RELATIONSHIP BETWEEN DIABETES SELF CARE MANAGEMENT AND DIABETIC PERIPHERAL NEUROPATHY IN ELDERLY PEOPLE WITH DIABETES MELLITUS IN JEMBER REGENCY

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ABSTRACT

Background: Around the world, 66% of people with diabetes mellitus have diabetic peripheral neuropathy (DPN). DPN is a major cause of morbidity and mortality due to complications such as diabetic foot ulcers, which often result in amputation of extremities or difficulty maintaining balance which results in trauma. DPN is nerve damage caused by hyperglycemia. DM patients who are able to manage their disease independently such as controlling blood sugar is called diabetes self care management (DSCM). **Objective:** To analyze the relationship between diabetes self care management and diabetic peripheral neuropathy in elderly people with diabetes mellitus in Jember Regency. **Methods:** This research is an observational study with a cross-sectional design with a purposive sampling technique to determine which Community Health Centers in Jember Regency will be used as research sites. The number of samples is 101 elderly with diabetes mellitus in Jember Regency. The DSCM data collection used The Summary of Diabetes Self Care Activities Questionnaire and the DPN used the Neuropathy System Score. **Results:** The level of diabetes self care management in elderly DM in Jember Regency was in the poor category, with the majority being 61 people (60.4%). The level of diabetic peripheral in the elderly with diabetes mellitus in Jember Regency is in the severe category, with 67 people (66.3%). In the Pearson correlation test, the relationship between diabetes self care management and diabetic peripheral neuropathy in elderly people with diabetes mellitus in Jember Regency obtained a p-value of 0.000 (p <0.05). **Discussion:** The better the DSCM score, the lighter the DPN complications and vice versa. **Conclusion:** There is a relationship between diabetes self care management and diabetic peripheral neuropathy in elderly people with diabetes mellitus in Jember Regency.

Keywords: Diabetic Peripheral Neuropathy, Self Care Management, Diabetes Mellitus, Elderly

INTRODUCTION

Elderly is synonymous with declining health, especially physical health status. The health status of the elderly will decrease with age due to a decrease in physiological and cognitive functions (Ariyanto et al., 2020). Physiological changes in the elderly cause a decrease in the function of various organs in the body Physiological changes in the elderly, especially the endocrine system, an unhealthy lifestyle has the potential to

cause diabetes mellitus (Setiyorini & Wulandari, 2017). Diabetes mellitus that is not treated and does not get proper management can cause damage to various organs of the body, one of the damage to organs due to diabetes mellitus is diabetic peripheral neuropathy (Rima, 2019). Diabetic peripheral neuropathy is damage that occurs in the nerves caused by an increase in blood glucose, which results in decreased blood circulation to cells and decreased function of nerve cells (Suhertini & Subandi, 2016). Patients with diabetes mellitus who experience complications of peripheral neuropathy will have a low quality of life due to signs and symptoms they experience such as: neuropathic pain, impaired physical mobilization, and balance disorders (Bondar & Popa, 2018). DPN is a major cause of morbidity and mortality due to complications such as diabetic foot ulcers, which often result in amputation of extremities or difficulty maintaining balance which results in trauma.

Indonesia is in 7th place among the top 10 countries with the most diabetes sufferers in the world with a total of 10.7 million diabetics (Kementerian Kesehatan RI., 2020). A preliminary study conducted at the Jember District Health Office obtained data on the number of people with diabetes mellitus of 41,771 people in 2021 (DINKES Kab.Jember, 2021). Data from the Jember District Health Office in 2022 obtained from reports from the Community Health Centers in Jember District stated that 635 elderly suffer from DM (Diabetes Mellitus) (DINKES Kab.Jember, 2022). Data shows that 27% -57% of the total DPN population is between the ages of 50 and 60 years, and the number jumps to 50% -100% if the age is > 70 years (Ahmad et al., 2019). Around the world, 66% of people with diabetes mellitus have diabetic peripheral neuropathy (DPN).

Control and prevention of DPN can be done by controlling blood glucose (Kayar et al., 2017). DM patients who are able to manage their disease independently such as controlling blood sugar and preventing other DM complications are referred to as diabetes self care management (DSCM) (ADA, 2017). According to ADA (2017), the implementation of DSCM aims to enable diabetes mellitus patients to manage their disease independently. The management target is to reduce DM morbidity and mortality (PARKENI, 2015). DSCM performed by people with diabetes mellitus includes taking medication regularly, adjusting diet, physical exercise, monitoring blood glucose, doing regular foot care, and smoking status (ADA, 2017). Therefore, the authors are interested in researching the relationship between diabetes self care management and diabetic peripheral neuropathy in elderly people with diabetes mellitus in Jember Regency.

METHODS

This research was an observational study with a cross-sectional design with a sampling technique to determine which Community Health Centers were used as research locations using purposive sampling by selecting 20 Community Health Centers which had the highest number of elderly DM in Jember Regency. The Community Health Centers that were used as research locations were 10% taken from 20 Health Centers which had the highest DM patient elderly where the total number of Community Health Centers in Jember Regency was 50 Community Health Centers. According to (Maurida, 2019) the required precision value for a large population is 10% so that the number of Community Health Centers that are the research sample locations is 10% x 20 = 2, so that there are 2 Community Health Centers. Determination of Puskesmas was

carried out by purposive sampling, namely Patrang Health Center with 54 respondents and Kencong Health Center with 47 respondents. The sample size in this study was 101 elderly people with DM who were taken using a total sampling technique from the total number of elderly people with DM from the Patrang Health Center and Kencong Health Center. DSCM data collection using The Summary of Diabetes Self Care Activities Questionnaire and DPN using the Neuropathy System Score.

Data were analyzed through univariate and bivariate analysis using the Pearson Correlation test with a significance level of 95% ($\alpha \leq 0.05$). The statistical test uses the SPSS computer program. If the statistical results show $p \leq 0.05$, it means that there is a significant relationship between diabetes self care management and diabetic peripheral neuropathy in elderly people with diabetes mellitus in Jember Regency, and if $p > 0.05$ there is no relationship between diabetes self care management and diabetic peripheral neuropathy in elderly people with diabetes mellitus in Jember Regency.

RESULTS

Tabel 1. Characteristics of Respondents

No	Patient Characteristics	F	%
1.	**Gender**		
	Male	6	5,9
	Female	95	94,1
2.	**Age**		
	Elderly 60-74 years old	100	99
	Old 75-90 years old	1,0	1,0
3.	**Long Suffer DM**		
	5 Year	8	7,9
	6 Year	35	34,7
	7 Year	29	28,7
	8 Year	10	9,9
	9 Year	12	11,9
	10 Year	4	4,0
	11 Year	3	3,0
4	**Blood sugar**		
	200-300 mg/dL	52	51,5
	301-400 mg/dL	46	45,5
	401-500 mg/dL	0	0,0
	501- 600 mg/dL	3	3,0
5	**Blood Pressure**		
	Normal (<120 mm/Hg)	8	7,9
	Pre Hipertensi (120-139 mm/Hg)	53	52,5
	Hipertensi Stage I (140-159 mm/Hg)	25	24,8
	Hipertensi Stage II (>160 mm/Hg)	15	14,9
6	**Education**		
	No School	13	12,9
	Elementary School	35	34,7
	Junior High School	28	27,7
	Senior High School	17	16,8
	College	8	7,9
7	**Job Status**		
	Work	35	34,7
	Unemployment	66	65,3

No	Patient Characteristics	F	%
8	**Residence Status**		
	Alone	9	8,9
	With Husband/Wife	44	43,6
	With Family/Children	48	47,5
9	**Smoking Status**		
	Smoking	4	4,0
	Do Not Smoking	97	96,0

Source: Processed primary data using SPSS, 2023

Based on the table above, it is known that of the 101 elderly respondents who suffer from diabetes mellitus, the majority are female, as many as 95 people (94.1%). Respondents have the majority age of Elderly (Elderly) 60-74 years (99%). Long suffered from diabetes mellitus in the majority of respondents for 6 years, namely as many as 35 respondents (34.7%). Blood sugar in the majority of respondents was 200-300 mg/dL, namely 52 respondents (51.5%). Blood pressure The majority of respondents were pre-hypertensive (120-139 mm/Hg), namely 53 respondents (52.5%). Respondents have the majority of elementary school education levels, namely as many as 35 respondents (34.7%). The majority of respondents with employment status did not work as many as 66 people (65.3%). The majority of respondents living status live with family/children as many as 48 people (47.5%). The majority of respondents with smoking status did not smoke as many as 97 people (96.0%).

Tabel 2. Identification of Diabetes Self Care Management (DSCM)

DSCM	F	(%)	Results
Good	0	0	
Sufficient	40	39,6	
Less	61	60,4	
Total	101	100,0	
Mean			31,41
Median			30,00
Modus			16,00
Std. Deviation			12,226
Minimum			15,00
Maximum			57,00
Sum			3173,00

Source: Processed primary data using SPSS, 2023

Based on the table above, it is known that of the 101 respondents who suffer from diabetes mellitus, the majority of diabetes self care management behaviors are in the less category, 61 people with a percentage (60.4%), the sufficient category is 40 people with a percentage (39.6%), the good category is (0%). The mean value (mean) of diabetes self care management behavior is 31.4 (less category).

Tabel 3. Identification of Diabetic Peripheral Neuropathy (DPN)

DPN	F	(%)	Results
Light	14	13,9	
Moderate	20	19,8	
Severe	67	66,3	
Total	101	100,0	
Mean			7,10
Median			7,00
Modus			8,00
Std. Deviation			2,05
Minimum			3,00
Maximum			10,00
Sum			718,00

Source: Processed primary data using SPSS, 2023

Based on the table above, it is known that of the 101 respondents who suffer from diabetes mellitus who experience diabetic peripheral neuropathy, the majority are in the severe category, 67 people with a percentage (66.3%), the moderate category is 20 people with a percentage (19.8%), and the mild category as many as 14 people with a percentage of (13.9%). The mean value (mean) of the behavior of diabetic peripheral neuropathy with the number 7 (severe category).

Based on the table above, it is known that out of 101 respondents, none of the respondents had diabetes self care management in the good category. Respondents whose diabetes self care management was in the sufficient category were 40 people, the majority had diabetic peripheral neuropathy in the moderate category as many as 20 people, 14 people in the mild category, and a minority in the severe category as many as 6 people. Respondents whose diabetes self care management was in the less category were 61 people who all experienced diabetic peripheral neuropathy in the severe category.

Based on the table above, it is found that there is a correlation between diabetes self care management and diabetic peripheral neuropathy in elderly people with diabetes mellitus with a p-value = 0.00 < alpha (0.05) so Ha is accepted which means there is a relationship between diabetes self care management and diabetic peripheral neuropathy in elderly people with diabetes mellitus in Jember Regency.

Tabel 4. The Relationship between Diabetes Self Care Management and Diabetic Peripheral Neuropathy in Elderly People with Diabetes Mellitus in Jember Regency

DSCM*DPN Crosstabulation						*Pearson Correlation*	*p-value*
		DPN					
		Light	**Moderate**	**Severe**	**Total**		
DSCM	**Sufficient**	14	20	6	40	**-0,959**	**0,000**
		35,0%	50,0%	15,0%	100,0%		
	Less	0	0	61	61		
		0,0%	0,0%	100,0%	100,0%		
Total		14	20	67	101		
		13,9%	19,8%	66,3%	100,0%		

Source: Processed primary data using SPSS, 2023

DISCUSSION

Identification of Diabetes Self Care Management (DSCM)

The results of this study show that diabetes self care management in elderly diabetics in Jember Regency is in the poor category. This shows that the level of self-care in elderly diabetics in Jember Regency is still not well done. Diabetic elderly in Jember Regency, the level of awareness of dietary control, physical exercise/physical activity, regular monitoring of blood glucose levels, foot care, and pharmacological therapy/ medication is still lacking in controlling diabetes to prevent complications from diabetes. This is in line with research by Hartati et al (2019) which said there was a relationship between self-care and the quality of life of diabetes mellitus patients at the Internal Medicine Polyclinic at Langsa Hospital.

Self care is the ability of individuals, families and communities to manage health, improve health status, prevent disease, prevent or overcome disabilities with or without the support of health care providers (Hartati et al., 2019). Diabetes self care management consists of various independent activities that must be carried out by DM patients. Diabetes self-care management includes adjusting eating patterns or diet, physical exercise/physical activity, monitoring blood glucose levels regularly, foot care, and pharmacological therapy/medication. If diabetes self-care management activities are carried out well, the risk of developing complications will decrease, so that patients can maintain their quality of life (Chaidir et al., 2017).

Diabetes self-care management is a person's effort to maintain glucose levels close to normal through self-care measures by following a diet, doing physical activity, monitoring blood glucose levels, using drugs, and other self-care measures. Proper self-care will reduce the risk of complications caused by diabetes mellitus and in this study the awareness of the elderly to carry out diabetes self-care management on average is in the less category and the possibility of suffering from complications due to DM is still very large. The majority of diabetes self-care management levels in elderly diabetics in Jember Regency are still in the poor category because the majority of them come from elementary school educational backgrounds. Some respondents also had an adequate level of diabetes self care management because some of their educational backgrounds were high school and university, the difference in the different levels of diabetes self care management could be due to educational background. Education is a parameter of the patient's understanding of self-care, self-management, and controlling blood glucose levels. Good education will encourage a person to behave positively so that they are more open and objective in receiving information, especially information about DM management. The openness of DM patients to information about health will lead the patient to actively carry out self-care activities, so that blood glucose levels can be controlled and the patient's health status remains stable.

This is in line with Indaryati's research (2018) which said diabetes mellitus is a disease caused by heredity and lifestyle which is very difficult to control for anyone, both people with high or low education. However, people who have higher education and have awareness of maintaining good health and are able to control risk factors for diabetes, for example in terms of maintaining a diet, exercise and managing stress. Someone who is more educated will have a better desire in terms of finding out the right information about diabetes prevention and practicing it correctly in their daily lives.

Another factor for elderly DM sufferers in Jember Regency in carrying out diabetes self care management is family concern. Family and care from those closest to DM sufferers can provide comfort, attention, affection, and motivation in achieving recovery with an attitude of accepting their condition. With family support, the elderly will be obedient in carrying out aspects of diabetes self care management so that blood sugar levels can be controlled. Elderly who live with their children are on average better at managing their self care because maybe the family reminds and motivates the elderly to control their blood sugar.

Identification of Diabetic Peripheral Neuropathy in Diabetic Elderly

The results of this study indicate that the rate of complications of diabetic peripheral neuropathy in elderly diabetics in Jember Regency is still high in sensory and motor clinical symptoms, which include: Complaints that are felt in the feet/legs burning sensation, numbness, tingling, weakness, cramps. Location of complaint: Foot/leg/other location. Time of exacerbation/recurrence: Night/day and night/only during the day. The patient has trouble sleeping due to these symptoms and the symptoms improve when: Walking/standing/sitting/lying down. This is in line with a study by Hanifah et al (2022) which stated that the higher the HbA1C level, the greater the risk of suffering from diabetic peripheral neuropathy as indicated by the lower the amplitude ratio of the sural nerve to the radial nerve. Research conducted by Y. D. Putri et al (2022) stated that there was a significant relationship between blood sugar levels and peripheral neuropathy disorders in patients with Type 2 DM.

Diabetes mellitus will cause many complications if not managed/controlled properly. One of the complications of DM is diabetic peripheral neuropathy. Diabetic peripheral neuropathy is one of the most common microvascular complications of diabetes mellitus and can worsen the quality of life of sufferers. Diabetic peripheral neuropathy is very dangerous because it can cause various problems including increasing heart rate, causing leg ulcers and even amputation, other nervous system disorders including diabetic retinopathy, sexual dysfunction, impotence and can result in death (Badrujamaludin et al., 2021).

The main cause of DPN in DM is hyperglycemia. The accumulation of fructose and serbitol in the nerves as a result of high glucose will result in oxidative stress and nerve damage. This will cause symptoms in the form of prickling sensations, numbness in the feet, decreased sensitivity to pain and temperature, so this increases the risk of injury and infection in the feet. Complications such as DPN can be minimized by carrying out various prevention efforts such as adopting a healthy lifestyle (nutritional therapy, medical and physical activity), attending health education, especially for DM patients.

The majority of DPN levels in elderly diabetics in Jember Regency are in the severe category. This is influenced by several factors such as high blood glucose, blood pressure, the majority of which are pre-hypertension and age. Someone who is > 60 years old or elderly is at great risk of getting DPN. Increasing age will affect the flexibility of blood vessels, resulting in a decrease in the vascularization of body tissues. The majority of glucose levels in respondents tend to be high, this is also a trigger for the occurrence of DPN. Persistent hyperglycemia resulting in increased activation of the polyol pathway or alternative pathways of glucose metabolism accumulates glucose in the

body so that you will experience neuropathy. Blood pressure is believed to be associated with damage to the endo neural microvascular resulting in neuropathy.

The minority of elderly diabetics in Jember Regency are in the mild category, which can occur due to factors such as their age which is still not too old, blood pressure tends to be normal, glucose levels are not too high, good self care, and family support in carrying out self care so that the level of The severity of DPN is in the mild category.

Analysis of the Relationship between Diabetes Self Care Management and Diabetic Peripheral Neuropathy in Elderly People with Diabetes Mellitus in Jember Regency

The results of the study showed that there were no respondents whose diabetes self care management was in the good category. The majority of respondents whose diabetes self care management was in the moderate category experienced diabetic peripheral neuropathy. Respondents whose diabetes self care management was in the less category all experienced diabetic peripheral neuropathy in the severe category.

The results of this study also showed that there was a correlation between diabetes self-care management and diabetic peripheral neuropathy in elderly people with diabetes mellitus in Jember Regency. The correlation value between DSCM and DPN shows a negative value, which means that the better the DSCM value, the lighter the DPN complications and vice versa, if the less the DSCM value, the more severe the DPN complications and shows a very strong relationship. This is in line with research by Indriani et al (2019) which stated that there was a significant relationship between Self Care and the

Incidence of Peripheral Neuropathy at the Internal Medicine Clinic at Cibabat Hospital, Cimahi City in 2018. From these results, researchers also concluded that effective self care for DM can prevent diabetes. the risk of DM patients experiencing complications of Peripheral Neuropathy, Self care can also control the patient's blood glucose so that it remains under control or normal, and can reduce the risk of other complications due to DM. Self care that can be done by DM patients independently includes diet or dietary adjustments, exercise, monitoring blood sugar levels which can be done independently with the help of a health worker at home or by routinely going to a health facility, taking diabetes medication regularly, and carrying out self-care feet so that the patient's self-care improves even more and can avoid the occurrence of complications, especially peripheral neuropathy which is the most complained about. Research conducted by Gode et al (2022) in Ethiopia also found that diabetic patients with DPN complications had worse diabetes self-care practices than those without DPN complications.

Diabetic peripheral neuropathy (DPN) is a common complication of diabetes mellitus that affects about half of patients with diabetes (Liu et al., 2020). DPN indicates a disturbance of the normal activity of the distal nerves in the lower and upper extremities, especially in the feet, which can alter autonomic, motor, or sensory function (IDF, 2017). The Toronto Consensus Panel on Diabetic Neuropathy defines DPN as a distal symmetric sensorimotor polyneuropathy that occurs as a result of metabolic and microvascular changes as a result of uncontrolled increases in blood glucose levels (chronic hyperglycemia) and cardiovascular risk (Tesfaye, 2014). Control and prevention of DPN can be done by controlling blood

glucose (Kayar et al., 2017). Controlling blood glucose in diabetics can only be done if they are able to live a healthy lifestyle and perform self-care.

Implementation of self-care activities for people with diabetes to manage their own condition is also known as diabetes self-care management (DSCM). DSCM is an integration of Orem's self-care theory approach to the nursing process of DM clients (Gharaibeh et al., 2017). Self care is very important to determine the success rate of treatment with chronic conditions such as diabetes mellitus, because without the role of self (self care), the healing of the disease will not achieve optimal results. DSCM performed by people with diabetes mellitus includes taking medication regularly, adjusting diet, physical exercise, monitoring blood glucose, doing regular foot care, and smoking status (ADA, 2017b). The goal of diabetes self-care management is to maintain near-normal glucose levels through self-care measures (Gharaibeh et al., 2017).

Self-care or diabetes self-care management for elderly diabetics in Jember Regency is mostly still in the less category because the majority of them come from elementary school educational backgrounds. Some respondents also had an adequate level of diabetes self care management because some of their educational backgrounds were high school and university, the difference in the different levels of diabetes self care management could be due to educational background. Good education will encourage a person to behave positively so that they are more open and objective in receiving information, especially information about DM management.

In terms of status of residence, the majority of elderly diabetics in Jember Regency live with their children and family, but in carrying out diabetes self-care management, the majority lack the possibility of the family and the elderly do not know how to do diabetes self-care management due to lack of education. Lack of diabetes self-care management will cause blood glucose to increase.

CONCLUSION

Diabetes self care management for elderly people with diabetes mellitus in Jember Regency is in the poor category. Diabetic peripheral neuropathy in the elderly with diabetes mellitus in Jember Regency is in the severe category. The results of the analysis show that there is a relationship between diabetes self care management and diabetic peripheral neuropathy in elderly people with diabetes mellitus in Jember Regency. The correlation value shows a very strong relationship and shows a negative value, which means the better the DSCM value, the lighter the DPN copy and vice versa, if the DSCM value is less, the DPN copy will be heavier.

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