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Original Article

Predictors of diabetes self-management among type 2 diabetics in Indonesia: Application theory of the health promotion model

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ABSTRACT

Objective: This study aimed to identify factors predicting diabetes self-management among adults with type 2 diabetes mellitus in Malang City, East Java, Indonesia.**Methods:** A cross-sectional design was used in this study. Participants were selected from five primary health centers in Malang City, East Java, Indonesia using the multistage sampling method. A total of 127 adults with type 2 diabetes mellitus were recruited. Data were collected by questionnaires which were the general diabetes knowledge, the Beliefs of Treatment Effectiveness, the Diabetes Distress Scale, the Self-efficacy for Diabetes Scale, the brief Chronic Illness Resources Survey, the Situational Questionnaire and the Summary of Diabetes Self-care Activities. A self-administered questionnaire was used to collect the data. Multiple linear regression with stepwise method was used to analyze the data.**Results:** The scores of seven questionnaires (i.e. diabetes knowledge, perceived benefit of diabetes self-management, diabetes distress, perceived self-efficacy, social support, situational influence, and diabetes self-management) were 13.75 ± 3.59 , 34.9 ± 4.89 , 3.03 ± 0.86 , 3.60 ± 0.53 , 27.79 ± 5.56 , 3.27 ± 0.58 , 3.81 ± 1.08 , respectively. The significant predictors of diabetes self-management were treatment, perceived self-efficacy, and situational influences. These variables explained 20.8% (adjusted $R^2 = 0.208$) of the variance in diabetes self-management among adults with type 2 diabetes mellitus in Malang City.**Conclusion:** Diabetes self-management among adults with type 2 diabetes mellitus could be improved by enhancing their perceived self-efficacy to achieve their self-management behavior, such as having a healthy diet, exercising regularly, actively monitoring blood glucose level, taking medication and foot care, and providing support to promote good situational influence.© 2017 Chinese Nursing Association. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

According to Indonesia's Ministry of Health [1], the prevalence of diabetes in 2007 in Indonesia was 1.1% of the total population aged 15 years and over, increasing to 2.1% in 2013. The proportion of diabetes sufferers among the general population in the Indonesian province of East Java is greater (2.5%) than the national average (2.1%) [1]. A total of 19,167 cases of morbidity in Malang City were related to type 2 diabetes mellitus in 2013 [2]. The Public Health

Center (PHC) of Gribig, Malang [3] reported 118 cases (25%) in November and December 2014 and 61 cases (20%) in January 2015 that had blood glucose levels of ≥ 200 mg/dL.

Therefore, promoting self-management adherence is important to prevent the number of complications related to diabetes mellitus. Basic diabetes self-management behavior include insulin and medication adjustments, blood glucose monitoring, alterations in the timing, frequency, and content of meals, changes in exercise patterns, and foot care [4]. The American Association of Diabetes Educator [5] also identified seven self-care behavior that are essential for successful and effective diabetes self-management, including healthy eating, being active, monitoring blood glucose level, taking medication, problem solving, healthy coping, and reducing risks.

A cross-sectional study conducted by Rahayu [6] determined

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that type 2 diabetes sufferers in urban and rural areas in Malang City, East Java, Indonesia showed less than optimal level of diabetes self-management behavior. According to Rahayu's study [6], significant factors that predict diabetes self-management were gender, occupation, and diabetes knowledge. These predictors explained 15.6% of the variance in patients' diabetes self-management behavior. Thus, more factors that can predict diabetes self-management in Indonesia should be identified.

Several studies have been conducted to investigate the factors that predict successful diabetes self-management in patients with type 2 diabetes mellitus. However, several studies showed inconsistent findings. These factors include personal factors, such as age [6–8], gender [6,7,9], monthly income [7,9], education [7,9], and diabetes duration [8,10,11]. A previous study found that elderly patients showed better self-management behavior than younger patients [7]. By contrast, Berhe et al. [7] determined that younger respondents are significantly more likely to adhere to proper diabetic foot care practice. When comparing gender, Bai et al. [9] reported that males had higher self-care behavior than females, whereas Berhe et al. [7] showed that females were more likely to implement diabetes self-management practices than males.

Another factor that can affect diabetes self-management is diabetes knowledge. Rahayu [6] found that diabetes knowledge was the strongest predictor in diabetes self-management among community diabetes patient in Indonesia with $\beta = 0.32$. By contrast, Abubakari et al. [12] determined that the contribution of knowledge to self-management practice was insignificant among adult patients of African-European origin. Similarly, Little-Gregory [13] reported that no correlation between diabetes knowledge and diabetes self-management in African–American women exists.

Perceived self-efficacy is the judgment of one's personal ability to organize and accomplish a particular course of action. Self-efficacy has a central role in personal change and is the foundation of human motivation and action [14]. Didarloo [15] found that self-efficacy was the strongest predictor of intentions among Iranian women with type 2 diabetes. Sharoni et al. [11] reported a positive relationship between self-efficacy and self-care behavior in Malaysian patients with type 2 diabetes.

Social support is one of the interpersonal influences that determine an individual's predisposition to engage in health-promoting behavior [14]. A previous study found that social support is an important predictor of self-care behavior in patients with type 2 diabetes in Southern Taiwan with $\beta = 0.43$ [9]. Sonsosa [16] determined that participants who receive social support from family members showed positive diabetes self-management practices among Filipino–Americans with type 2 diabetes. However, Hagerstrom [17] reported that no relationship between social support and health-promoting behavior or health outcomes in diabetes self-care regimen in the United States exists.

Diabetes distress (DD) refers to a condition distinct from depression that is associated with diabetes outcomes. DD is defined as patient concerns about disease management, support, emotional burden, and access to care [18]. Fisher et al. [19] explained that females with a poor diet and a low rate of exercise were more likely to become distressed over time, leading to high HbA1c levels and high rates of complications. A previous study found that the proportion of adults with type 2 diabetes mellitus in Dhaka who were suffering DD was 48.5%, with 22.4% suffering a high level of distress and 26.1% suffering a moderate level of distress [20]. Aikens [21] determined that DD was significantly associated with high HbA1c levels, low medication adherence, and low frequencies of healthy diet and exercise behavior, but not of blood glucose testing behavior.

Another factor that can affect diabetes self-management is situational influences. Nuryanto [22] found that situational

influences have a positive correlation with health-promoting behavior in elderly patients with hypertension with $r = 0.37$. However, Hagerstrom [17] reported that situational influences, particularly depressive symptoms, had no significant relationship with the health-promoting behavior among patients with diabetes in the United States.

Pender's Health Promotion Model explains that personal factors, perceived benefits of action, perceived barriers to action, perceived self-efficacy, activity-related affect, interpersonal influences, and situational influences are important elements in the changing of behavior [14]. Factors predicting self-management can be explained by this model. Therefore, this study aimed to investigate factors that predict self-management among adults with type 2 diabetes mellitus in Malang City, East Java, Indonesia.

2. Methods

2.1. Design, setting, and sample

A cross-sectional design was used in this study. The multistage sampling technique was used to recruit the participants. Data were collected from 127 adults with type 2 diabetes mellitus from five PHCs in Malang City, East Java, Indonesia. Data were collected from participants who met the following inclusion criteria: (1) aged 20–59 years old, (2) have diagnosed type 2 diabetes (for at least six months based on the PHC's medical records), (3) have blood glucose levels between 70 mg/dL and 300 mg/dL, (4) are willing to participate in this study, and (5) are able to read and write Bahasa Indonesia. The exclusion criteria are as follows: (1) suffer from impaired vision, such as blindness, (2) have a psychiatric illness that was diagnosed by a physician, such as schizophrenia or hallucinations, (3) suffer from cognitive impairment diagnosed by a physician, and (4) are hospitalized during the data collection period.

2.2. Data collection

Data were collected by questionnaires, which were translated into the Indonesian language. The questionnaires were self-administered and completed in approximately 60 min.

2.2.1. Diabetes knowledge

Diabetes knowledge was measured using the General Diabetes Knowledge Questionnaire [4]. This scale was used to assess the participants' understanding about diabetes and its management. The general knowledge questions were related to diabetes (5 items), risk of diabetes complications (5 items), self-care on a daily basis and on sick days (6 items), and medication use (5 items). The instrument consisted of 21 items with response type of "yes," "no," and "do not know." The reliability of diabetes knowledge was 0.77.

2.2.2. Perceived benefit of diabetes self-management

Perceived benefit of diabetes self-management was measured using the Beliefs of Treatment Effectiveness questionnaire [23]. This scale was defined as the perception of the importance of self-management in managing diabetes. This questionnaire contained nine items. The first four items of the questionnaire measured the belief that diabetes self-management (i.e., diet, exercise, medications/insulin, and self-monitoring blood level) were important in controlling diabetes. The remaining five items of the questionnaire measured the belief that diabetes self-management (i.e., diet, exercise, medications/insulin, self-monitoring blood level, and foot care) were important in preventing diabetes complications. The instrument had a five-point Likert scale of 1 = not important, 2 = slightly important, 3 = fairly important, 4 = very important,

and 5 = extremely important. Cronbach's α of the perceived benefits of diabetes self-management was 0.74.

2.2.3. Diabetes distress

Diabetes distress was measured using the Diabetes Distress Scale (DDS) [18]. The DDS consisted of 17 items that use the Likert scale, with each item scored 1 = not a problem, 2 = a slight problem, 3 = a moderate problem, 4 = somewhat serious problem, 5 = a serious problem, and 6 = a very serious problem concerning distress experienced over the past month. Questions 1, 3, 8, 11, and 14 were related to emotional burden; questions 2, 4, 9, and 15 were related to physician-related distress; questions 5, 6, 10, 12, and 16 were related to regimen-related distress; and questions 7, 13, and 17 were related to interpersonal distress. Cronbach's α of DD was 0.91.

2.2.4. Perceived self-efficacy

Perceived self-efficacy was measured using the Self-Efficacy for Diabetes scale [24]. This scale was a self-administered questionnaire containing eight items to determine how confident the individual is in performing certain activities related to the self-management of diabetes mellitus. This scale asked the respondents to rate their confidence using a scale of 1 = not at all confident, 2 = slightly confident, 3 = uncertain, 4 = confident, and 5 = totally confident. Cronbach's α of perceived self-efficacy was 0.78.

2.2.5. Social support

Social support was measured using the brief Chronic Illness Resources Survey [25]. The respondents rated each of the nine items using the Likert scale, with 1 = highly unsatisfied, 2 = unsatisfied, 3 = neutral, 4 = satisfied, and 5 = highly satisfied, to indicate which each source of support over the past sixmonths was a resource for them. Cronbach's α of social support was 0.73.

2.2.6. Situational influence

Situational influence was measured using the situational questionnaire developed by Nuryanto [22] and modified by the researcher. The researcher modified the questionnaire to assess the external environment surrounding adults with diabetes mellitus that can increase or decrease their commitment to or participation in diabetes self-management. The questionnaire consisted of 17 items, which were rated using the five-point Likert scale of 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. Negative statements were also recoded (5 = 1, 4 = 2, 3 = 3, 2 = 4, and 1 = 5). Cronbach's α of situational influences was 0.82.

2.2.7. Diabetes self-management

Diabetes self-management was measured using the Summary of Diabetes Self-Care Activities (SDSCA) [26]. The SDSCA is a brief self-report questionnaire about diabetes self-management behavior, including diet, exercise, blood glucose testing, medication, and foot care. This study used the revised SDSCA including 15 items that assess aspects of healthy eating activities (5 items), physical activity (2 items), medication adherence (1 item), blood glucose testing (2 items), and foot care (5 items). The SDSCA used a Likert-type scale in which participants recall how often they performed diabetes self-management during the past 7 days and answers range from 0 day to 7 days. Cronbach's α of diabetes self-management was 0.72.

2.3. Data analysis

Multiple regression analysis was used to examine the predictors of diabetes self-management among adults with type2 diabetes

mellitus. The significance level was set at $P < 0.05$.

2.4. Ethical permission

Ethical permission was obtained from the Ethical Review Board (ERB) Committee of Boromarajonani College of Nursing Nopparat Vajira (Bangkok, Thailand; ERB No. 09/2015).

3. Results

3.1. Sample characteristics

The results were presented as (1) descriptive analysis including the demographic characteristics of the participants (i.e., age, gender, diabetes duration, treatment, education, and income) and (2) factors predicting diabetes self-management.

Table 1 shows the demographic characteristics of the participants, including gender, treatment, age, diabetes duration, education, and income. A total of 127 participants were included in the analysis. Most of the participants (70.1%) were female. The majority of the participants used the combination of diet and medication treatment (78%). The median age of the participants was 55 years old. The age of the majority of the participants (75.6%) ranged from 51 years old to 59 years old. The median of the diabetes duration of the participants was three years. The participants attained elementary and senior high school education (37% and 27.6%, respectively). More than half of the participant's income (67.7%) was <1,882,250 (less regional standard payment of Malang City).

3.2. Diabetes knowledge

The diabetes knowledge of the participants ranged from 2 to 21 out of the total score of 21, with the mean score of 13.75 and standard deviation of 3.59. The diabetes knowledge score was classified into: good (≥ 17), fair (16–13), and poor (< 13). Around 47% of the participants had a fair level of knowledge, followed by poor level (31.5%).

Table 1
Number and percentage of demographic characteristics of participants ($n = 127$).

Demographic characteristics	Number	Percentage
Gender		
Male	38	29.9
Female	89	70.1
Treatment		
Diet	20	15.7
Diet + medication use	107	84.3
Age (years)		
20–30	2	1.6
31–40	3	2.3
41–50	26	20.5
51–59	96	75.6
Diabetes duration (years)		
<1	14	11
1–5.9	83	65.4
6–10	20	15.7
>10	10	7.9
Educational (years)		
Elementary school (≤ 6)	47	37
Junior high school (7–9)	24	18.9
Senior high school (10–12)	35	27.6
College or university (≥ 13)	21	16.5
Income/month (IDR)		
< 1,882,250	86	67.7
$\geq 1,882,250$	41	32.3

3.3. Perceived benefit of diabetes self management

Out of total score of 45, the scores of perceived benefits of diabetes self management ranged from 24 to 45 with the mean score of 34.9 and a standard deviation of 4.89. The perceived benefits of diabetes self management were classified into three levels: high (≥ 36), moderate (35–27), and low (< 27). About half of participants (51.2%) were classified as moderate perceptions about the benefits of diabetes self management, followed by high perceived benefit (46.5%).

3.4. Diabetes distress

The mean scores of participant's diabetes distress ranged from 1.10 to 4.90 with the mean score of 3.03 and standard deviation 0.86. The diabetes distress scores were classified into two levels: moderate distress (≥ 3) and low distress (< 3). Approximately 55% of participants had moderate distress level to diabetes mellitus.

3.5. Perceived self-efficacy

The mean score of participant's perceived self-efficacy ranged from 2.0–4.90 with the mean score of total participants of 3.60 and a standard deviation of 0.53. The scores of perceived self-efficacy were classified into three levels: high confidence (≥ 4), moderate confidence (3.9–3), and low confidence (< 3). Approximately 66% of the participants had a moderately confident perceived self-efficacy in diabetes self management, followed by highly confident (24.4%).

3.6. Social support

Out of total score of 45, the social support scores ranged from 14 to 45 with the mean score of 27.79 and a standard deviation of 5.56. The social support was classified into three levels: high (≥ 36), moderate (35–27) and low (< 27). Half of the participants (52.8%) had moderate level in the social supports they received. However, approximately 40% of the participant had low social support.

3.7. Situational influence

The mean score of total participants in situational influences was of 3.27 and a standard deviation was 0.58. The situational influences were classified by mean score into three levels: high (5.00–3.68), moderate (3.67–2.34) and low (2.33–1.00). More than half of the participants (65.4%) experienced a moderate level of situational influences. However, approximately 29% of the participants had high situational influences.

3.8. Diabetes self management

The diabetes self management mean scores ranged from 1 to 7 with the mean score of all participants of 3.81 and standard deviation of 1.08. The level of diabetes self management were classified into three levels: high (≥ 5.6), moderate (5.5–4.2) and low (< 4.2). More than half of the participant's diabetes self-management (63.8%) was classified as poor level.

3.9. Relationship between independent variables and diabetes self-management

Table 2 shows the correlations among age, gender, diabetes duration, treatment, education, income, diabetes knowledge, perceived benefits of diabetes self-management, DD, perceived self-efficacy, social support, situational influences, and diabetes self-management. Positive significant correlations were

Table 2

Matrix correlation between independent variables and diabetes self management ($n = 127$).

Independent Variables	<i>r</i>	<i>p</i>
1. Age ¹	-0.024	0.791
2. Gender ²	0.021	0.811
3. Diabetes duration ¹	0.108	0.229
4. Treatment ²	0.376**	<0.001
5. Education ¹	0.044	0.622
6. Income ¹	0.078	0.381
7. Diabetes knowledge ¹	0.260**	0.003
8. Perceived benefits ¹	0.183*	0.039
9. Diabetes distress ¹	0.073	0.414
10. Perceived self efficacy ¹	0.308**	<0.001
11. Social support ¹	0.314**	<0.001
12. Situational influences ¹	0.248**	0.005

(¹) = Pearson Product-Moment correlation coefficient; (²) = Point Biserial correlation coefficient; **: Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

established between treatment, diabetes knowledge, perceived benefit, perceived self-efficacy, social support, situational influences, and diabetes self-management ($r = 0.376$, $P < 0.01$; $r = 0.260$, $P < 0.01$; $r = 0.183$, $P < 0.05$; $r = 0.308$, $P < 0.01$; $r = 0.314$, $P < 0.01$; and $r = 0.248$, $P < 0.01$, respectively). However, other variables, such as age, gender, diabetes duration, education, income, and diabetes distress, had no significant correlations with diabetes self-management.

3.10. Factors predicting diabetes self-management

Multiple linear regression analysis was conducted to examine the variables that significantly predicted diabetes self-management. After examining the assumption of multiple linear regression, the independent variables, including treatment, diabetes knowledge, perceived benefit, perceived self-efficacy, social support, and situational influences, were inputted into the stepwise multiple regression model.

The stepwise regression model revealed that only three variables, including treatment, perceived self-efficacy, and situational influences, were significant predictors of diabetes self-management among adults with type 2 diabetes mellitus in Malang City, East Java, Indonesia.

Table 3 shows that treatment, perceived self-efficacy, and situational influences combined accounted for 20.8% (adjusted $R^2 = 0.208$) of the variation of diabetes self-management. The strongest predictor of diabetes self-management was treatment ($\beta = 0.318$), followed by perceived self-efficacy ($\beta = 0.217$).

Treatment positively affected the score of diabetes mellitus, with $B = 0.993$ ($P < 0.01$). This finding indicates that participants who had a treatment combination consisting of diet and medication are 0.993 times more likely to succeed in diabetes self-management than participants who only had treatment by diet. Perceived self-efficacy positively affected diabetes self-management, with a statistically significant value of $B = 0.468$

Table 3

Factors predicting diabetes self management ($n = 127$).

Predictors	<i>B</i>	<i>SE</i>	<i>Beta</i>	<i>t</i>	<i>p</i>
Treatment	0.993	0.253	0.318	3.929	<0.001
Perceived self efficacy	0.468	0.177	0.217	2.648	0.009
Situational influences	0.018	0.009	0.162	1.995	0.048
Constant (α) = 0.917					

$R^2 = 0.227$; Adjusted $R^2 = 0.208$.

($P < 0.01$). This finding indicates that, when the score of perceived self-efficacy increased by 1, the score of diabetes self-management in adults with type 2 diabetes mellitus will increase by 0.468. Moreover, situational influences positively affected diabetes self-management, with a statistically significant value of $B = 0.018$ ($P < 0.05$). This finding indicates that, when the score of situational influences increase by 1, the score of diabetes self-management in adults with type 2 diabetes mellitus will increase by 0.018.

4. Discussion

This study identified the importance of factors that influence diabetes self-management among adults with type 2 diabetes mellitus in Malang City, East Java, Indonesia. This study showed that treatment, perceived self-efficacy, and situational influences explained 20.8% of the variance in diabetes self-management among adults with type 2 diabetes mellitus in Malang City. By contrast, diabetes knowledge, perceived benefits of diabetes self-management, and social support did not significantly predict diabetes self-management among adults with type 2 diabetes mellitus in Malang City.

Treatment was the strongest predictor of diabetes self-management among adults with type 2 diabetes mellitus in Malang City. Participants who had a treatment combination consisting of diet and medication were more likely to succeed in diabetes self-management than participants who only had treatment by diet. This finding could be attributed to the fact that participants who had a treatment combination consisting of diet and medication had a specific treatment, such as taking medication regularly and being more aware of preventing the severity of the disease. Therefore, they focused more attention to diabetes self-management. This finding was also supported by that of Al-Ibrahim [27] who reported that diabetes was significantly less controlled among Kuwaiti patients who are taking oral hypoglycemic agent medications only.

Perceived self-efficacy was identified as the second strongest factor predicting diabetes self-management among adults with type 2 diabetes mellitus in Malang City. This finding indicates that participants with higher perception of self-efficacy had higher diabetes self-management score. Perceived self-efficacy expresses people's self-belief in their ability to carry out specific behavior under a certain situation [14]. This particular finding in this study was consistent with the finding of a previous study in which self-efficacy was the strongest predictor of self-care behavior among Iranian women with type 2 diabetes mellitus [15]. Phetarvut [28] also reported that self-efficacy ($\beta = 0.509$, $P < 0.001$) had more influence on diabetes self-management among patients with type 2 diabetes mellitus in Thailand. More than half of the participants in Phetarvut's study had moderate confidence on perceived self-efficacy in diabetes self-management.

Situational influence was another predictor of diabetes self-management among adults with type 2 diabetes mellitus in Malang City. Pender et al. [14] explained that the situation may directly affect behavior by presenting environmental signs that trigger action. The participants with greater situational influences had higher diabetes self-management score. This finding indicates that more than half of the participants had a moderate level of situational influence. Thus, in this study, more than half of the participants had a poor level in diabetes self-management because the participants reported that shops that sell food according to the diabetes diet were difficult to find, PHC staff did not conduct home visits regularly for people with diabetes who cannot go to the PHC, and PHC staff did not regularly perform a complete foot exam at least annually. Thus, PHC staff should collaborate with diabetic patients to improve diabetes self-management. This finding was

also supported by that of Hagerstrom [17] who reported a significant negative correlation between situational influences (depressive symptoms) and glycemic control (A1c).

Another finding of this study was that diabetes knowledge did not show any statistical significance in predicting diabetes self-management among adults with type 2 diabetes mellitus in Malang City. This finding was in contrast to that of Rahayu [6] who revealed that diabetes knowledge was the strongest predictor in diabetes self-management among community diabetes patient in Indonesia. A possible reason for this difference may be the use of different measurement tools of diabetes knowledge. The General Diabetes Knowledge Questionnaire developed by Wattanakul [4] was used in the current study instead of the Diabetes Knowledge Questionnaire used by Rahayu.

This study revealed that perceived benefits of diabetes self-management did not influence diabetes self-management among adults with type 2 diabetes mellitus in Malang City. A possible reason for this finding may be related to culture. People in Malang City would only engage in health-promoting behavior, such as diabetes self-management, after experiencing the worst condition. Therefore, perceived benefit could not influence diabetes self-management in this study. This finding was supported by Ayele et al. [29] who determined that perceived benefits of recommended self-care were not good predictors of self-care behavior among diabetic patients in Harari, Eastern Ethiopia.

This study also clarified that social support did not show any significant effects on diabetes self-management among adults with type 2 diabetes mellitus in Malang City. This finding was also supported by that of Wattanakul [4] who reported that social support did not have a significant influence on the self-management behavior among patients with type 2 diabetes mellitus in rural Thailand. A possible reason for this finding was imbalanced support from health care providers, family, and peers. Most adults with type 2 diabetes mellitus perceived that they had social support at the moderate level, and only small number of participants were satisfied with the social support that they received. The average scores of social support was 27.79 or at the moderate level, that is, good support from health care providers, but low support from family and peers, particularly exercising together with family and neighbors. Therefore, social support in this study could not predict diabetes self-management. A limitation of this study was that it was conducted among adults with type 2 diabetes mellitus who came to the PHC. Their lifestyle was different from the population who experience difficulties in accessing PHCs. Therefore, the results of this study could only apply to similar populations.

5. Conclusions

This study intended to determine the factors predicting diabetes self-management among adults with type 2 diabetes mellitus in Malang City, East Java, Indonesia. These factors included age, gender, diabetes duration, treatment, education, income, diabetes knowledge, perceived benefits of diabetes self-management, diabetes distress, perceived self-efficacy, social support, and situational influences. This study highlights that diabetes self-management has a significant relationship with treatment, diabetes knowledge, perceived benefits of diabetes self-management, perceived self-efficacy, social support, and situational influences. However, the significant predictors of diabetes self-management were only treatment, perceived self-efficacy, and situational influences. These variables explained 20.8% of the variance in diabetes self-management among adults with type 2 diabetes mellitus in Malang City. The strongest predictor of diabetes self-management was treatment, followed by perceived self-efficacy.

Duality of interest

The authors declare that there is no duality of interest associated with this manuscript.

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