Research Article

Dyslipidemia, Physical Activity, and Long Suffering from DM are Associated with Peripheral Neuropathy in Diabetes Mellitus Patients: Cross-Sectional Study

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ABSTRACT

Background: DM is a serious problem with the incidence rate increasing every year. Based on data obtained from the Ranomeeto Community Health Center, there are still many DM sufferers found. The results of interviews with residents suffering from DM revealed that there were DM patients who experienced peripheral neuropathy which was characterized by permanent numbness, temporary numbness, and weakness in the legs, namely numbness and cramps. The aim of this research aims to determine the factors associated with the incidence of peripheral neuropathy in diabetes mellitus sufferers in the Ranomeeto Health Center Work Area.

Methods: The research method used was observational using a cross-sectional design with a proportional random sampling technique with a population of 215 respondents and a sample size of 68 respondents.

Results: The results of the study showed that there was a relationship between the duration of DM and peripheral neuropathy (X^2 Calculation = 45.634 ≥ X^2 Table = 3.841), there is a relationship between dyslipidemia and peripheral neuropathy (X^2 Calculation = 14.645 ≥ X^2 Table = 3.841), and there is a relationship between physical activity and the incidence of peripheral neuropathy (X^2 Calculation = 39.151 ≥ X^2 Table = 3.841).

Conclusions: Based on the result, it can be concluded that long suffering from DM, dyslipidemia, and physical activity are factors related to the incidence of peripheral neuropathy in diabetes mellitus patients in the Ranomeeto Health Center Working Area.

Keywords : Diabetes Mellitus; Peripheral Neuropathy; Dyslipidemia; Physical activity

INTRODUCTION

DM is a serious problem with the incidence rate increasing every year. DM attacks almost all groups of people from the age of 15 years and over throughout the world (1). According to the International Diabetes Federation (IDF) in 2021 in Pakistan, the prevalence of DM sufferers reached 229.562 million cases (30.8%) and Indonesia reached a prevalence of 20.4 million cases (10.6%). Diabetes is responsible for 6.7 million deaths. According to IDF (2021) more than 81% of them occur in low and middle-income countries. Data from PERKENI in 2021 explains that the national prevalence of DM is 20.4 million Indonesians diagnosed with DM (2).

The incidence of DM in DKI Jakarta Province has the highest prevalence (3.4%), Southeast Sulawesi Province ranks 30th with a prevalence (1.3%) and NTT Province ranks last with a prevalence (0.9%). According to Basic Health Research in 2018, the prevalence of DM in South Konawe Regency was 2,681 cases (1.11%) of the total number of cases in Southeast Sulawesi Province (3). Data from the Southeast Sulawesi Provincial Health Service in 2021 was 31,600 cases (4).

Damage to peripheral nerves causes changes in autonomic, motor, and sensory functions such as impaired walking function, muscle weakness, and affects touch sensitivity. This condition triggers symptoms of weakness, numbness, and pain in the leg area(5),(6). High levels of lipids can induce oxidative stress in sensory neurons, thus playing a significant role in the occurrence of diabetic neuropathy and dyslipidemia is one of the risk factors that cause peripheral

neuropathy because the abnormal state of fat (lipid) in the blood results in blockage of arteries so that blood circulation goes to the extremities. down can be obstructed (7).

Based on data from the Ranomeeto Community Health Center, it shows that in 2021 there were 215 DM sufferers with a prevalence of (0.07%) and only 131 people hadgethealth services at the Ranomeeto Community Health Center. Data from interviews with 10 Ranometo residents who suffer from DM showed that there were 8 DM sufferers who experienced peripheral neuropathy characterized by permanent numbness, temporary numbness and weakness in the legs, namely numbness and cramps. After conducting in-depth interviews with the 8 patients, it was found that 4 people had suffered from DM for more than 4 years, 3 people had suffered from DM for more than 3 years, and 1 person had suffered from DM for more than 5 years. Based on data and phenomena from the Ranometo Community Health Center, researchers are interested in conducting research with the title "Factors Associated with the Incident of Peripheral Neuropathy in Diabetes Mellitus Patients in the Ranomeeto Community Health Center Working Area".

METHODS

Type of this research is observational research using a Cross-Sectional study design. Variable the dependent research is the incidence of peripheral neuropathy and the independent variables include length of suffering from DM, dyslipidemia, physical activity. This research was conducted in the Ranomeeto Community Health Center working area, with a population of 215

respondents and a sample size of 68 respondents, who were collected using proportional random sampling techniques. Research variables are measured using questionnaires consisting of demographic information and peripheral neuropathy, long-suffering from DM, dyslipidemia, and physical activity. The instrument used in this research was the Indonesian version of the Global Physical Activity Questionnaire (GPAQ). Peripheral neuropathy consists of two assessment categories, namely category 1 is declared problematic ($\geq$ 50%) and category 0 is declared no problem (< 50%), length of suffering in years, results of cholesterol measurements (Mg/dl) and activity, both mild, moderate and heavy. The duration of suffering from DM is assessed based on the length of time suffering from DM which is assumed to be in years (8).The assessment of dyslipidemia is known by determining the results of cholesterol measurements in Mg/dl units as well as assessing visual activity which is known to be measured in categories: declared "insufficient" if < 600 METs and sufficient if > 600 METs. Bivariate analysis used the chi-square statistical test with a significance level of α=0.05. This research was carried out by paying attention to research ethics, namely first asking for respondents' consent to be interviewed, maintaining confidentiality of respondent data, names written using initials, and maintaining fairness without discriminating against all respondents.

RESULTS
Characteristics of Respondents
Characteristics of respondents based on age, gender, education, and work of respondents in the Ranomeeto Community Health Center

Work Area (n=68) can be seen in the following table:

Table 1. Characteristics of Respondents

Demographic Characteristics		
Age	n	%
25-34 years old	17	25
35-44 years old	14	21
45-54 years old	15	22
>55 years	22	32
Gender		
Man	29	43
Woman	39	57
Education		
Elementary school	20	29
Junior High School	12	18
Senior High School	22	32
Bachelor	14	21
Work		
Civil servants	11	16
Retired	3	4
Self-employed	17	25
Farmer	22	32
Doesn't work	15	22

Based on table 1, data was obtained from 68 respondents, the majority of respondents (57%) were women and aged >55 years (32%) with a high school degree (32%). Almost all respondents work as farmers (32%).

Incidence of Peripheral Neuropathy, Length of Suffering, Dyslipidemia, and Physical Activity of Respondents

Table 2. Frequency Distribution Peripheral Neuropathy, Length of Suffering, Dyslipidemia, and Physical Activity of Respondents (n=68)

Characteristics of Respondents Suffering from DM (n=68)

Characteristics of Respondents Suffering from DM (n=68)		
Peripheral Neuropathy Incidence	n	f
Neuropathy	40	59
Not neuropathy	28	41
Suffering from DM for a long time		
Long sufferer	39	57
New sufferer	29	43
Dyslipidemia		
Dyslipidemia	37	54
No dyslipidemia	31	46

Characteristics of Respondents Suffering from DM (n=68)		
Physical Activity		
Less Activity	39	57
Enough Activity	29	43

Based on table 2, it shows that as many as 40 respondents (59%) experienced neuropathy and 39 respondents (57%) had suffered from DM for a long time. More than half of the respondents experienced dyslipidemia, 37 respondents (54%) and 39 respondents (57%) had less activity.

The Relationship between Long Suffering from DM, Dyslipidemia, Physical Activity and the Incident of Peripheral Neuropathy

Table 3 Results of statistical tests on duration of suffering from DM, dyslipidemia, physical activity and the incidence of peripheral neuropathy (n=68)

Chi-Square statistical test (n=68)							
Variable	**Peripheral Neuropathy**				**Total**		**Statistic test**
	Peripheral Neuropathy		**Not Peripheral Neuropathy**				
Suffering from DM for a long time	n	%	n	%	n	%	
Old Sufferers	37	54.4	2	2.9	39	57.4	X2 Count = 45,634
New Sufferers	3	4.4	26	38.2	29	42.6	X2 Table = 3,841 *p-value= 0.000*
Dyslipidemia							
Dyslipidemia	30	44.1	7	10.3	37	54.4	X2 Count = 14,645
No Dyslipidemia	10	14.7	21	30.9	31	45.6	X2 Table = 3,841 *p-value = 0.000*
Physical Activity							
Less Activity	36	52.9	3	4.4	39	57.4	X2 Count = 39,151
Enough Activity	4	5.9	25	36.8	29	42.6	X2 Table = 3,841 *p-value = 0.000*

Table 3 displays the results of the correlation test using the Chi-square test, showing that long suffering is strongly related to the incidence of peripheral neuropathy in DM sufferers. Apart from that, dyslipidemia also has a strong relationship with the incidence of peripheral neuropathy in diabetes mellitus sufferers. Likewise, physical activity has a strong relationship with the incidence of peripheral neuropathy in diabetes mellitus sufferers in the Ranomeeto Health Center Work Area.

DISCUSSION

According to the findings of this study, long-term suffering from DM and the incidence of peripheral neuropathy in diabetes mellitus sufferers have a strong relationship in the Ranomeeto Health Center Work Area.The results of this study are in line with research (10) which revealed that the length of time suffering from DM has a significant relationship with the incidence of peripheral neuropathy. This means that the long time you suffer from DM affects changes in the walls of blood vessels. The walls of blood vessels will thicken which will have an impact on blood pressure and can ultimately damage blood capillaries and nerve fibers slowly, causing complications. The results of other research show that respondents with new DM sufferers can also suffer from neuropathy because they do not maintain their diet and also do not control their blood sugar.resultIt's easy to get neuropathy even if the respondent is just suffering from DM, while old DM sufferers can also not experience neuropathy if the sufferer is able to control their diet and always control their blood sugar regularly and always exercise (11)

The findings of this study also show that dyslipidemia has a strong relationship with the incidence of peripheral neuropathy in diabetes mellitus sufferers in the region. Work Ranomeeto Community Health Center. The results of this study are in line with research (12) The results obtained showed that a history of dyslipidemia was significantly associated with the incidence of diabetic neuropathy. This research showed that a DM patient with dyslipidemia was 2.23 times more likely to have diabetic neuropathy and in this study dyslipidemia was found in 60% of diabetic neuropathy

sufferers. According to other research, neuropathy can be caused by various things, although the respondents did not have dyslipidemia. One of the causes of neuropathy is poor blood sugar control which is the cause of neuropathy, while DM sufferers who experience dyslipidemia are also likely not to experience neuropathy by always maintaining or controlling their blood sugar. Either way, it can reduce the occurrence of complications that will occur (13).

Respondents with dyslipidemia have a greater potential for developing diabetic neuropathy compared to respondents who do not suffer from dyslipidemia. Matter the because respondents with dyslipidemia can increase the possibility of blocked arteries or problems with obstructed blood circulation to the lower extremities, resulting in the feeling of cramps, numbness and numbness felt in DM sufferers with dyslipidemia. The group that often experiences peripheral neuropathy is female because it is caused by differences in daily activities and lifestyle patterns. In addition, the increase in lipid (blood fat) levels in women is higher than in men, so women tend to experience increased blood sugar levels compared to men, which can cause neuropathy more easily (14).

Physical activity has a strong relationship with the incidence of peripheral neuropathy in diabetes mellitus sufferers in the Ranomeeto Health Center Work Area. The results of this research are in line with research conducted by (15) that respondents with sufficient activity can also get neuropathy because it is triggered by long suffering from DM and lack of Blood sugar control in terms of lifestyle can cause damage to peripheral nerves, while respondents with less activity may not get neuropathy because of good blood sugar

control and good knowledge about the disease they suffer from.

Respondents with less activity have a greater potential for developing neuropathy compared to respondents who have sufficient activity. This is because in respondents with sufficient activity the use of insulin to control blood sugar levels in the body is good and makes it energy that can be used by DM sufferers for activities, whereas in respondents with insufficient activity it greatly influences the occurrence of weakness throughout the body due to inadequate use of insulin. As a result, glucose in the blood cannot be converted into energy that can be utilized by the body, so respondents with less activity easily experience complications from DM.

The results of this study also show that the largest age group suffering from DM is aged >55 years. Most respondents in the age group >55 years carried out light activities such as tending a shop and watching TV, while in the 35-44 years age group most respondents carried out heavy activities such as gardening and exercising. Based on data obtained from work, farming is a job where many respondents experience DM, namely risk factors that cannot be changed such as heredity or genetics, and risk factors that can be changed such as lifestyle due to uncontrolled eating patterns and poor stress management, these factors can influence someone getting DM and this factor is often found in respondents whose work is farmers. Furthermore, DM also causes other complications, including chronic kidney disease.(17-19)

CONCLUSIONS

The incidence of diabetes mellitus (DM) that was identified during the research reported that the incidence of peripheral neuropathy in diabetes mellitus sufferers in the Ranomeeto Health Center Work Area had a very strong relationship between the length of time they suffered from DM and the incidence of peripheral neuropathy in diabetes mellitus sufferers. Apart from that, there is a fairly strong relationship between dyslipidemia and strong physical activity and the incidence of peripheral neuropathy in diabetes mellitus sufferers in the Ranomeeto Health Center Work Area

ACKNOWLEDGEMENT

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