
Research Article**The Relationship between the Level of Glycosylated hemoglobin (HbA1c) with The Incidence Rate of Diabetic Foot in H. Adam Malik General Hospital***Fernando Silalahi Marshal, Doddy Prabisma Pohan, Aznan Lelo*Division of Thoracic, Cardiac and Vascular Surgery, Department of Surgery, RSUP H. Adam Malik
Department of Pharmacology and Therapeutics, Faculty of Medicine, University of Sumatera Utara**Abstract:**

Background : Diabetes Mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia that occurs due to insulin secretion abnormalities, insulin work or both. Most Diabetes Mellitus treatments are always associated with diabetic ulcers. Death rates and amputation rates are still high, respectively at 32.5% and 23.5%. The fate of patients with post-amputation Diabetes Mellitus is still very bad, as many as 14.3% will die within a year after amputation and 37% will die 3 years after amputation. It has been mentioned in previous clinical studies that uncontrolled diabetes mellitus was associated with elevated HbA1c levels associated with the development of retinopathy as well as other complications, with a research reference value $r = 0.079$.

Methods : The study involved Diabetes Mellitus patients with diabetic foot diagnosis in Thoracic, Cardiac, and Vascular Surgery Polyclinic Department of Surgical and Inpatient Surgery RSUP H. Adam Malik Medan period January 2014-December 2016 with a total sample of 70 people.

Result : The mean age of study subjects was $55.65 + 12.25$. In the table shows that the study subjects based on the most gender were men with 47 subjects (67%). The mean of Glycosylated hemoglobin (HbA1c) was $6.4 + 2.44$ mg / dL with the most patients found at HbA1c <7 mg / dL level of 49 patients (70%). The result of the analysis is $p = 0.0001$ ($p < 0,05$) this means there is significant relation between Glycosylated hemoglobin (HbA1c) and diabetic foot. Also obtained OR = 3.1 (CI = 95%, $p < 0.05$).

Conclusion: Bivariatically there was a significant correlation between Glycosylated hemoglobin (HbA1c) and diabetic foot with $p = 0.0001$ and Odd Ratio of OR = 3,1 (CI = 95%, $p < 0,05$). For the mean result of Glycosylated hemoglobin (HbA1c) was $6.4 + 2.44$ mg / dL with the highest HbA1c <7 mg / dL of 49 patients (70%).

Keywords : HbA1C, Diabetic foot, amputation**Introduction**

Diabetes Mellitus (DM) is a chronic disease that is still a main health problem in Indonesia. According to the American Diabetes Association (ADA) 2010, DM is a group of metabolic diseases with the characteristic of hyperglycemia occurring because of abnormality of insulin secretion and usage or both of them.¹

Glycosylated haemoglobin (HbA1c) was first found in the 1960s through a process of hemoglobin electrophoresis.² The usage of HbA1c for the monitoring of control degree for glucose metabolism of patients with diabetes was first proposed in 1976.³ *Glycosylated hemoglobin* is a condition where glucose is binded to systemic circulation including hemoglobin existing in red blood cells.⁴

Patients with diabetic ulcer in Indonesia requires a large cost, 1,3 million to 1,6 million each month and 43.5 million each year for a patient.⁵ Diabetic foot may emerge because of wound on the foot accompanied by infection. In DM patients,

this wound may occur due to several factors such as neuropathy, ischemia, trauma and infection.⁶

The level of blood glucose is a determinant of HbA1c, which clearly shows control of diabetes mellitus for the last 2 months. It has been mentioned in previous clinical studies that uncontrolled has a relationship with the increase in HbA1c level which is associated to development of retinopathy like other complications, with the reference value of study $r = 0.079$.⁷ The expert committee of the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD) then recommended the use of HbA1c for the diagnosis of diabetes mellitus, and in 2010 ADA included HbA1c into the diagnostic criteria of diabetes.⁸

Methods

This study is an analytic study with the design of *cross sectional* study. The study was performed in the polyclinic of Thoracic and Cardiovascular Surgery, Department of Surgery

and ward of RSUP H. Adam Malik Medan. The collection of data was started since the proposal of this study was agreed by the ethical committee. The population in this study was DM patients with the diagnosis of diabetic foot and DM patients without the diagnosis of diabetic foot in RSUP H. Adam Malik Medan. The study sample was DM patients with the diagnosis of diabetic foot at the Polyclinic of Thoracic and Cardiovascular Surgery, Department of Surgery and ward of RSUP H. Adam Malik Medan in the period of January 2014-December 2016. The total of samples collected was 70 people.

The inclusion criteria in this study was:

- Gender male and female
- Diabetes Mellitus patients accompanied by symptoms of diabetic foot
- Diabetes Mellitus patients without symptoms of diabetic foot

The exclusion criteria in this study was:

- Patients who refused to be study samples
- Patients who didn't perform examination of glycosylated hemoglobin
- History of previous peripheral vascular disease, eg. : PAD, Buerger's disease

The data collected was processed and displayed descriptively in tables or graphics. The explanation of tables and graphics would be displayed in narration. The data was processed using SPSS v20. All of the study subjects would be asked for agreement from the patients and their family after given explanation about the condition of patient and action performed.

Results

Characteristic of Study Subjects

The study involved DM patients with the diagnosis of diabetic foot in the Polyclinic of Thorax, Cardiac and Vascular Surgery, Deartment of Surgery and ward of RSUP H. Adam Malik Medan for the period of January 2014- December 2016 with the total of sample 70 people. The characteristic of study subjects was described in the following table:

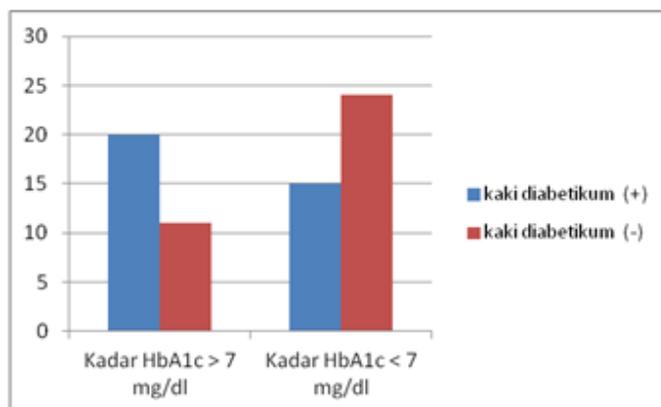
Tabel 1. Characteristic of Study Subjects

Characteristic	N	%
Age (Mean ± SD)	55,65 ± 12,25	
Gender		
Male	47	67
Female	23	33
Level of HbA1c (Median)		
Level of HbA1c (Mean)	6,4 ± 2,44	
Level of HbA1c > 7	21	30
Level of HbA1c < 7	49	70
Diabetic foot		
Diabetic foot (+)	35	50
Diabetic foot (-)	35	50

Based on the table above it can be seen that mean age of study subjects was 55.65 ± 12.25. In the table it can be seen that study subjects based on the most gender was male with 47 subjects (67%). For the mean of *Glycosilated hemoglobin (HbA1c)* level was 6,4 ± 2,44 mg/dL with the patients mostly with the HbA1c < 7 mg/dL as many as 49 patients (70%). In addition based on the characteristic of diabetic foot found the amount of patients with or without diabetic foot were the same, as many as 35 subjects (50%) in RSUP. Haji Adam Malik Medan.

Bivariate Analysis

The characteristic of study subjects assessed in this study comprised two variables, level of *Glycosilated hemoglobin (HbA1c)* and diabetic foot. In this analysis, we performed bivariate analysis using Chi-Square which were patients classified respectively into 2 categories. The result of analysis obtained was p = 0,0001 (p<0,05) this means that there was a significant relationship between the level of *Glycosilated hemoglobin (HbA1c)* and diabetic foot. In addition, we obtained OR = 3,1 (CI=95%, p<0,05). This means that patients with the level of *Glycosilated hemoglobin (HbA1c)* > 7 mg/dL were in risk three to five times fold to suffer diabetic foot, as displayed in the table below.



P = 0,0001 OR = 3,1 (CI=95%, p<0,05).

Figure 1. Analysis of Relationship between the level of HbA1c and Diabetic Foot

Discussion

In this study the mean age of study subjects was 55,65 ± 12,25. This is suitable to the study by Wild that stated increase of the prevalence of diabetic patients occur in the elderly population. Prevalence of diabetes in patients coming from various age groups were estimated to increase from 2.8% in 2000 to 4.4% in 2030.⁹

Another result may be visible that study subjects based on gender, mostly were male, 47 subjects (67%). This was suitable to another study that the prevalence of diabetes found higher in men compared to women.⁹

The result of analysis obtained was p = 0,0001 (p<0,05) this meant that there was a significant relationship between the level of *Glycosilated hemoglobin (HbA1c)* and diabetic foot. In addition, we found OR = 3,1 (CI=95%, p<0,05). Patients with

the level of *Glycosilated hemoglobin (HbA1c)* > 7 mg/dL were in risk three to five times to suffer diabetic foot, as displayed formerly. This was in accordance to the study performed by Hasan et al, found that the level of HbA1c uncontrolled was an strong indicator to blood glucose level which was also uncontrolled.¹⁰

Conclusion

1. Bivariate, there was a significant relationship between the level of *Glycosilated hemoglobin (HbA1c)* and diabetic foot with $p = 0,0001$ and Odd Ratio = 3,1 (CI=95%, $p < 0,05$).
2. For the mean result of *Glycosilated hemoglobin (HbA1c)* level was $6,4 \pm 2,44$ mg/dL with most patients had the level of HbA1c < 7 mg/dL as many as 49 patients (70%).

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