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Submission date: 12-May-2023 05:53AM (UTC+0700)
Submission ID: 2090797340
File name: Lampiran_7_Manuskrip_JAFES_Coauthor.pdf (507.83K)
Word count: 4265
Character count: 23681

ORIGINAL ARTICLE

Journal of the ASEAN Federation of Endocrine Societies

Factors Associated with Dietary Behaviour among Patients with Type 2 Diabetes Mellitus in Rural Indonesia

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Abstract

Background. Type 2 Diabetes Mellitus (T2DM) is one of the fastest-growing diseases and most serious major health problems worldwide. Few studies have focused on the association of social support with diabetes-related dietary behaviour.

Objective. To examine the relationship between social support and dietary behaviour among patients with diabetes in a rural area of Indonesia.

Methodology. This was a descriptive cross-sectional study that included 120 physically healthy patients above 18 years old with T2DM for at least 6 months. Data analysis was done using a stepwise regression model.

Results. The mean age was 61.97 years (SD = 7.85, range = 52-74); 86.7% of the participants were females. Social support (β = 0.272, p = <0.001), diabetes medications (β = 0.169, p = 0.003), duration of diabetes (β = 0.118, p = 0.0047), and presence of diabetes complications (β = 0.197, p = 0.008) were significant predictors of dietary behaviour and accounted for 34.2% of the variance.

Conclusions. Social support, diabetes medications, presence of diabetes complications, and duration of diabetes were associated with improved dietary behaviour. Therefore, social support should be considered when designing dietary interventions for patients with type 2 diabetes mellitus.

Key words: critical illness-related corticosteroid insufficiency, shock, corticosteroid, cortisol

INTRODUCTION

Diabetes mellitus type 2 (T2DM) is a chronic metabolic disorder that has affected approximately 463 million adults; it is estimated to increase to 700 million by 2045.[1] It is one of the fastest growing diseases that poses a serious impact on public health worldwide.[1] Globally, there were about 4.2 million diabetes-related deaths and at least US$ 760 billion in diabetes-related healthcare costs.[1]

Approximately 79% of adults with diabetes reside in developing countries. Indonesia ranks 7th among countries with the highest prevalence rates of diabetes mellitus globally. In 2019, the number of people with diabetes in Indonesia was 10.7 million (6.2% of the total population).[2] According to the Basic Health Research in 2018, East Java province ranked 2nd in the number of patients with diabetes in Indonesia. About 151,878 people with an average age of 15-45 years were reported to have diabetes in 2018.[2] Up to 90% of T2DM cases may be preventable if people adopted proper eating habits and lifestyle changes.[3] Approximately 80 to 90% of people with T2DM are overweight or obese. Weight reduction of 5 to 10% from initial body weight will significantly decrease the risk of cardiovascular disease by improving glycemic control.[4]

Medical Nutrition Therapy is a key component in diabetes management. Numerous dietary and lifestyle guidelines promoting healthy eating patterns have been created to achieve optimal levels of blood glucose, blood pressure, and lipids to delay or prevent diabetes complications.[5] In previous observational researches, dietary habits were reflected by data on food intake and involved various diets such as the Mediterranean diet, the Dietary Approaches to Stop Hypertension (DASH) diet or the alternative Healthy Eating Index (AHEI).[4] These diets are known to lower the risk for chronic diseases.

Previous studies have reported predominant dietary trends in American, European and Asian populations and their

ISSN 0857-1074 (Print) | eISSN 2308-118x (Online)
Printed in the Philippines

Received: April 20, 2021. Accepted: November 11, 2021.
Published online first: June 16, 2022.
https://doi.org/10.15605/jafes.037.02.02

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relationship with diabetes. A balanced diet composed of nutritious food such as fish, meat, vegetables, fruits and whole grains is associated with a decreased risk of T2DM. Results of a systematic review showed that diets based on the Mediterranean diet, DASH and AHEI have great potential for diabetes prevention. However, these diets differ in some specific components and appear to be population-specific.[6] For example, food accessibility and consumption vary significantly in Indonesia compared to other regions due to differences in environment, agriculture, food production, processing and cultural practices. In addition, people consume various combinations of food groups. Studies on population-specific dietary habits have emerged in an attempt to address this issue.

Recent studies have shown that patients with a strong social support system have better glycemic control, improved therapeutic compliance, and enhanced self-care behaviors, making it a significant parameter in diabetes management.[7,8] Social support was identified as a significant predictor of certain self-care behaviors such as diet, exercise, blood glucose monitoring and foot care.[9]

A study done among Turkish patients with diabetes showed that self-care practices increased as perceived social support also increased.[10] Another study among Indonesians found that social support was associated with self-management.[11,12] However, social support also varies by culture, and the role of social support in people with diabetes should be studied in a culture-based context.[8] While some empirical studies have explored the relationship between social support and diabetes management, few have concentrated specifically on the impact of social support on diabetes-related dietary behaviour. Hence, the aim of this study was to examine the relationship between social support and dietary behaviours among patients with diabetes in rural Indonesia.

METHODOLOGY

This cross-sectional study was conducted at one of the community centers in Malang, East Province, Indonesia.

Participants

The study enrolled 120 people with type 2 diabetes between January and July 2019 using convenience sampling. This study was conducted at a community center in Malang, East Province, Indonesia. It was approved by the ethical review board at the authors' institution (No.E.5.a/029/KEPK-UMM/II/2020).

All recruited participants agreed to take part in the study. Patient inclusion criteria were as follows: Type 2 diabetes duration of at least 6 months, age over 18 years old, and absence of any physical disability. Patients were excluded if they were pregnant, had a mental/cognitive problem, or had advanced chronic complications of type 2 diabetes.

The sample size was calculated using a power analysis (G-Power software Version 3.1) for the planned regression analyses, effect size = 0.15, power level = 0.80, effect size = 0.15, and p = 0.05, resulting in a required sample size of 98.

Data Collection

The nurses in the community center helped identify potential participants. Data were gathered through face-to-face interviews. Before the questionnaires were administered, the research coordinator informed the nurses about the process of data collection, as well as the inclusion and exclusion criteria. On the average, completion of the forms took 15 minutes.

Demographic information such as gender, age, level of education, marital status, job and level of income was obtained through self-reports. The patient's clinical diabetic symptoms over the last year were also assessed with self-reports. A 3-month review of the patient's complications, other non-communicable diseases and medications were extracted from medical records in the community health center. Five types of diabetes-related complications were included: hepatic, ophthalmologic, cardiac, cognitive, and peripheral vascular. A patient was labelled as having diabetes complications if he/she had at least one of the above.

Dietary behaviour was measured using the Dietary Behaviours Questionnaire (DBQ), a self-reported dietary behaviour questionnaire developed by Primanda et al. The instrument has been translated into Bahasa The DBQ consisted of four dimensions (33-items): recognition of calorie needs (4-items), selection of healthy food (16-items), arrangement of a meal plan (6-items), and management of challenges in dietary behaviours (7-items). The DBQ rating scale was a four-point Likert scale ("1" = never, "2" = occasionally, "3" = frequently, and "4" = routinely). The total DBQ scores ranged from 33 to 132 and were categorized into three low (33 to 65), moderate (66 to 98), and high (99 to 132).[13] Cronbach's alpha coefficient was 0.73.

Social support was measured using an instrument developed by Megananda, et al.[14] This questionnaire has 12 items related to social support provided by family, friends, and others (e.g., health workers) including emotional support, appreciation support, information support and instrumental support. This questionnaire used a five-point Likert scale scoring as follows: 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), and 5 (strongly agree). The total score ranged from 12 to 60. Social support was considered low if patients scored below 22, moderate if the score was 22 to 30, high if the score was 31 to 41, and very high if greater than 41. Reliability using Cronbach's alpha coefficient was 0.76.[14]

Statistical analyses

Data regarding demographic characteristics and clinical information were presented using numbers, percentages,

means and standard deviations. A Kolmogorov-Smirnov test showed that the data were normally distributed (p-value = 0.089). The Pearson product-moment correlation coefficient was used to examine relationships between two variables for continuous data with normal distribution and Spearman's rho test was used for non-normally distributed data. Standardized residuals were examined for variables before the regression model was created, and independent variables were examined for multicollinearity. Variables in the analysis included complications, treatment and nondiabetic complications. In the regression model, the variables significantly associated with dietary behaviors were included in the bivariate correlation analysis. A stepwise linear regression analysis was used to examine the relationship between social support and dietary behaviours after accounting for duration of disease and presence of diabetic complications. The data in the study were analysed using the SPSS 15.0 (Statistical Package for the Social Sciences) package program.

Table 1. Descriptive characteristics of individuals with type 2 diabetes and model variables (N = 120)

Variables	Mean ± SD	n (%)
Age in years	61.97±7.85	
Gender		
Female		104 (86.7)
Male		16 (13.3)
Educational level		
Primary school		14 (11.7)
Secondary school		79 (65.8)
Tertiary school		27 (10.5)
Marital status		
Married		98 (81.7)
Single		22 (18.3)
Employment		
Employed		25 (20.8)
Unemployed		95 (79.2)
Income level		
Income less than expenses		88 (73.3)
Income equal to expenses		23 (19.2)
Income more than expenses		9 (7.5)
Duration of diabetes (months)	26.93±7.65	
Diabetes chronic complications		
Yes		56 (46.7)
No		64 (53.3)
Nondiabetic chronic diseases		
Yes		32 (26.7)
No		88 (73.3)
Medications		
Oral hypoglycaemic agents only		56 (46.7)
Insulin only		30 (25.0)
Oral hypoglycaemic agents + insulin		34 (28.3)
Dietary behaviour questionnaire scores	109.32±13.05	
Recognizing amount of calorie needs	14.19±2.53	
Selecting healthy food	54.92±6.06	
Arranging a meal plan	18.53±2.38	
Managing dietary behaviours challenges	21.68±3.53	
Social support	55.37±6.69	
Emotional support	14.07±1.97	
Information support	13.91±1.62	
Appreciation support	13.55±1.95	
Instrumental support	13.83±1.78	

RESULTS

A total of 120 respondents were included in this study. The mean age was 61.97 years (SD = 7.85, range = 52-74); 86.7% were females; 65.8% graduated from secondary level; 81.7% were married; 79.2% were unemployed, and 64.1% had an income less than basic minimum regional salary. The mean period of diabetes diagnosis was 10.17 years (SD = 7.95, range = 1-60). Almost 50% of participants had diabetes complications while 26.7% had other nondiabetic chronic diseases. Forty-six percent were treated with oral hypoglycaemic agents (Table 1).

There is a positive relationship between dietary behaviour, social support, duration of diabetes, diabetic complications, medications and nondiabetic chronic diseases. (Table 2). There was no identified multicollinearity among the independent variables. Social support and dietary behaviour had a normal distribution. Stepwise regression analysis was performed to determine the contribution of dietary behaviour (Table 3).

Using Pearson's correlation, linear regression used the predictor variables shown to have a strong correlation with the dependent variable of dietary behaviour (Table 3). According to the results of our analysis, social support ($\beta = 0.272$, $p = <0.001$), medications ($\beta = 0.169$, $p = 0.003$), duration of diabetes ($\beta = 0.118$, $p = 0.0047$), and diabetes complications ($\beta = 0.197$, $p = 0.008$) were significant predictors of dietary behaviour and accounted for 34.2% of the variance (Table 3).

DISCUSSION

This study found that among patients in rural Indonesia, dietary behaviours were moderate in all dimensions (acknowledging caloric requirements, choosing nutritious foods, planning a meal schedule and handling the complexities of dietary behaviour). Varying results were observed in previous researches that used the same tool.[13]

Table 2. Correlation between different diabetes predictor variables and dietary behaviour (N = 120)

Variables	1	2	3	4	5	6	7
Years with diabetes	—						
Medications	-0.35*	—					
Diabetic complications	-0.35*	0.42**	—				
Nondiabetic chronic diseases	-0.36*	-0.37*	0.33**	—			
Medications	-0.25*	0.52**	0.44**	0.47**	—		
Social support	0.42**	0.40**	0.47**	0.39*	0.52**	—	
Dietary behaviour	0.44**	0.42**	0.38*	0.32*	0.41**	0.49**	—

Table 3. Predictors of dietary behaviours (N = 120)

Variables	β	SE of B	t	p
Total score of dietary behaviours				
Medications[a]	0.169	0.080	3.045	0.003
Diabetes complications[b]	0.197	0.137	-2.491	0.008
Years with diabetes	0.118	0.104	1.897	0.047
Social Support	0.272	0.141	4.072	<0.001
Model R^2 = 0.351, adjusted R^2 = 0.342, F = 17.95, p < 0.001.				

[a] Medications (insulin medication use: yes = 1, no = 0) and [b] diabetes complications (yes = 1, no = 0) are dummy variables.

Cultural context can affect the dietary habits of patients with diabetes, (e.g., greater rice consumption, sweets and salt intake), which may be difficult to avoid.[15] In addition, social desirability, comfort, quality and price influence the determinants of food choice. Low income was seen as one barrier to the management of dietary behaviours among patients with type 2 diabetes.[16,17] In particular, there might have been poor-reporting among patients with diabetes and/or obesity in favour of socially appropriate answers. Therefore, nonjudgemental dietary behaviour assessment should be routinely integrated into diabetes management.

Social support is a significant factor that influences dietary behaviour even if its role in diabetes management has previously been underscored.[8,18] However, positive family support has helped individuals with diabetes adjust to their disease.[8] One of the possible reasons is that social support enhances adherence to a restricted diet and greatly impacts self-care and eating behaviours of individuals with diabetes. These studies did not directly measure dietary behavior but it was included as part of the self-management indicators.[10,12] Respondents who had higher scores were found to have very high levels of comfort and affection from family, friends and health workers. Respondents felt support in the form of assistance, if needed, from family, friends and medical personnel as well as affectionate advice on how to lead a healthy life.[19] This relationship can also be explained as a cultural phenomenon.

Most people in Indonesia are Muslims and therefore practice fasting. This custom may have influenced their answers to the questions in the diet domain. This proves that designing a diabetes self-management plan to include enhanced social support leads to improved dietary behaviours among patients.

Diabetes medications also affect dietary behaviour. In this study, we found that the dietary activity of the patients improved when insulin was included in the treatment.

We also found a significant association between the presence of diabetes complications and dietary behaviours, in contrast with the results of other related studies.[7,20] The reason for this inconsistency from previous findings may be due to individual culture-influenced interpretation of disease.[21] Patients have been observed to adjust eating behaviour when they have diabetic complications. Also, the duration of diabetes has been positively correlated with diet adherence. This is interesting because earlier studies did not reveal any association between the duration of diabetes and dietary behaviors.[7,20,22]

Limitations

In this study, the social support instrument we used was meant to evaluate the dimensions of social support in the general population, and was not specific for patients with diabetes. Indonesia has 35 provinces with many islands. This study was conducted in a region where the population had comparably lower income levels, which may have posed limitations on its generalizability. However, given that we conducted this study in one of Indonesia's major rural areas, the results can still be regarded as relevant.

CONCLUSIONS

In conclusion, we found that a good social support system improved dietary behaviours. The use of diabetes medications, presence of diabetes complications, and duration of diabetes were also significantly associated with a healthier dietary behaviour. When designing management strategies to benefit people with type 2 diabetes, it should include social support. Note that patients with diabetes may frequently adjust their diets because medical complications require them to do so. For this reason, individualize each dietary prescription according to the patient's needs. Future studies that investigate eating patterns with longer follow-up are recommended.

Acknowledgments
The authors thank all the patients who participated in this study.

Statement of Authorship
All authors certified fulfillment of ICMJE authorship criteria.

Author Contributions Statement
ADK, NLM, NM conceived and designed the study. YBP and HNH helped in the collection, analysis and interpretation of data. ADK and NLM drafted the article. ADK revised the article.

Author Disclosure
The authors declared no conflict of interest.

Funding Source
None.

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