

Correlation of D-dimer Levels with Fasting Blood Glucose Levels in Patients with Type 2 Diabetes Mellitus

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Abstract

Original Research Article

Chronic hyperglycemia in patients with Type 2 Diabetes Mellitus (T2DM) can cause damage to various organs, resulting in both microvascular and macrovascular complications that lead to an increased risk of cardiovascular disease. One of the markers that can detect vascular disorders is D-dimer levels. Fasting blood glucose (FBG) analysis in T2DM patients associated with D-dimer levels is important to know to be used as an indicator in connection with diabetes complications, especially vascular complications. This study aims to determine the correlation between D-dimer levels and FBG. The study was conducted in three hospitals in North Sulawesi province. The study population was T2DM patients (as evidenced by fasting blood glucose >126mg/dL) who examined themselves in the period January-June 2023. Samples were obtained using the total sampling method, where all populations that met the inclusion and exclusion criteria were used as participants. Ninety-four patients with T2DM (62 women and 32 men) were eligible to be participants in this study. Blood pressure, GDP and D-dimer were examined. Based on the results of the blood pressure examination, 40 participants suffered from hypertension and 54 participants did not. The average values of blood glucose, HbA1c and D-dimer levels in hypertensive and non-hypertensive participants are not much different. The results of the analysis using Spearman's rho showed that there was a moderate correlation between D-dimer levels and GDP ($p=0.03$, $r=0.302$). In conclusion, although there is a moderate correlation between D-dimer levels and fasting blood glucose levels, D-dimer is not recommended to be used as an indicator of complications in T2DM.

Keywords: Type 2 diabetes mellitus, D-dimer, Fasting blood glucose.

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INTRODUCTION

Diabetes is a serious health problem that has reached frightening proportions. Globally, diabetes is affecting around 500 million people today [1]. The World Health Organization (WHO) describes diabetes mellitus as a chronic metabolic disease marked by high blood glucose levels. Type 2 Diabetes Mellitus (T2DM) is mainly brought on by a combination of two main factors: insufficient insulin secretion by pancreatic cells and the tissues' incapacity to respond to insulin. Over time, this condition can cause damage to the heart, blood vessels, eyes, kidneys, and nerves [2].

One of the main consequences of diabetes is cardiovascular disease (CVD), which has a twofold greater risk in people with diabetes compared to the general population [3, 4]. In patients with type 2 diabetes, perfect blood-glucose management significantly reduces the risk of microvascular problems but not macrovascular disease. Thus, it's critical to identify

preventative measures for cardiovascular diseases in individuals with diabetes. One crucial initial step in preventative efforts is identifying patients who are at high risk. For high-risk diabetic individuals, biomarkers like D-Dimer can be used to predict the risk of cardiovascular diseases [4].

D-dimer is a circulating peptide and a degradation product of cross-linked fibrin, which is produced during thrombus formation. Elevated D-dimer levels indicate a propensity for higher thrombosis and greater systemic fibrin production [4, 5]. High D-dimer concentrations have been linked to cardiovascular disease occurrences and prognoses, according to reports [4]. The aim of this study is to determine the correlation between D-dimer levels and fasting blood glucose levels in patients with type 2 diabetes mellitus.

MATERIAL AND METHODS

Sampling was collected for six months from three hospitals in North Sulawesi. Using total-sampling

method, samples were collected from all inpatients and outpatients with type 2 diabetes mellitus proven by the result of fasting blood glucose ≥ 126 mg/dL who met the inclusion and exclusion criteria. Exclusion criteria were pregnant women, cardiovascular, hematology and infection disease.

The participants' systolic and diastolic blood pressures were measured with aneroid sphygmomanometer. Hypertension was defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg. Venous blood was taken from all participants after an overnight fasting and serum samples were used to examine fasting blood glucose and D-dimer levels. Fasting blood glucose levels were examined using a Cobas C111 analyzer and D-dimer levels were examined using Hipro analyzer.

RESULTS AND DISCUSSION

After data collection, 94 patients met the criteria to become participants of this study. Table 1 shows the general description of the results. Based on gender, 62 participants of this study were female and 32 were male. The age range of the participants was 23 to 82 years with the highest number (43 participants) was in the 45 to 59 years age group. Based on the presence of hypertension,

40 participants (42.55%) had hypertension and 54 participants (57.45%) had no hypertension. Laboratory examinations conducted in this study were fasting blood glucose levels (GDP) and D-dimer levels. The results of fasting blood glucose examination showed that the average fasting blood glucose level was 209.596 mg/dL with a minimum value of 127 mg/dL and a maximum value of 552 mg/dL. The examination results of D-dimer levels showed that 54 subjects (57.45%) were in the normal category (< 0.5 ng/mL) and 40 subjects (42.55%) were in the high category (≥ 0.5 ng/mL).

Table 1: General Description

Characteristics	Descriptive Analysis		
	mean \pm SD	minimum	maximum
Age (year)	56.80 \pm 1.12	23	82
SBP (mmHg)	134.29 \pm 2.41	80	202
DBP (mmHg)	75.97 \pm 1.51	40	129
FBG (mm/dL)	209.6 \pm 7.6	127	552
D-dimer (ng/mL)	1.00 \pm 0.12	0.12	4.56

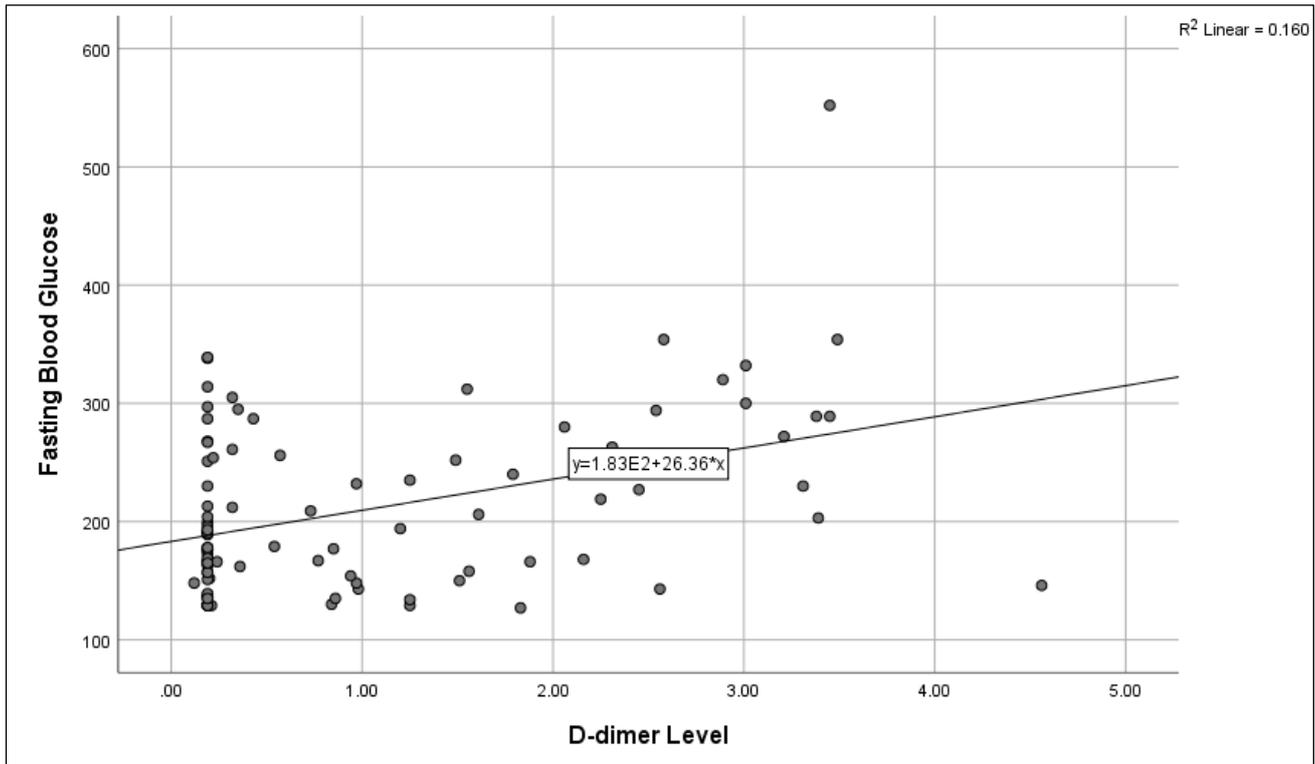


Figure 1: Correlation between D-dimer and fasting blood Glucose

The aim of this study was to determine the correlation between D-dimer levels and fasting blood glucose. The results of analysis using Spearman's rho showed that there was a moderate correlation between D-dimer levels and GDP ($p=0.03$, $r=0.302$) (Figure 1). The

results of this study are in line with the results of previous studies. Research from Coban (2005) showed that the level of D-dimer was related to fasting blood glucose in type 2 diabetes mellitus ($p<0.05$) [6]. Many studies have shown an increase in coagulation markers in patients

with T2DM [7-9]. Depletion of the antioxidant reserve and enhanced glycolysis are further effects of hyperglycemia. Reduced glutathione (GSH) is the main antioxidant in erythrocytes, and erythrocyte oxidative stress (EOS) develops when GSH levels are low. Reduced erythrocyte membrane fluidity and increased procoagulant tissue factor are linked to EOS. An increased risk of vascular events, including prothrombotic activity, is linked to increased blood viscosity, of which decreased erythrocyte membrane fluidity is a partial contributory component. The innate feedback mechanism linked to thrombosis for the purpose of preserving hemostasis subsequently leads to elevated levels of plasma D-dimer [10].

CONCLUSION

From the results, it can be concluded that there is a sufficient correlation between D-dimer levels and fasting blood glucose levels. Nevertheless, D-dimer is not recommended to be used as an indicator of complications in type 2 diabetes mellitus.

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