# Factors Influencing Eating Behaviors among Type 2 Diabetes Mellitus Patients in Sidoarjo Sub-district, East Java, Indonesia

นิพนธ์ต้นฉบับ

Original Article

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***วารสารไทยเภสัชศาสตร์และวิทยาการสุขภาพ 2558;10(2):39-48***

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## บทคัดย่อ

**วัตถุประสงค์:** เพื่อศึกษาพฤติกรรมการบริโภคและปัจจัยทำนายพฤติกรรมการบริโภคในผู้ป่วยเบาหวานชนิดที่ 2 **วิธีการศึกษา:** กลุ่มตัวอย่าง ได้แก่ผู้ป่วยเบาหวานชนิดที่ 2 ในตำบลไซโดอาโจ เมืองอีสจาวา ประเทศอินโดนีเซีย ด้วยการสุ่มอย่างง่ายจำนวน 117 ราย รวบรวมข้อมูลระหว่างมกราคมถึงกุมภาพันธ์ พ.ศ. 2558 วิเคราะห์ข้อมูลด้วยสถิติพรรณนา และสถิติสมการถอดถอยพหุคูณแบบขั้นตอน **ผลการศึกษา:** พฤติกรรมการบริโภค รายได้ของครอบครัว ความสามารถของตนเอง ความเครียด และการสนับสนุนของครอบครัว ของกลุ่มตัวอย่างผู้ป่วยเบาหวานชนิดที่ 2 โดยภาพรวมอยู่ในระดับปานกลาง (ค่าเฉลี่ย ± ส่วนเบี่ยงเบนมาตรฐานเท่ากับ 75.44 ± 10.58, 1,746,846.15 ± 521,828.66, 60.88 ± 6.30, 42.59 ± 5.77 และ 55.38 ± 13.83, ตามลำดับ) สำหรับระดับการศึกษา และความรู้ ของผู้ป่วยเบาหวานชนิดที่ 2 อยู่ในระดับสูง (12.43 ± 2.45 และ 12.08 ± 2.29 ตามลำดับ) และการสื่อสารของบุคลากรด้านสุขภาพกับผู้ป่วยเบาหวานชนิดที่ 2 อยู่ในระดับเหมาะสม (33.42 ± 5.34) สำหรับปัจจัยได้แก่ ความสามารถของตนเอง ($\beta$ = 0.36, $P$ < 0.001) การสนับสนุนของครอบครัว ($\beta$ = 0.31, $P$ < .001) รายได้ของครอบครัว ($\beta$ = 0.24, $P$ < 0.001) และความเครียด ($\beta$ = -0.18, $P$ < 0.01) สามารถทำนายพฤติกรรมการบริโภคของผู้ป่วยเบาหวานชนิดที่ 2 ได้อย่างมีนัยสำคัญทางสถิติ และทำนายพฤติกรรมการบริโภคของผู้ป่วยเบาหวานชนิดที่ 2 ได้ร้อยละ 66.5 ($R^2$ = 0.665, $F_{(4,112)}$ = 55.63, $P$ < 0.001) ระดับการศึกษา ความรู้ และการสื่อสารของบุคลากรด้านสุขภาพไม่สามารถทำนายพฤติกรรมการบริโภคของผู้ป่วยเบาหวานชนิดที่ 2 ได้ **สรุป:** ความสามารถของตนเอง การสนับสนุนของครอบครัว รายได้ครอบครัว และความเครียด สามารถทำนายพฤติกรรมการบริโภคที่เหมาะสม สนับสนุนการพัฒนาโครงการ/โปรแกรมที่ส่งเสริมพฤติกรรมการบริโภค ที่เน้นการส่งเสริมความสามารถของตนและการสนับสนุนของครอบครัวในผู้ป่วยเบาหวานชนิดที่ 2 รวมทั้งคำแนะนำการบริโภคอาหารที่เหมาะสมกับรายได้ของครอบครัว

**คำสำคัญ:** พฤติกรรมการบริโภค, ความสามารถของตนเอง, การสนับสนุนของครอบครัว, ความเครียด, ผู้ป่วยเบาหวานชนิดที่ 2

## Abstract

**Objectives:** To describe and examine predictive factors toward eating behaviors among type 2 diabetes patients. **Methods:** A simple random sampling was conducted to recruit 117 diabetes patients from Sidoarjo sub-district. Data were collected from January to February, 2015. Descriptive statistics and stepwise multiple regression were used for data analysis. **Results:** Type 2 diabetes patients' eating behaviors, monthly income of family, self-efficacy, psychological stress, and family support were in moderate levels (means with standard deviations of 75.44 ± 10.58, 1,746,846.15 ± 521,828.66, 60.88 ± 6.30, 42.59 ± 5.77, and 55.38 ± 13.83, respectively), while educational level and knowledge were in high level (12.43 ± 2.45 and 12.08 ± 2.29, respectively), and healthcare worker communication was in sufficient level (33.42 ± 5.34). Self-efficacy ($\beta$ = 0.36, $P$ < .001), family support ($\beta$ = 0.31, $P$ < .001), monthly income of family ($\beta$ = 0.24, $P$ < 0.001), and psychological stress ($\beta$ = -0.18, $P$ < 0.01) were significant predictors of eating behaviors and accounted for 66.5% in the variance of eating behaviors ($R^2$ = 0.665, $F_{(4,112)}$ = 55.63, $P$ < 0.001). Educational level, knowledge, and healthcare worker communication were not significant predictors of eating behaviors. **Conclusion:** Self-efficacy, family support, family monthly income, and psychological stress predicted eating behaviors. Program aiming at increasing self-efficacy, motivating family support, decreasing psychological stress and also providing information related to food consumption behavior in everyday life to suit the income of the family should be developed.

**Keywords:** eating behaviors, self-efficacy, family support, psychological stress, type 2 diabetes patients

## Introduction

Diabetes mellitus (DM) is one of the leading causes of death due to serious complications.[1] According to the World Health Organization, 347 million people worldwide have diabetes.[2] Based on data from the Indonesian Ministry of Health in 2012, the number of diabetic patients has reached 5.7% of Indonesian population or about 12 million people.[3] Diabetes mellitus case number in Sidoarjo, which is the second largest of East Java following Surabaya, from Sidoarjo's Health Department as of 2013 reached 55,107 cases.[4] The cases were diagnosed and recorded by the Health Department, but there are still many cases of undiagnosed diabetes incidence in the community.[5]

Although diabetes has been difficult to control in the best condition, it will be more difficult if the circumstances of diabetes is exacerbated by emotional disturbances, home instability, or inadequate knowledge and lack of motivation.[6]

Many type 2 diabetes patients are admitted to hospital because they have an active diabetes complication.[7] Nutrition intervention in type 2 diabetes is one of the parts that are integral with the other treatments.[8] Therefore, changes in lifestyle associated with eating behaviors in type 2 diabetes patients greatly impact their quality of life. By having healthy eating behaviors, they can keep their blood sugar levels in a stable state, and they are also able to control the progression of the disease. Therefore, they can avoid the complications that can aggravate their condition and reduce insulin resistance.[9,10]

According to some previous research, there are many factors that can affect food selection and eating patterns of type 2 diabetes patients. The fourth phase (educational and organizational diagnosis) of Precede-Proceed Model developed by Green and Kreuter mentions factors influencing behaviors.[11] There are three kinds of factors on educational and organizational diagnosis phase: 1) predisposing factors (monthly income of family, education level, knowledge, self-efficacy, psychological stress, belief, attitude, etc.), 2) reinforcing factors (family support, peer support, social support, etc.) and 3) enabling factors (healthcare worker communication, program services, and resources or development of new skills). Based on previous research, there are multiple factors that can affect self-management or self-treatment in patients with diabetes mellitus, as well as eating behaviors. The factors include monthly income of family, level of education, knowledge, co-morbid illnesses of hypertension, hyperlipidemia and cardiac diseases, the level of family functioning, family support, social support, health care service especially provider-patient communication self-management, misleading "popular" knowledge and advice, belief, and self-efficacy.[9,12-17] Several barriers associated with low income and eating behaviors among type 2 diabetes patients.[13]

When asked about the considerations in selecting foods, the highest response obtained was about taste and price. This results in the emergence of a barrier. A major obstacle that arises is that they want food to taste good at a price that is affordable to them and which is also healthy. Finally it was the result of them experiencing stress which causes over-eating or unhealthy food choices as well as difficulty resisting the temptation to eat unhealthy food. Income is also often associated with education level. In patients with low income, they have a lower level of education that will influence the decision making for the selection of foods and understanding the information related to the importance of eating behaviors for diabetes patients.[16,18] Level of education had limitations which impact health behaviors. However, these can be overcome if healthcare workers can provide information related to the management of the disease (especially changing behaviors). These behaviors must be adhered to and should be clearly and easily understood by the diabetes patients.

Other factors such as family support and healthcare worker communication can impact directly or indirectly self-management, especially dietary behaviors. These factors can exert their influence indirectly when they affect the confidence of people with diabetes that will motivate them to follow good dietary behavior.[17] Communication and support of families will create a social environment that is feasible for a patient with diabetes for treatment by medical professionals.[19] Only medical and drug treatment for chronic diseases such as diabetes are not adequate. These patients also need to be aware of self-management, especially eating behaviors. Provision of information about disease suffered by the patient is the duty of a healthcare worker. The process of providing information, or communication by medical practitioners, greatly affects the understanding of the patient so that they can carry out self-management independently. Effective communication of healthcare workers is more important to decision-making styles in predicting diabetes self-management.[20]

The process to determine the factors that can affect eating behaviors of a given population is very important to follow. This is because it enables health care providers to see which factors can influence the eating behaviors of the diabetes patients. Such understanding on these factors can be helpful in the preparation of program planning for eating behaviors. Research in Indonesia is often performed on hospitalized diabetes patients, but rarely in community-dwelling patients, especially about eating behaviors. This research aimed to study factors influencing eating behavior among type 2 diabetes patients, which consist of predisposing factors (monthly income of family, education level, knowledge, self-efficacy, and psychological stress), reinforcing factor (family support), and enabling factor (healthcare worker communication). The results of this study could be used as input for health professionals to prepare effective nursing plan or program for diabetes patient.

**Specific objectives** of this study included 1) to describe eating behaviors, predisposing factors (monthly income of family, educational level, knowledge, self-efficacy, and psychological stress), reinforcing factor (family support) and enabling factor (healthcare worker communication) of Indonesian people with type 2 diabetes, and 2) to examine the association between eating behaviors and predisposing factors, reinforcing factor, and enabling factor among type 2 diabetes patients, in Sidoarjo sub-district, East Java province, Indonesia. With such objectives, the **hypothesis** was that predisposing factors (monthly income of family, educational level, knowledge, self-efficacy, and psychological stress), reinforcing factor (family support) and enabling factor (healthcare worker communication) could predict eating behaviors among type 2 diabetes patients in Sidoarjo sub-district, East Java province, Indonesia.

## Methods

This predictive correlation research study examined predictive factors between predisposing factors (monthly income of family, education level, knowledge, self-efficacy, and psychological stress), reinforcing factors (family support), and enabling factors (healthcare worker communication) to eating behaviors among type 2 diabetes patients in Sidoarjo sub-district, East Java, Indonesia. The sample was those adult people residents in Sidoarjo sub-district who were diagnosed with type 2 diabetes. They visited the Sidoarjo Community Health Center for follow up. This health center has the scope of their employment with a total of type 2 diabetes patients of 3,356 people.[4] Participant recruitment process was done by simple random sampling. The researcher obtained address of type 2 diabetes patients from Sidoarjo Community Health Center and conducted research by home visits. Data were collected during January to February, 2015.

In sample size determination, Tabachnick and Fidell formulation[21] was used for calculation. This formula is appropriate for multiple regression analysis with several independent variables. Based on the formula of "n = 50 + 8m" where m equals number of independent variables, a sample size (n) of 106 was achieved. With a 10% increment to compensate for missing data, a total number of 117 were required. The inclusion criteria for sample selection were 1) age between 20 - 60 years old, and 2) being able to read, write, and comprehend Indonesian language, and 3) willingness to participate in the study.

**Instruments**

Data were collected by using self-reported questionnaire, including demographic data, eating behaviors, knowledge, self-efficacy, psychological stress, family support, and healthcare worker communication. The questionnaire was developed in English and had been translated into Indonesian language by back-translation.[22] **Demographic data questionnaire** consisted of questions for gender, age, marital status, educational level, and monthly family income.

**Eating behaviors** were measured using a questionnaire to determine the response of the participants toward the consumption of foods that are recommended for diabetic patients, including food intake, the selection of a healthy diet, the appropriate meal planning, and challenging dietary settings (selecting a place to eat for good health when eating out and portion control). The questionnaire developed by Primanda, Kritpracha, and Thaniwattananon consists of 4 dimensions with a total 33 items, specifically 1) recognizing the amount of calorie needs (4 items), 2) selecting a healthy diet and amount (16 items), 3) arranging a meal plan (6 items), and 4) managing dietary challenges (7 items).[23] This questionnaire was called self-management diabetes dietary behaviors questionnaire (SMDBQ). The total score of SMDBQ ranges from 33 to 132, with higher scores indicating better eating behaviors. In this study, the SMBDQ total score was classified into three levels, namely high (101 - 132), moderate (67 - 100), and low (33 - 66). Based on the result from Primanda and colleague[23], SMDBQ attained an acceptable reliability with a Cronbach's alpha coefficient of 0.73. In this study, the coefficient of Cronbach's alpha found in a pilot test with 30 participants was 0.83.

**Knowledge** was measured using combination of the **Diabetes Knowledge Questionnaire (DKQ)** developed by Garcia, Villagomez, Brown, Kouzekanani, and Hanis,[24] and Park and colleagues.[25] The choice of the potential response are "yes," "no," and "don't know." The total score ranges from 0 to 18, with higher scores indicating higher level of the patient's knowledge. Based on two previous studies, the total score of the DKQ was classified into 3 levels, including low knowledge (0 - 5), moderate knowledge (6 - 11) and high knowledge (12 - 18). In this study, the Kuder-Richardson 20

(KR-20) coefficient of 0.61 indicated a borderline reliability in the pilot test with 30 participants.

**Self-efficacy questionnaire** was used to measure the type 2 diabetes patients' perception of their ability to maintain their eating behaviors. In this study, self-efficacy was measured using 10 items of modified self-efficacy for diet from 15 items of the Diabetes Management Self-Efficacy Scale-UK (DMSES-UK) statements with a scale of 0 - 10, where 0 means the lowest scale of self-efficacy and 10 means the highest scale of self-efficacy. DMSES-UK was developed by Sturt, Hearnshaw, and Wakelin.[26] The total score of DMSES ranges from 0 to 100, with higher scores indicating higher level of self-efficacy. In this study, self-efficacy score of the DMSES was classified into 3 levels, including high (68 - 100), moderate (34 - 67), and low self-efficacy (0 - 33). In this study, the DMSES-UK exhibited a high reliability with the Cronbach's alpha coefficient of 0.89 in the pilot test with 30 participants.

**Psychological stress questionnaire** was used to measure the feelings of type 2 diabetes patients for potential problems that may be faced by them. These attributes included emotional burden, physician-related distress, regimen-related distress, and interpersonal distress. In this study, psychological stress was measured using 16 items from Diabetes Distress Scale (DSS) developed by Polonsky and colleagues.[27] DSS uses a rating scale of "not a problem," "a slight problem," "a moderate problem," "somewhat serious problem," "a serious problem," and "a very serious problem." The total score of DDS ranges from 16 to 102, with higher scores indicating higher levels of distress. The total score of DDS is classified into 3 levels of stress, specifically low (16 - 31), moderate (32 - 47), and high distress ($\geq$ 48). The DDS had an adequate reliability with a Cronbach's alpha coefficient of 0.87, and a sufficient validity with significant linkages to the Center for Epidemiological Studies Depression scale, meal planning, exercise, and total cholesterol.[27] In this study, the Cronbach's alpha coefficient found in a pilot test with 30 participants was 0.85.

**Family support questionnaire** was used to measure the perception of supporting system and motivation given by the family to help type 2 diabetes patients engage in healthy eating behaviors. Family support was measured using 20 items of the Diabetic Social Support Questionnaire-Family (DSSQ-Family) developed by La Greca and Bearman (citied in Puntsho Om).[28] The DSSQ-Family used a frequency rating scale of "never," "less than 2 times a month," "twice a month," "once a week," "several times a week," and "at least once a day." The total score of DSSQ-Family ranges from 0 to 100. The DSSQ-Family total score is divided into 3 levels, which are a low family support (0 - 33), moderate family support (34 - 66), and high family support (67 - 100). Higher scores indicated higher support from family. Based on result from Puntsho Om[28], DSSQ-Family had an adequate internal consistency score with a Cronbach's alpha of 0.95. In this study, the Cronbach's alpha coefficient found in a pilot test with 30 participants was 0.97.

**Healthcare worker communication** was used to measure type 2 diabetes patients' perception about communications made by healthcare workers in providing information associated with diabetes mellitus. Healthcare worker communication was measured using Health Care Communication Questionnaire (HCCQ) developed by Gremigmi, Sommarugo, and Peltenburg.[29] The HCCQ uses a rating scale of "not at all," "a little," "somewhat," "very much," and "completely." The total score of HCCQ ranges from 13 to 65, with higher scores indicate better communication. Based on the HCCQ total scores, communication of healthcare worker is classified into 3 levels namely "good" (48 - 65), sufficient (30 - 47), and bad communication (13 - 29). Based on results from Gremigmi and colleague[25], Cronbach's alpha values met a criterion of acceptable reliability of 0.70, ranging from 0.72 to 0.86. In this study, the Cronbach's alpha coefficient found in a pilot test with 30 participants was 0.90.

### Data collection

This study was approved by the Institutional Review Board (IRB), Faculty of Nursing, Burapha University (IRB No. 10-11-2557, Dec. 8, 2014). After getting permission from institute authorities, the researcher conducted research by home visits. Participants were gathered from the Sidoarjo Community Health Center. Participant recruitment was conducted from the patient registry of the Sidoarjo Community Health Center for follow up as potential participants. The researcher obtained address of the patients from Sidoarjo Community Health Center and conducted research by home visit. The researcher explained about the human protection, purpose and method used in this study. If the potential respondents were accepting and willing to join the study, serve, then they were asked to sign an informed consent. The researcher explained briefly about the direction to fill the questionnaire and allowed respondents to fill it out according to their own circumstances. The questionnaire took about 20 - 30 minutes to complete.

**Data analysis**

Descriptive statistics were used to describe eating behaviors, monthly income of family, educational level, knowledge, self-efficacy, psychological stress, family support, and healthcare worker communication. A stepwise multiple regression was conducted to examine the association between eating behaviors and the potential factors described above. Statistical significant level was set at a level of 0.05.

## ผลการศึกษา

**Type 2 diabetes patients' characteristics**

Most of type 2 diabetes patients were female (64.10%). The majority were in the age range of 41 - 50 years (45.30%) followed by 51 – 60 years (33.33%). As for marital status, majority of the patients were married (76.92%). More than half of the patients completed high school (55.56%). The majority (70.09%) earned family monthly income of 1,500,000 - 2,500,000 Rupiahs (125.00 - 208.33 USD) (*M* = 1,746,846.15; *SD* = 521,828.66) (Table 1).

**Table 1** Type 2 diabetes patients' characteristics (N = 117)

| Characteristics | Number | % |
|---|---|---|
| Gender | | |
| Male | 42 | 35.90 |
| Female | 75 | 64.10 |
| Age (year) *M* = 47.07, *SD* = 7.832 Min=27, Max=60 | | |
| 21-30 | 4 | 3.42 |
| 31-40 | 21 | 17.95 |
| 41-50 | 53 | 45.30 |
| 51-60 | 39 | 33.33 |
| Marital status | | |
| Single | 2 | 1.71 |
| Married | 90 | 76.92 |
| Divorced/ Widow | 25 | 21.37 |
| Educational level | | |
| Primary School | 1 | 0.86 |
| Junior high school | 21 | 17.95 |
| High school | 65 | 55.56 |
| Diploma | 7 | 5.98 |
| Undergraduate | 20 | 17.09 |
| Graduate | 3 | 2.56 |
| Monthly income of family (Rupiahs) (1 USD=12,000 Rupiahs) | | |
| *M* = 1,746,846.15; *SD* = 521,828.66 Min=750,000, Max=3,775,000 | | |
| ≤ 1,499,999 | 29 | 24.79 |
| 1,500,000-2,500,000 | 82 | 70.09 |
| ≥ 2,500,001 | 6 | 5.12 |

**Levels of eating behavior and its potential influencing factors**

The patients' eating behaviors, monthly family income, self-efficacy, psychological stress, and family support in a moderate level (mean ± standard deviation of 75.44 ± 10.58, 1,746,846.15 ± 521,828.66, 60.88 ± 6.30, 42.59 ± 5.77, and 55.38 ± 13.83, respectively). Their educational level and knowledge were in a high level (12.43 ± 2.45 and 12.08 ± 2.29, respectively) and healthcare worker communication was considered as sufficient (33.42 ± 5.34) (Table 2).

**Table 2** Level of eating behaviors, monthly family income, educational, knowledge, self-efficacy, psychological stress, family support and healthcare worker communication of type 2 diabetes patients (N = 117)

| Variables | *Mean* | *SD* | Level |
|---|---|---|---|
| Eating behavior | 75.44 | 10.58 | Moderate |
| Monthly income of family* | 1,746,846.15 | 521,828.66 | Moderate |
| Educational level | 12.43 | 2.45 | High |
| Knowledge | 12.08 | 2.29 | High |
| Self-efficacy | 60.88 | 6.30 | Moderate |
| Psychological stress | 42.59 | 5.77 | Moderate |
| Family support | 55.38 | 13.83 | Moderate |
| Healthcare worker communication | 33.42 | 5.34 | Sufficient |

* Rupiahs (1 USD = 12,000 Rupiahs)

**Association between eating behavior and potential influencing factors**

The results shows that self-efficacy ($\beta$ = 0.36, *P*–value < 0.001), family support ($\beta$ = 0.31, *P*–value < 0.001), monthly income of family ($\beta$ = 0.24, *P*–value < 0.001), and psychological stress ($\beta$ = -0.18, *P*–value < 0.01) were significant predictors of eating behaviors and accounted for 66.50% in the variance of eating behaviors ($R^2$ = 0.665, $F_{(4,112)}$ = 55.63, *P*–value < 0.001). On the other hand, educational level, knowledge, and healthcare worker communication were not significant predictors of eating behaviors (Table 3). The prediction equations were showed as follows:

1. The typical multiple regression equation based on raw scores:

$$\text{Eating behaviors} = 31.07 + 0.60\,(\text{self-efficacy}) + 0.24\,(\text{family support}) + 4.95*10^{-6}\,(\text{monthly income of family}) - 0.33\,(\text{psychological stress})$$

2. The typical multiple regression equation based on Z scores:

$$Z_{\text{eating behaviors}} = 0.36\,(Z_{\text{self-efficacy}}) + 0.31\,(Z_{\text{family support}}) + 0.24\,(Z_{\text{monthly income of family}}) - 0.18\,(Z_{\text{psychological stress}})$$

**Table 3** Results of final model of stepwise multiple regression analysis examining factors influencing eating behaviors among type 2 diabetes patients (N = 117)

| Independent variables | *b* | SE(b) | Beta | *t* | *P*-value |
|---|---|---|---|---|---|
| 1. Self-efficacy | 0.60 | .13 | 0.36 | 4.83 | < .001 |
| 2. Family support | 0.24 | .056 | 0.31 | 4.27 | < .001 |
| 3. Monthly income of family | $4.95*10^{-6}$ | .00 | 0.24 | 3.67 | < .001 |
| 4. Psychological stress | -0.33 | .11 | -0.18 | -3.14 | .002 |
| Constant = 31.07 | | 7.41 | | 4.19 | < .001 |
| $R^2$ = 0.665, $F_{(4, 112)}$ = 55.63, $P$ < 0.001 | | | | | |

## อภิปรายและสรุปผลการศึกษา

The findings of this study were discussed as follows:

**Eating behaviors**

In the current study, type 2 diabetes patients had moderate level of eating behaviors. Several reasons could contribute to such modest level of appropriate eating behaviors. The patients reported additionally that they were unable to manage dietary challenges and the culture of Indonesian people including eating rice in huge portions and the culture of attending many events or ceremonies. The nutritional proportions for type 2 diabetes patients as recommended by ADA are 50 - 60% carbohydrates, 30% fats, and 10 - 20% protein. Fiber and complex carbohydrate become the most important consumption for diabetes patients because it contains fructose which will lead to significant reduction in fasting blood sugar level, lipid level, and also reduction of body weight in diabetics.[30-32] Unfortunately Indonesian people find it difficult to replace their diet habits. The majority of Indonesian people regularly eat rice or other foods made from rice.[23] In traditional Indonesia culture, people often serves food that is high in fat and very sweet for most of their traditional gatherings.[23] Food selection was also a challenge for Indonesian people as these diabetes patients reported that they were more likely to use any oils for cooking other than the recommended vegetable oils (such as sunflower, soybean or saffola oil) for cooking. In addition, many Indonesians still apply bulk oil which actually should have been no longer allowed to use because it contains highly saturated fat. Those habits can cause someone get overweight, which in turn will disrupt the work of organs' function. Nutrition intervention in type 2 diabetes is one of the parts that integrates with the other treatments and changes in lifestyle associated with eating behaviors.[8] Diabetes patients should increase their awareness about healthy dietary behaviors by understanding the importance of eating behaviors regarding their condition, and choosing healthy eating behaviors. Ultimately it is intended to enable them to achieve a good quality of life.

**Monthly family income**

In the current study, the majority of type 2 diabetes patients (70.09%) earned a monthly family income of 1,500,000 - 2,500,000 Rupiahs (125 - 208.33 USD). Total income per month was still below the minimum district standard of Sidoarjo for year 2015 which was 2,705,000 Rupiah (225.42 USD).[33] In that condition, people had limitation on the cost of children's education and health care costs. This is somewhat becoming a problem for type 2 diabetes patients to adhere healthy eating behaviors.[34] In low-income communities, it is often found that the incidence of diabetes is caused by factors related to the cost of healthy food, stress-related eating inappropriate, and the temptation to eat unhealthy food.[13]

**Educational level**

The present study shows that more than half of type 2 diabetes patients (55.60%) completed high school. Only a few of them completed junior high school (17.95%) and primary school (0.86%). This relatively high level of education was achieved since the Indonesian government agenda advocates a 12-years minimum compulsory education. This is evidenced by 10.5% of 146.4 trillion IDR (USD 12.2 billion) of the budget revenues and expenditures that was allocated for the education sector.[35] Low educational level often causes type 2 diabetes patients difficulty understanding all the information related to self-management and making decisions related to food selection and eating patterns.[18]

**Knowledge**

Type 2 diabetes patients in this had high level of knowledge of appropriate eating behaviors. It shows that these patients have a good understanding and are able to analyze their needs to continue performing appropriate eating behaviors. High level of knowledge in this study could be due to the fact that type 2 diabetes patients were already well informed by healthcare workers of Sidoarjo Community Health Center. Health education on nutrition knowledge is needed to improve the nutritional knowledge, skills, and food intake behaviors.[36]

**Self-efficacy**

In this study, type 2 diabetes patients had moderate level of self-efficacy of diabetes eating behaviors. It shows that type 2 diabetes patients had been able to choose appropriate foods for their circumstances, but they had difficulty scheduling meal time when in a condition of sick, away from home, and feeling depressed or anxious. The behavioral specific cognition influences a commitment to engage in health promoting behaviors as well as directly promotes greater participation in health promoting behaviors.[37] Dietary self-efficacy in type 2 diabetes patients is identified as one of variables that can affect eating behaviors, such as food selection and eating patterns.[14]

**Psychological stress**

In this study, type 2 diabetes patients had moderate distress. Usually diabetes patients at this phase shows that they feel worried for their health condition. According van Amberg (citied in Hawari)[38] which states that a person in moderate distress will experience sleep disturbances, feeling unable to relax, feel tense and anxious on their condition. The results showed that type 2 diabetes patients felt that their doctors still pay less attention to their problems associated with eating behaviors, and feel less appreciated. They also perceived no emotional support by the family or friends. These patients often failed to perform appropriate health behaviors because of poor stress management and coping. Thus they had difficulty establishing patterns of behaviors to solve the problems of diet and exercise.[39]

**Family support**

Type 2 diabetes patients in this study had moderate level of family support. Based on additional information provided by the family members, they were likely to support by giving advice to avoid inappropriate foods for these diabetes patients. These family members also continuously monitored and warned the patients when the patients were tempted to eat non-recommended food. Some family members also showed that they understood how important to eat right for these diabetes patients and they showed the patients that they were pleased when the patients ate right. However, these family members faced difficulty buying foods appropriate for type 2 diabetes patients, and also in choosing a place to eat out that serves food appropriate for the patients. For some patients living with their children who worked long hours from morning to evening, less attrition, especially on healthy eating, was given to their diabetes parents. The increasing family support leads to decreasing perceived-barriers toward dietary self-care.[15] This idea comes from their assumption that the function of the family to support the needs of patients with diabetes obtain a good quality of life can be fulfilled.

**Healthcare worker communication**

Most type 2 diabetes patients in this study perceived that healthcare worker communication was only in a sufficient level. They reported that the way healthcare worker communicated was adequate and able to provide the information required. Sufficient level of healthcare worker communication means that healthcare workers have good communication skills and able to convey enough information needed by patients.[40] Therefore in our study, there was an effective communication between healthcare workers and patients. Ratings of provider communication effectiveness are more important than a participatory decision-making style in predicting diabetes self-management.[20] Giving the right information will have a higher effectiveness in improving patient empowerment in terms of self-management and lifestyle modification, rather than just simply involving those in decision making about their lives.[41]

**Factors influencing eating behaviors**

**Self-efficacy**

In our study, self-efficacy of type 2 diabetes eating was a significant predictor of eating behaviors. It was asserted that increasing self-efficacy in diabetes patients would improve diabetic self-management, especially eating behaviors. Dietary self-efficacy in diabetes patients is identified as one of variables that can affect eating behaviors.[14] Increasing self-efficacy influenced the development of depression, and impacted decision-making process and treatments adherence.[42, 43] With high self-efficacy, diabetes patients are more likely to have low stress and anxiety.[44] Increasing self-efficacy in type 2 diabetes patients will lead to a good impact in the diabetic self-management behaviors, such as diet, exercise, blood sugar testing, and taking medication, and ultimately a better glycemic control.[45,46]

**Family support**

The present study showed that family support predicted eating behaviors. This could be attributable to various reasons. The presence of family support to diabetes patients in a form of advice and positive criticism would make the patients more aware of the importance of glycemic control through healthy eating. A higher family support could lead to a higher adherence of treatments and a better quality of life.

Higher family support should also help decrease perceived barriers to dietary self-care. This is because the patients perceive the function of the family to support them obtain a good quality of life.[15,47] Communication and support from family is creating a social environment that could enhance type 2 diabetes treatment provided by medical professionals.[19]

**Monthly family income**

The result of this study showed that monthly family income predicted eating behaviors. Previous study showed that Indonesian type 2 diabetes patients had inappropriate food selection and their habit of using bulk oil. Family income had direct and indirect impact between eating behaviors and health among type 2 diabetes patients.[48] In low-income communities, it is often found that the incidence of diabetes is caused by factors relating to cost of healthy food, stress-related inappropriate eating, and the temptation to eat unhealthy food.[13] Low income level and low socio-economic environment could affect one's perception of health and it results in health disparities.[49]

**Psychological stress**

In this study, psychological stress was one of the factors that predicted eating behaviors. It has been known that psychological stress impacts eating behaviors among type 2 diabetes patients as shown by a strong correlation with the decision-making process for food selection and eating patterns.[50] In a study, symptoms of depression significantly affects eating behaviors of type 2 diabetes patients in a different forms based on age, sex, and education.[51] The emotional stress affects the mindset of diabetes patients in decision-making related to health behaviors that further also impact to their quality of life.[52] Diabetes patients know about their illness but they often fail to perform proper health behaviors because of psychological stress and coping less well. They therefore had difficulty establishing patterns of behaviors to solve the diet problem.[39]

**Factors not influencing eating behaviors**

**Educational level**

In this study, educational level was not a predictor of eating behaviors. The results showed that more than half of diabetes patients were more than half completed 12 years for their educational level and 25.60% of them completed more than 12 years who must be able to manage information toward eating behaviors so that increasing their awareness about healthy eating behaviors. On the other hand, the level of education had limitation impact on health behaviors.[46,18] Educational levels and limitation in the process of learning (cognitive factors) will be over if healthcare worker provide information related to the disease management (especially changing behaviors) that must be endured by those with a clear and easily understood by T2DM patients and in accordance with their condition.[18]

**10.2 Knowledge**

Knowledge was not a predictor of eating behaviors. Even though T2DM patients have found out information about healthy eating behaviors, but they still have limitations to continue performing healthy eating behaviors due to other factors. Some researchers even considered the knowledge about healthy eating behaviors is very important for T2DM patients because they assume that T2DM patients are expected to remain informed and more critical in assessing the information about their condition and how to maintain, which in turn will lead to motivate them to change their behaviors and also to improve the nutritional knowledge, skills, and food intake behaviors due to prevent increasing number of T2DM in the community.[36,53]

**10.3 Healthcare worker communication**

Healthcare worker communication was not a predictor of eating behaviors. Even though in general T2DM patients considered healthcare worker communication was good enough but still they got slightly less favorable treatment which sometimes little rushed and they also did not get enough counseling related to healthy eating behaviors. Some researchers considered that the process of providing information by healthcare worker greatly affect the understanding of the patient in improving their lifestyle of healthy behaviors.[20, 41] In the treatment of chronic diseases such as diabetes mellitus, it is not enough to run medical and drug treatment, but they should also aware their self-management. Provision of information about the disease suffered by the patient is the duty for healthcare worker. Ratings of provider communication effectiveness are more important than a participatory decision-making style in predicting disease self-management.[20]

**Conclusion**

The findings of this study established Indonesian people with T2DM practiced moderate levels of eating behaviors. Self-efficacy, family support, monthly income of family, and psychological stress explained appreciable amount of variance in eating behaviors. It means the four factors (self-efficacy, family support, monthly income of family, and psychological stress) should be a concern for nursing intervention to improve commitment to action and actual performance of the eating behaviors. Therefore, the findings of present study consistent with other researchers and Precede model, wherein the validity of healthy eating behaviors' predictors partially proved the hypothesis of the study. The findings suggest that nurse and health professionals should develop a program aimed at increasing self-efficacy, motivating family for giving support, decreasing psychological stress and also providing information related to food consumption behavior in everyday life to suit the income of the family.

From this study, **future research** is recommended. The future research should replicate the study in the large areas and should be adding other factors associated with eating behaviors and also making interventions.

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