

THE RELATIONSHIP OF LONG TIME SUFFERING FROM TYPE 2 DIABETES MELLITUS ON THE DEGREE OF PERIPHERAL NEUROPATHY AT GOTONG ROYONG HOSPITAL SURABAYA

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ABSTRACT

Introduction: Peripheral neuropathy is one of the most frequent complications in Diabetes Mellitus. The prevalence of diabetic neuropathy based on studies is 8% in newly diagnosed DM sufferers and 50% in patients who have long suffered from DM. Peripheral neuropathy is defined as damage to the peripheral nerves which can cause damage to sensory, motor and autonomic nerve function.

Objective: This study aims to determine the relationship between the duration of suffering from Type 2 Diabetes Mellitus and the degree of peripheral neuropathy at the Gotong Royong Hospital in Surabaya.

Method: This research is an observational analytical study with a *cross-sectional design* using an instrument in the form of a questionnaire on type 2 DM patients at the Gotong Royong Hospital in Surabaya from August to October 2023. The number of samples used in the research was 45 people.

Results: The results of the analysis of the relationship between the duration of suffering from Type 2 Diabetes Mellitus and the degree of peripheral neuropathy using the *Spearman's test* showed $p = 0.023$.

Conclusion: There is a significant relationship between the duration of suffering from Type 2 Diabetes Mellitus and the degree of peripheral neuropathy at the Gotong Royong Hospital in Surabaya.

Keyword: diabetes mellitus, diabetic neuropathy

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INTRODUCTION

Diabetes mellitus is one of the biggest global problems in the world with an incidence of 1.5 million in those aged < 70 years and is the third deadliest disease in Indonesia after stroke and heart disease with the incidence rate continuing to increase.^{1,2}

Diabetes Mellitus (DM) is a metabolic disease with chronic hyperglycemia which can occur due to impaired insulin work, insulin secretion, or both. Over time, DM can cause several complications. Complications that often occur in DM sufferers are caused by damage to the motor, sensory and autonomic nervous systems with symptoms most often found in the peripheral parts of the body. Diabetic neuropathy is characterized by pain, numbness, numbness and tingling which occurs in 50% of all diabetes mellitus sufferers in the world. The incidence of neuropathy in diabetes can be caused by many factors that are not yet known for certain, including the duration of diabetes mellitus.^{3,4,5}

METHODS

This research uses a cross-sectional observational analytical method. The samples used in this study were all patients at the Gotong Royong Hospital in Surabaya who had been diagnosed with DM. The sample used in the research was 45

respondents using a purposive sampling technique. Researchers used primary data with questionnaires and secondary data in the form of medical records. The data will be processed into the SPSS version 26 program for data analysis. Analysis is carried out with the Spearman's test. This study uses a p value <0.05 (considered significant).

RESULT

Table 1. Distribution of Demographic Data for Research Samples.

Frequency Distribution of Demographic Characteristics of Diabetes (n=45)		
Respondent Category	Frequency	Percentage (%)
Age		
50-60 years	36	80%
60 – 65 years	9	20%
Gender		
Man	14	31.1%
Woman	31	68.9%
Type 2 DM for a long time		
< 5 years	13	29%
5-10 years	16	35.5%
> 10 years	16	35.5%
HbA1c		
< 7%	8	17.8%
7-8 %	5	11.1%
> 8%	32	71.1%

Based on table 5.1, the age criteria in this study are divided into 2, namely 50-60 years (middle age) and 60-65 years (elderly). Based on the data obtained, the number of respondents aged 50-60 years was 36 people (80%), age 60-65 years old as many as 9 people (20%). Based on gender

criteria, the results showed that there were 14 male respondents (31.1%), 31 female respondents (68.9%). Based on the criteria for the duration of suffering from type 2 DM, the results showed that the duration of suffering from type 2 DM was <5 years for 13 people (29%), 5-10 years for 16 people (35.5%), and > 10 years for 16 people (35.5%). Based on the HbA1c criteria, the results were HbA1c < 7% for 8 respondents (17.8%), HbA1c 7-8% for 5 respondents (11.1%), and HbA1c > 8% for 32 respondents (71.1%).

Table 2. Sample Distribution of Degrees of Peripheral Neuropathy Based on Gender.

Degree of peripheral neuropathy	Gender		Total
	Man	Woman	
No neuropathy	-	-	-
Mild neuropathy	6(42.8%)	11 (35.5%)	18(40%)
Moderate neuropathy	6(42.8%)	15 (48.3%)	21 (46.7%)
Severe neuropathy	2(14.2%)	5(16.1%)	7(15.2%)
Total	14(100%)	31(100%)	45(100%)

Based on table 2, it is known that the largest number of respondents were female respondents, 31 respondents (68.9%) with 15 respondents (48.3%) suffering from moderate neuropathy, 11 respondents (35.5%) suffering from mild neuropathy, and 5 respondents (16.1%) suffering from severe neuropathy. Meanwhile, there were 14 male respondents (31.1%) with 6 respondents (42.8%)

suffered from mild neuropathy, 6 respondents (42.8%) suffered from moderate neuropathy, and 2 respondents

(14.2%) suffered from severe neuropathy.

Table 3. Sample Distribution of Long Suffering from Peripheral Neuropathy Based on Age of Diabetics

Duration suffering from type 2 DM	Age		Total
	50-60 yrs	60-65 yrs	
< 5 yrs	11 (32%)	2 (22%)	13(54%)
5-10 yrs	14 (41%)	3 (33%)	17(71%)
> 10 yrs	9(27%)	4 (45%)	13(72%)
Total	34 (100%)	9 (100%)	45(100%)

Table 3 shows that the largest number of respondents were respondents aged 50-60 years, namely 34 respondents, of the 34 respondents it was found that 11 respondents (32.2%) had suffered from DM < 5 years, 14 respondents (41.1%) had suffered from DM 5-10 years and 9 respondents (26.4%) suffered from DM > 10 years. A total of 9 respondents aged 60-65 years with 2 respondents (22.2%) suffering from DM < 5 years, 3 respondents (33.3%) suffering from DM 5-10 years, and 4 respondents (44.4%) suffering from DM > 10 years.

Table 4. Sample Distribution of Frequency Degrees of Peripheral Neuropathy Based on Length of Suffering from DM

Degree of Peripheral neuropathy	Duration suffering from DM			Total
	< 5 years	5-10 years	> 10 years	
No neuropathy	-	-	-	-
Mild neuropathy	68 (66.7%)	4 (23.5%)	4 (25%)	16 (35.5%)
Moderate neuropathy	3 (25%)	11 (64.7%)	6 (37.5%)	20 (44.4%)
Severe neuropathy	1 (8.3%)	2 (11.8%)	6 (37.5%)	9 (20%)
Total	12 (100%)	17 (100%)	16 (100%)	45 (100%)

Criteria for the duration of suffering from type 2 DM are divided into three, namely < 5 years, 5-10 years, and > 10 years. Based on these data, it was found that 17 respondents suffered from type 2 DM for 5-10 years, with 11 respondents (64.7%)

suffering from moderate neuropathy, 4 respondents (23.5%) suffering from mild neuropathy, and 2 respondents (11, 8%) suffer from severe neuropathy. There were 16 respondents who suffered from type 2 DM > 10 years, with 6 respondents (37.5%) suffering from severe neuropathy, 6 respondents (37.5%) suffering from moderate neuropathy, and 4 respondents (25%) suffering from mild neuropathy. There were 12 respondents with type 2 DM <5 years, with 8 respondents (66.7%) suffering from mild neuropathy, 3 respondents (25%) suffering from moderate neuropathy, and 1 respondent (8.3%) suffering from severe neuropathy.

Table 5. Spearman's rho correlation test results.

		Duration suffering from DM	Degree of peripheral neuropathy
Spearman's rho	Duration suffering from DM	Correlations coefficient	1.000
		Sig-(2 tailed)	.338
		n	45
Degree of peripheral neuropathy	Duration suffering from DM	Correlations coefficient	.338
		Sig-(2 tailed)	.023
		n	45

Based on the results of the correlation test, it is known that the significance value or Sig (2-tailed) is 0.023, which is smaller than 0.05, which means there is a significant (meaningful) relationship between the variable length of suffering from type 2 DM and the degree of peripheral neuropathy.

DISCUSSION

Based on table 1 and table 2, the data obtained shows that the largest number of diabetes mellitus patients with good,

moderate or poor glycemic control is aged 51 to 60 years, both for patients who have a history of smoking and those without a history of smoking. Apart from the smoking habit of half of the total study sample, it is known that as a person gets older, their intolerance to glucose will also increase. The reason behind this is that pancreatic β cells gradually become smaller with age. As a result, the production of the insulin hormone is disrupted, causing an increase in blood sugar levels.⁷

Patients with type 2 diabetes mellitus who had never smoked before and those who had smoked in the past comprised two parts of the study sample. The research began by carrying out a Mann Whitney test on the research results. There were no significant differences between the HbA1c levels of the four categories of smokers. The significance value obtained was 0.207, where this figure was > 0.05. In diabetes mellitus sufferers, this shows that smoking is not correlated with HbA1c levels.

In line with previous research, these findings show that patients with type 2 diabetes mellitus and a history of smoking do not have significant differences in HbA1c levels compared with patients without a history of smoking. The findings of this study are consistent with research by Rahim, AR in 2023 which found no correlation between smoking and the prevalence of uncontrolled type 2 diabetes

mellitus.^{8,9}

This research shows results that are not in line with the theory stated by the World Health Organization (WHO) which states that tobacco use is strongly associated with an increased risk of developing type 2 diabetes. In 2013, Vlassopoulos, A. found that compared to non-smokers, those who smoking has 0.08% higher HbA1c values, and heavy smokers have 0.14% higher HbA1c levels. The nicotine contained in cigarettes will cause a decrease in insulin sensitivity and decrease glucose uptake by muscles. This will result in an increase in insulin resistance. Cigarette smoke contains nicotine which activates catecholamine hormones, inhibits insulin function, and disrupts pancreatic β cells thereby reducing insulin secretion. Nicotine influences insulin secretion in pancreatic β cells via nAChRs. Pancreatic islets and pancreatic β cells may have functional nicotinic receptors, according to some studies. The presence of nicotine-sensitive neural nicotinic receptors in pancreatic cells provides a switch for modulating the physiological function of pancreatic cells by acetylcholine and is involved in tobacco toxicity. This explains that the activity of pancreatic β cells may be negatively influenced by the nicotine contained in cigarettes. Decreased insulin secretion and continued increase in insulin resistance will keep the patient's blood glucose high.^{10,11,12}

The research results differ from theory due to many risk factors for increasing HbA1c levels that cannot be studied because of limitations in the research such as the type of oral medication consumed by the patient, physical activity or exercise routine, food intake, stress level and lifestyle of diabetes patients. type two mellitus was the research sample. The results of this study also cannot represent all type two diabetes mellitus patients who smoke and who do not smoke because the study population is relatively small. Table 1 shows that the highest median HbA1c test result was in the heavy smoker category, then the lowest was in the light smoker category. However, light smokers only have a frequency of 2 people so it cannot describe the overall results.

CONCLUSION

Based on the results of the research that has been carried out, several conclusions can be drawn, namely:

1. The average result of checking HbA1c levels in patients who have a smoking habit is 8.9%. These average results indicate that most diabetes mellitus patients who have a history of smoking have poor glycemic control.
2. The average result of checking HbA1c levels in patients who do not have a smoking habit is 8.4%.

These average results show that most diabetes mellitus patients who do not have a history of smoking also have poor glycemic control, although the numbers are still better than patients with a history of smoking.

3. There is no significant relationship between smoking habits and HbA1c levels in type two diabetes mellitus patients at the Gotong Royong Hospital.

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