Original Article

Dietary Regulation As A Factor Predicting Quality of Life in Diabetic Peripheral Neuropathy Patients

Sukhri Herianto Ritonga[1*,] **Eva Decroli**[1], **Brian Sri Prahastuti**[2], **Elly Usman**[1] , **Mudjiran**[3] , **Adang Bachtiar**[4], **Afriwardi**[1], **Husna Yetti**[1]

[1] Faculty of Medicine, Andalas University, Padang City, West Sumatra, Indonesia
[2] Presidential Staff Office II, Jakarta, Indonesia
[3] Faculty of Education, Padang State University, Padang City, West Sumatra, Indonesia
[4] Faculty of Public Health, University of Indonesia, Depok, West Java, Indonesia

(Correspondence author's email, nerssukhri88@gmail.com)

ABSTRACT

Diabetic peripheral neuropathy is a complication of diabetes mellitus with the number of sufferers continuing to increase from time to time. A decrease in quality of life occurs as this disease progresses, both in physical, mental, and social aspects. Controlling risk factors for declining quality of life needs to be done early, one of the risk factors for declining quality of life is diet. The aim of this research is to analyze dietary regulation as a predictive factor for quality of life in diabetic peripheral neuropathy sufferers. The type of research used is quantitative research with a cross-sectional approach. The respondents in the study were 210 diabetic peripheral neuropathy sufferers who were selected using consecutive sampling techniques. Data collection uses a questionnaire that meets the existing validity and reliability criteria. The data analysis used in this research is SEM PLS analysis. The results show that dietary regulation has a positive influence on quality of life (r=0.236, p=0.0001). Dietary regulation has an effect size on quality of life (f square = 0.095) and also has the ability to predict quality of life well (Q square = 0.232). Dietary regulation is also feasible and suitable in explaining interactions between variables (NFI = 0.540; SRMR = 0.99). The conclusion is dietary regulation can be a good predictive factor for quality of life, so that by improving the diet of diabetic peripheral neuropathy sufferers it will be possible to improve their quality of life.

Keywords: Predictive Factors, Diabetic Peripheral Neuropathy, Dietary Management, Quality of Life

INTRODUCTION

Diabetic peripheral neuropathy (DPN) is one of the complications of diabetes mellitus with the highest number of sufferers among other complications. At least 50% of people with diabetes mellitus will develop diabetic neuropathy. Controlling blood glucose levels is important to prevent this complication [1]. At the global level, the prevalence of DPN ranges between 16% and 87% of diabetes mellitus sufferers. The same thing also happens in Indonesia, where the prevalence is 58% of all diabetes mellitus sufferers [2,3].

DPN causes a decrease in the quality of life for sufferers. An increased risk of falls, the appearance of pain and a decrease in quality of

life are the main problems in DPN[4]. This decrease in quality of life will not stop at just decreasing the quality of life but can also increase the risk of death in DPN sufferers [5].

The reduction in the quality of life of DPN sufferers requires holistic and comprehensive treatment and must be done early. For this reason, it is necessary to analyze each risk factor that has a significant effect on the sufferer's quality of life. There are several risk factors for decreasing quality of life in DPN sufferers collected from various studies. These factors can be categorized into lifestyle factors consisting of diet, smoking, lack of physical activity and regularity of treatment. Characteristic factors of sufferers such as age, length of time suffering from DM, blood sugar levels, lipid levels. Comorbid disease factors such as hypertension[6–13].

Among these factors, lifestyle factors are the factors with the most potential to be used as predictors of the quality of life of DPN sufferers. This is because lifestyle factors are one of the risk factors for DPN that can be modified. Lifestyle factors are also one of the main causes of diabetes mellitus and its complications. Lifestyle factors are also one of the main management factors in managing diabetes mellitus itself [14].

One of the lifestyle factors that is very dominant in DPN sufferers is diet. Diet can be an important key in controlling blood sugar. A good diet can not only maintain blood sugar levels within normal limits but can also provide sufficient nutritional intake that the body needs for metabolism. So that the disease does not worsen and ultimately the sufferer's quality of life can be maintained as optimally as possible[15].

Early prevention of decreased quality of life in DPN sufferers needs to be done. Assessment of predictive factors for decreased quality of life can be studied further by building a prediction model. Predictive models are the process of uncovering relationships between variables to predict some desired outcome[16]. According to Kalechofsky (2016) and Shmueli (2010), this prediction model generally uses statistical techniques to predict future behavior[17,18].

Dietary regulation as a predictive factor for quality of life will make an important contribution to the management of *diabetic peripheral neuropathy sufferers*. Where these sufferers will be able to maintain their general quality of life while also being able to prevent the occurrence of diabetic ulcers which will ultimately reduce the risk of amputation or even death. Based on the explanation above, researchers are interested in conducting research related to dietary regulation as a predictive factor for quality of life in sufferers of diabetic peripheral neuropathy.

METHOD

The type of research used was qualitative research with a *cross sectional approach* . This research was carried out in the work area of Puskesmas throughout Padangsidimpuan City for 5 months, namely from May 2022 to September 2022.

Respondents in this study were *diabetic peripheral neuropathy sufferers* who had been diagnosed by a doctor and had been assessed using the *Diabetic Neuropathy Score* (DNS) instrument with a total of 210 people. Respondents were selected using *consecutive sampling technique*. The sample inclusion criteria used in this research were not being anxious or depressed, not experiencing cognitive disorders, being able to communicate, being able to read and write and being willing to follow all research procedures.

The research instrument used is a research instrument that has been developed by the research team. This instrument has been tested for validity and reliability. Validity testing is carried out using *face validity, content validity* and *construct validity* . The reliability test used is *internal consistency* by paying attention to the *Cronbach alpha value* .

Data analysis in this research was SEM PLS using the SMART PLS application version 3.2.9. The research has obtained ethical approval from the Research Ethics Commission of the Faculty of Medicine, Andalas University with letter number 487/UN.16.2/KEP-FK/2021.

RESULTS

Table 1. Characteristics of Respondents

No	Respondent Characteristics	n	%
1	Gender		
	Man	99	47.1
	Woman	111	52.9
2	Comorbidities		
	None	80	38.1

	Hypertension	78	37.1
	Strokes	2	1.0
	Respiratory disorders	4	1.9
	Heart Disorders	7	3.3
	Kidney disorders	1	0.5
	Visual Impairment	1	0.5
	Other	37	17.6
3	Suffering from DM for a long time		
	Less than 5 years	113	53.8
	More than 5 years	97	46.2
	Amount	210	100.0

Based on the characteristics outlined in the table, it is evident that the majority of survey respondents are female, comprising 52.9% of the total. Examining respondents' characteristics concerning comorbidities, the research findings indicate that a substantial portion, specifically 38.1%, can boast of being free from any comorbid conditions. In contrast, the most prevalent comorbidity among respondents is hypertension, affecting 37.1% of the surveyed individuals.

Shifting our focus to the duration of diabetes mellitus among respondents, a significant 53.8% have grappled with the condition for less than 5 years. This temporal aspect provides valuable insight into the distribution of experiences among respondents, shedding light on the prevalence of relatively recent diagnoses.

This explicit analysis of gender distribution, health conditions, and the temporal dimension of diabetes mellitus offers a detailed and comprehensive portrait of the respondents' health profiles.

Table 2. Characteristics of Respondents Based on Age and Blood Glucose Levels

No	Respondent Characteristics	Mean	SD	Min	Max
1	Age	53.3:	8,62₄	3:	7:
2	Blood Glucose Levels	228.7:	83,36!	6:	45₆

Based on the table, the average age of respondents in this study was 53.31 years, while the average blood glucose level of respondents was 228.72 mg/dl.

Table 3. Frequency Distribution of Dietary Regulation and Quality of Life

No	Variable	n	%
1	Dietary Regulation		
	Bad	7	3.3
	Needs improvement	106	50.5
	Good	97	46.2
2	Quality of Life		
	Good	165	78.6
	Bad	45	21.4
	Total	210	100.0

Based on the table, the majority of respondents' dietary regulation are in the need for improvement category, namely 50.5%, while regarding quality of life, the majority of respondents are in the good quality of life category, namely 78.6%.

Table 4. Hypothesis Test Results, Path Coefficient Value, F² Value and Q² Value

	r value	T value	P value	F² value	Q² value
Dietary regulation > Quality of life	0.236	3,947	0,000	0.095	0.232

Based on the table, dietary regulation has a significant influence on quality of life. This influence is positive, which means that the better the diet, the better the quality of life (r= 0.236; t= 3.947; p= 0.000). This predictive factor has a good ability to predict quality of life and has *an effect size* on quality of life (Q Square = 0.095; F Square = 0.232).

Table 5. Model Feasibility Analysis Results

	Saturated Model	Estimated Model
SRMR	0.099	0.099
NFI	0.540	0.540

Based on the table, it can be concluded that the feasibility of the resulting model is at a moderate level (NFI value= 0.540), whereas according to the SRMR value this model is considered feasible or suitable in explaining the relationship between variables (SRMR value= 0.099).

DISCUSSION

Based on the results of this research, it was found that diet is a predictive factor that has a direct influence on quality of life. The predictor value resulting from this variable is 0.236, which means that for every 1 unit increase in diet, the quality of life will increase by 23.6%. The results of the research show that the better the diet of type 2 DM sufferers with peripheral neuropathy, the better their quality of life. The dimensions assessed in this eating pattern consist of the amount of food, regularity and type of food.

Controlling diet in type 2 DM sufferers with peripheral neuropathy is a lifestyle intervention that has been proven to be effective in improving the sufferer's health status. This improved health status can take the form of good blood sugar control, more stable body weight, reduced pain and can also improve quality of life. This is in accordance with the results of research conducted by Bunner (2015) and Storz & Kuster (2020) which stated that regulating a diet with plant-based ingredients can control body weight, control blood sugar levels and reduce the pain scale in diabetic neuropathy sufferers [19,20].

The application of dietary regulation for each person can be measured based on the amount of food, the regularity of eating and the type of eating. Amount of food means how much food is consumed at each meal, both main meals and snacks. Eating regularity means the frequency of main meals 3 times a day and can also be accompanied by snacks 2 times a day. Type of food means the content and composition of the food consumed at each meal.

Setting a healthy eating pattern will help maintain ideal body weight. Food intake has a strong correlation with obesity. The occurrence of obesity is not only related to the amount and frequency of food, but the type of food also plays an important role in the occurrence of obesity [21].

Dietary management is the main management for diabetes mellitus sufferers. The aim of this food management is to achieve and maintain ideal body weight, achieve normal glycemic levels, prevent worsening of diabetes mellitus, meet nutritional needs and also maintain the sufferer's sense of comfort. The final result of this eating management is the achievement of an optimal quality of life [22–24].

Managing diet by regulating the composition and frequency of meals is often a problem for people with diabetes mellitus. Diabetes mellitus sufferers' old habits of eating large amounts often become a problem when they are asked to adjust their eating to new existing rules. This can trigger a decline in the quality of life of diabetes mellitus sufferers and it is not uncommon for these sufferers to refuse to follow this rule. This is in accordance with the opinion of Chong (2017) who states that most diabetes mellitus sufferers will return to their original lifestyle after 2 years of suffering from diabetes mellitus [25]).

However, if the diet is acceptable. So this eating pattern has a significant relationship with quality of life. As stated by Purwandari and Susanti (2017), adherence to dietary patterns has a positive relationship with the quality of life of diabetes mellitus sufferers with moderate relationship quality. On the other hand, if you eat too much, it will reduce your quality of life. As stated by Nilsson (2012), a diet containing more red meat is a negative factor in the quality of life in type 2 DM sufferers [26,27].

Diet will also be related to weight gain in DM sufferers. Where an increase in body weight of 5 kg more often results in a decrease in quality of life compared to a decrease in body weight of 5 kg [28].

The same thing also applies to type 2 DM sufferers with peripheral neuropathy, that adjusting their diet can improve their quality of life. However, the application of dietary regulation is still difficult to implement well in type 2 DM sufferers with peripheral neuropathy. Dietary management in type 2 DM sufferers with peripheral neuropathy is worse than in type 2 DM sufferers without peripheral neuropathy [29].

CONCLUSIONS

Diet is a good predictor variable for quality of life. The predictor value resulting from this variable is 0.236, which means that for every 1 unit increase in diet, the quality of life will increase by 23.6%. Dietary regulation is important to maintain properly in type 2 DM sufferers with peripheral neuropathy. So that the sufferer's quality of life can be maintained in an optimal condition for as long as possible. The role of various parties such as health workers, care givers and families is needed so that type 2 DM sufferers with peripheral neuropathy are still able and willing to maintain their diet.

REFERENCES

1. Feldman EL, Callaghan BC, Busui RP, Zochodne DW, Wrigth DE, Bennett DL, et al. Diabetic neuropathy. Nat Rev Dis Prim. 2020;5(1):1–40.
2. Malik RA, Andag-silva A, Dejthevaporn C, Hakim M, Koh JS, Pinzon R, et al. Diagnosing peripheral neuropathy in South- East Asia : A focus on diabetic neuropathy. 2020;11(5).
3. International Diabetes Federation. IDF Diabetes Atlas 10 th edition. Vol. 102, Diabetes Research and Clinical Practice. 2021. 147–148 p.
4. Pop-Busui R, Boulton AJM, Feldman EL, Bril V, Freeman R, Malik RA, et al. Diabetic neuropathy: A position statement by the American diabetes association. Diabetes Care. 2017;40(1):136–54.
5. AlSadrah SA. Impaired quality of life and diabetic foot disease in Saudi patients with type 2 diabetes: A cross-sectional analysis. SAGE Open Med. 2019;7:205031211983209.
6. Sohail S, Qadir A, Ashraf A, Ashraf SJ, Serafi S, Hussain Z. Prevalence of risk factors promoting diabetic neuropathy. Int Biol Res. 2017;5(1):1–5.
7. Putri AM, Hasneli Y. Faktor-Faktor Yang Mempengaruhi Derajat Keparahan Neuropati Perifer Pada Pasien Diabetes Melitus : Literature Review Factors Associated of Severity of Peripheral Neuropathy Among Diabetes Mellitus Patients : Literature Review Berdasarkan Riset Kesehatan D. 2020;
8. Su J bin, Zhao L hua, Zhang X lin, Cai H li, Huang H yan, Xu F, et al. HbA1c variability and diabetic peripheral neuropathy in type 2 diabetic patients. Cardiovasc Diabetol. 2018;17(1):1–9.
9. Pai YW, Lin CH, Lin SY, Lee I Te, Chang MH. Reconfirmation of newly discovered risk factors of diabetic peripheral neuropathy in patients with type 2 diabetes: A case-control study. PLoS One. 2019;14(7):1–10.
10. Rahmawati A, Hargono A. Dominant Factor of Diabetic Neuropathy on Diabetes Mellitus Type 2 Patients. J Berk Epidemiol. 2018;6(1):60.
11. Khawaja N, Abu-Shennar J, Saleh M, Dahbour SS, Khader YS, Ajlouni KM. The prevalence and risk factors of peripheral neuropathy among patients with type 2 diabetes mellitus; The case of Jordan. Diabetol Metab Syndr. 2018;10(1):1–10.
12. Liu X, Xu Y, An M, Zeng Q. The risk factors for diabetic peripheral neuropathy: a meta-analysis. PLoS One. 2019;14(2):e0212574.
13. Papanas N, Ziegler D. Risk factors and comorbidities in diabetic neuropathy: An update 2015. Rev Diabet Stud. 2015;12(1–2):48–62.
14. Perkeni. Pedoman Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 Dewasa di Indonesia 2021. PB Perkeni. 2021. 119 p.
15. Ritonga SH, Julianda DP, Antoni A. Penderita Masalah Kaki Diabetik. J Keperawatan Prior. 2021;4(1):1–8.
16. Kuhn M, Johnson K. Applied Predictive Modeling with Applications in R. 2013. 615 p.
17. Kalechofsky H. A Simple Framework for Building Predictive Models. A Little Data Sci Bus Guid. 2016;(September):6–17.
18. Shmueli G. To explain or to predict? Stat Sci. 2010;25(3):289–310.
19. Bunner AE, Wells CL, Gonzales J, Agarwal U, Bayat E, Barnard ND. A dietary intervention for chronic diabetic neuropathy pain: A randomized controlled pilot study. Nutr Diabetes. 2015;5(5):e158-6.
20. Storz MA, Küster O. Plant-based diets and diabetic neuropathy: A systematic review. Lifestyle Med. 2020;1(1):1–11.
21. Sami W, Ansari T, Butt NS, Rashid M, Hamid A. Effect Of Diet Counseling on Type 2 Diabetes Mellitus: A Review. Int J Health Sci (Qassim). 2017;11(2):65–71.
22. Iqbal Z, Azmi S, Yadav R, Ferdousi M, Kumar M, Cuthbertson DJ, et al. Diabetic Peripheral Neuropathy: Epidemiology, Diagnosis, and Pharmacotherapy. Clin Ther. 2018;40(6):828–49.
23. ADA. Lifestyle management: Standards of medical care in Diabetesd2018. Diabetes Care.

2018;41(January):S38–50.

24. Perkeni. Pedoman Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 Dewasa di Indonesia 2019. PB Perkeni. 2019.

25. Chong S, Ding D, Byun R, Comino E, Bauman A, Jalaludin B. Lifestyle changes after a diagnosis of type 2 diabetes. Diabetes Spectr. 2017;30(1):43–50.

26. Purwandari H, Susanti SN. Hubungan Kepatuhan Diet Dengan Kualitas Hidup Strada. J Ilm Kesehat. 2017;6(2):16–21.

27. Nilsson E. Aspects of Health-Related Quality of Life. Linköping: LiU-Tryck; 2012. 1–86 p.

28. Ridderstråle M, Evans LM, Jensen HH, Bøgelund M, Jensen MM, Ericsson Å, et al. Estimating the impact of changes in HbA1c, body weight and insulin injection regimen on health related quality-of-life: A time trade off study. Health Qual Life Outcomes. 2016;14(1):1–10.

29. Gode M, Aga F, Hailu A. Self-Care Practices Among Adult Type 2 Diabetes Patients With and Without Peripheral Neuropathy: A Cross-Sectional Study at Tertiary Healthcare Settings in Ethiopia. Can J Nurs Res. 2022;54(3):345–56.

.