and adipose tissue [13].

According to the findings, patients with type 1 and type 2 diabetes have significantly higher BMIs than control groups. These results support the results achieved by [14], they show a good relationship between BMI and DM. In other words, people who are obese are more likely to develop diabetes. The literature backed up the current result that diabetes and other chronic diseases are greatly increased by obesity [15-17]. About 55 percent of type 2 diabetics are reportedly fat [18]. Because adipose tissue is a source of various chemical signals to other tissues, chronic obesity causes increased insulin resistance that can evolve into diabetes. Before the onset of chronic hyperglycemia, obesity exhibits insulin resistance [19]. Even in obese people with normoglycemia and diabetic patients, obesity is usually linked to insulin resistance [20].

The results indicate that there is no discernible difference between type 1 and type 2 patients' total WBC counts when compared to controls, but we did find some elevation in some type 1 and type 2 DM patients. Despite this, all means of total WBCs were high and close to the upper limit of the normal WBC count this may be due to the association between inflammation response and diabetes observed, as WBCs are one measure of inflammation. This result is consistent with recent research that showed that young workers with low and high WBC counts had an increased chance of developing diabetes [21]. The findings indicate that there is no appreciable variation in the total platelet count between type 1 and type 2 patients and the control group. This finding is corroborated by another study, which also found no appreciable changes in platelet count in diabetes patients. [22]. According to the study, type 1 and type 2 patients had significantly higher diastolic and systolic blood pressure when compared to the control group (3). Hypertension, which is regarded as a major cause of morbidity and mortality in adults, is thought to be one of the most prevalent disorders afflicting humans. Heart disease, stroke, and even renal failure are the main side effects of hypertension [23]. Since many years ago, it has been recognized that one of the causes of hypertension is diabetes mellitus. Both those with insulin-dependent diabetes (IDDM) and those with non-insulin-dependent diabetes (NIDDM) have shown signs of having high blood pressure [24]. Tables 6 and 7 demonstrate significant differences in DBP and SBP between patient groups at various ages and control groups (P 0.05). The alterations in the renin-angiotension-aldosterone system, catecholamines, renal disorders, arteriosclerosis, hyperglycemia, and hyperinsulinaemia are some of the pathophysiological pathways that contribute to hypertension in diabetic patients, independent of age [25]. This occurs at the risk of intracellular dehydration because increased glucose levels in the extracellular fluid compartment increase osmotic pressure, which in turn causes fluid to move from the intracellular to extracellular compartment. Due to its ability to increase renal tubular salt absorption, which is linked to water retention, hyperinsulinaemia may also result in hypervolemia [26]. Thus, volume expansion over an extended period of time in patients with poorly controlled diabetes mellitus may result in higher cardiac output and consequently hypertension. Diabetic patients have diffuse glomerulosclerosis, which is linked to hypertension [27] Additionally, changes in the renin-angiotension-aldosterone system have been noted, and certain patients have significantly lower plasma levels of renin and angiotension, which predisposes the patients to developing hypertension [28].

CONCLUSION

Diabetes mellitus has been linked to higher BMIs than normal weight, and the majority of patients are obese. One of the causes of high blood pressure is DM. Patients with type 1 and type 2 diabetes do not significantly differ in their WBC and platelet counts from the control group.

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