

Research

DESCRIPTION OF PAIN IN DIABETES MELLITUS AND NON-DIABETES MELLITUS PATIENTS AT PUSKESMAS DANUREJAN 1, YOGYAKARTA

Anandora Bagas Satrio Wibowo¹, Lisa Kurnia Sari¹, Dewi Lestari¹, Yanti Ivana Suryanto¹
Probosuseno¹

¹Fakultas Kedokteran Universitas Kristen Duta Wacana, Yogyakarta

Corresponding Author: lisa.tandean@gmail.com

ABSTRACT

Background Diabetes mellitus (DM) is a disease caused by impaired glucose metabolism, failure of the pancreas to produce the insulin hormone or the body's inability to respond to the insulin hormone. The neurologic complications are neuropathic or nociceptive pain. Neuropathic pain can cause the decrease in patient's quality of life. Knowing the spread of neuropathic pain based on anatomical predilection may help clinicians conduct early diagnosis and improve the patient's quality of life.

Objective This study aimed to determine the characteristics, prevalence and location of pain in patients with type 2 diabetes mellitus and non-diabetes mellitus at Puskesmas Danurejan I Yogyakarta.

Methods A descriptive quantitative study on 42 secondary data from previous study in Puskesmas Danurejan I. The inclusion criteria were data of patients with neuropathic pain (electric shock-like pain, stabbing pain) and nociceptive pain (burning sensation pain) who were > 40 years old. The exclusion criteria were incomplete data and recorded consumed non-steroidal anti-inflammatory drugs in the last of 4 days in previous study. Univariate and bivariate analysis were used in this study.

Results Patients with DM accounted for 50% of cases by 21 people. Patients with DM had the most frequent comorbidities, such as hypertension (42.8%) and obesity (42.8%). Most patients with DM reported pain (85.7%) with neuropathic back pain (27.7%). Based on the type of pain, patients with DM most frequently reported neuropathic pain (66.7%) ($p=0.001$).

Conclusion There was a relationship between diabetes mellitus and the incidence of neuropathic pain but not nociceptive pain.

Keywords: diabetes mellitus; nociceptive pain; neuropathic pain.

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INTRODUCTION

Diabetes mellitus is caused by impaired glucose metabolism, failure of the pancreas to produce the insulin hormone or the body's inability to respond to the insulin hormone.^{1,2} Yogyakarta Special Region (DIY) ranks third in the province with the highest prevalence of diabetes mellitus in Indonesia at 3.1 percent based on RISKESDAS.³ In addition to hyperglycemia, this disease is characterized by micro and macrovascular complications, which include retinopathy, nephropathy, neuropathy and an increased risk of cardiovascular-related death. One of the complications that arises is neuropathic or nociceptive pain.⁴ Pain usually appears as nonspecific pain with unknown pathologies and is currently one of the main complaints among diabetic patients.⁴ Nociceptive pain

provides a warning of impending tissue damage that encourages actions to protect the body from harm. This neuropathic pain is a confusing and disturbing symptom and not only interferes with the physical but also psychic of the individual.⁵ Until now, there has been a few research in Indonesia reports the neuropathic pain of DM patients related to anatomical predilection. The aim of this research is to be carried out at the community health clinic because it is a primary health service facility that can cover many DM patients.

METHODS

This study was a quantitative descriptive method using secondary data from previous study with the title "Incidence of Soft Tissue Rheumatism in Superior Extremities in Type 2 Diabetes Mellitus Patients at the

Danurejan 1 Yogyakarta Health Center" in 2018. The previous study samples were Type 2 of Diabetes Mellitus and non-Diabetes Mellitus patients who checked themselves at the Danurejan Health Center Yogyakarta in September 2018. The inclusion criteria of this study were patients with neuropathic (electric shock-like pain, stabbing pain) and nociceptive pain (burning sensation pain) symptoms who were > 40 years old, while the exclusion criteria of this study were patients with incomplete data and who consumed non-steroidal anti-inflammatory drugs in the last of 4 days. Analysis of the sample size calculation using the binomial formula proportion obtained a sample of at least 42 patients. Samples that meet the criteria will be analyzed with univariate to figure out

demographic data, comorbid data (hypertension, gout arthritis, obesity, and others comorbid), the picture of pain according to anatomical predilection. Bivariate analysis used to find out if there is a correlation between diabetic and non-diabetic patients with pain.

RESULTS

The general characteristic of patients in Table 1. The most age groups are in the age range of 56-60 years (12 people) and 61-65 years (12 people), followed by the age group of 51-55 years (10 people), 46-50 years (4 people), and 41-50 years (4 people). Patients with DM accounted for 50% of cases of 21 people, as did non-DM patients.

Table 1. General characteristics of patients

Characteristics	Sum	Percentage (%)
Gender		
Male	7 people	16.6
Female	35 people	83.4
Education		
Elementary School	9 people	21.4
Junior High School	16 people	38.0
Senior High School	12 people	28.5
University	5 people	14.2
Work		
Housewife	14 people	33.3
Private Employees	5 people	11.9
Self Employed	2 people	4.7
Government Employees	13 people	30.9
Other	8 people	19.0

Based on the data in table 2, there are 9 patients with DM who had hypertension (42.8%) while for patients without DM who did not have hypertension are 16 people (71.2%). Patients with DM who did not have gout arthritis, amounted 19 people (90.5%), as well as patients without DM (95.3%). Patients with DM who had no cholesterol are 13 people (61.9%), as well

as in patients without DM (90.5%). Patients with DM without obesity are amounted to 12 people (57.2%), as well as patients without DM amounted to 13 people (61.9%). Therefore, patients with DM had no other diseases amounted to 90.5%, as well as patients without DM amounted to 20 people (95.3%).

Table 2. Characteristics of DM and non-DM patients based on comorbid diseases

Characteristics	Diabetes Mellitus (DM)	
	Patients with DM	Patients without DM
Hypertension		
Yes	9 (42.8%)	5 (23.8%)
No	12 (57.2%)	16 (71.2%)
Gout Arthritis		
Yes	2 (9.5%)	1 (4.7%)
No	19 (90.5%)	20 (95.3%)
Cholesterol		
Yes	8 (38.1%)	2 (9.5%)
No	13 (61.9%)	19 (90.5%)
Obesity		
Yes	9 (42.8%)	8 (38.1%)
No	12 (57.2%)	13 (61.9%)
Other Diseases		
Yes	2 (9.5%)	1 (4.7%)
No	19 (90.5%)	20 (95.3%)

In Table 3, patients with DM mostly reported pain (85.7%), while in non-DM patients reported pain (52.3%). In DM patients the most commonly reported pain location was the back (27.7%), while in non-DM patients, the most commonly reported pain locations

were the legs and the knees each by (16.7%). Based on the type of pain, patients with DM most often reported neuropathic pain by (66.7%). Whereas in patients without DM most often reported nociceptive (44.4%) followed by neuropathic by (16.7%).

Table 3. The pain distribution of patients

Pain Location	Diabetes Mellitus	
	Yes	No
Arm	4 (22.2%)	0
Chest	1 (5.5%)	0
Waist	1 (5.5%)	0
Back	5 (27.7%)	2 (11.1%)
Hand	2 (11.1%)	1 (5.5%)
Foot	0	3 (16.7%)
Knee	1 (5.5%)	3 (16.7%)
Shoulder	1 (5.5%)	1 (5.5%)
Elbow	1 (5.5%)	0
Neck	1 (5.5%)	0
Solar plexus	1 (5.5%)	0
Not specific	0	1 (5.5%)

Based on the correlation between type 2 diabetes mellitus and non-diabetes mellitus type 2 with pain, the chi square test results obtained p value (0.019) < a (0.05). Statistically these results can be interpreted to mean that there is a meaningful correlation between Type 2 DM and non Dm Type 2 to pain (Table 4). Based on the correlation between type 2 diabetes mellitus with neuropathic pain, Chi Square test results obtained p value (0.001) > a (0.05).

Statistically these results can be interpreted to mean that there is a meaningful correlation between type 2 DM and Neuropathic Pain (Table 4). Based on the correlation between type 2 diabetes mellitus with nociceptive pain, Chi Square test results obtained p value (0.758) > a (0.05). Statistically these results can be interpreted that there is no meaningful correlation between type 2 DM and Nociceptive Pain (Table 4).

Table 4. Correlation between type 2 diabetes mellitus and non type 2 diabetes mellitus with pain, neuropathic pain dan nociceptive pain

	Pain			Neuropathic Pain			Nociceptive Pain		
	Yes	No	p	Yes	No	p	Yes	No	p
Type 2 DM	18 42,9%	3 7%	0,019	12 28,6%	9 21,4%	0,001	10 23,8%	11 26,2%	0.758
Non Type 2 DM	11 26,2%	10 23,8%		2 4,8%	19 45,2%		11 26,2%	10 23,8%	

DISCUSSION

In this study, it was found that the most DM age group was in the age range of 56-65 years old. In the United States, in the age group of 20-44 years, it is estimated that about 3.7% of people have diabetes; while in the age group of 45-64 years increased to 13.7%; and the highest percentage of 26.9% is found in the 65-year-old age group (CDC, 2020).⁶ The results of similar studies were also observed in the UK, where the prevalence of diabetes increases with age. The peak prevalence of diabetes can be found in the age group of 65-74 years with 15.7% in male and 10.4% in woman.⁷ Research conducted by Suastika *et al*/ on the population in Bali showed that the prevalence of type 2 DM was higher in the elderly group compared to the younger age group, which was almost 2 times.⁸ According to the theory, elderly patients are at high risk for the development of type 2 diabetes due to the combined effect of increased insulin resistance and impaired pancreatic function with aging. Age-related insulin resistance is mainly associated with adiposity, sarcopenia, and physical activity.⁹

The study also reported comorbidities that occurred in DM patients, where the most commonly found were obesity and hypertension (42.8% each), followed by cholesterol (38.1%) and gout (9.5%). Research in the United States reports that diabetes affects almost 1 in 10 adults, with the majority (90%-95%) of cases being diabetes type 2.¹⁰ Research conducted by Isna *et al*/ in Indonesia reported that 63.9% of adult type 2 DM sufferers obesity (BMI 25 kg / m²), fat intake was higher than recommended (30.77±9.06%), but the average energy intake was insufficient compared to energy needs (62.06±23.67%). The prevalence of obesity in adults with type 2 diabetes was found to be related to nutritional knowledge, level of education, and how long suffering from type 2 DM.¹¹

The pathophysiology of diabetic neuropathy involves metabolic and vascular factors. Hyperglycemia causes an increase in sorbitol and fructose which leads to impaired blood supply to the nerves.^{12,13} Besides that, hyperglycemia causes the non-enzymatic incorporation of glucose into proteins through unregulated glycation reactions, activation of reactive oxygen species, and activation of abnormal protein kinase C where this whole process contributes to the onset of pain.^{12,13}

The results of the statistical test found that there was a significant correlation between Type 2 Diabetes mellitus and the incidence of neuropathic pain with p value = 0.001 then a statistical test conducted on Type 2 Diabetes mellitus on the incidence of Nociceptive pain obtained a value of p = 0.758 where there was no meaningful correlation between Type 2 DM and Nociceptive pain. In a study conducted by Liberman *et al.*, 2014, a cross-sectional study of 324 patients confirmed with type 2 DM with pain found that neuropathic pain in DM patients was much more common than nociceptive pain.¹⁴ Then in the next study by Aguiar *et al.*, 2018 using the same method on 129 DM patients, 59.1% felt pain and 34.1% of them were neuropathic pain.¹⁵ In another study by Bouhassira *et al*/ in 2013 on 766 patients with DM type 1 or type 2 it was found that the overall prevalence of chronic pain with neuropathic characteristics was 20.3%.¹⁶

In DM patients the most reported location of pain was the back (27.7%). Research conducted by Hartemann *et al*/ reported that the prevalence of lower limb pain ranged from 6% to 27%, and was more common in type 2 (32%) than type 1 diabetes (12%).¹⁷ Ziegler *et al*/ reported significantly lower pain in the lower extremities. The percentage of patients with type 2 diabetes who reported lower limb pain was bigger (32.1%) than the percentage of patients with type 2 diabetes who reported having neuropathy (23.9%),

indicating that not all pain was neuropathy or that the criteria for determining peripheral neuropathy did not identify all cases.¹⁸ According to research from Feldman, *et al.*, 2019, neuropathy is caused by damage to the diffuse and focal nervous system and occurs in half of all individuals with diabetes. The most common form of diabetic neuropathy is distal symmetrical polyneuropathy. Our study also reported that the most of non-DM patients experienced nociceptive pain (72.7%). Nociceptive pain occurs when there is damage or injury to body tissues.

CONCLUSION

In the study, it was found that people with DM occur a lot at the age of 56-65 years with symptoms of pain, while when compared to non-DM sufferers. In DM patients, the most frequent location of pain is the back. There was a correlation between diabetes mellitus and the incidence of neuropathy and no correlation was obtained between diabetes mellitus and the incidence of nociceptive pain.

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CONFLICT OF INTEREST AND FUNDING RESOURCES

None of the authors have any conflicts of interest associated with this paper.

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