Conference Paper

Self-Efficacy as a Predictor of Self-Management Behavior Practice Among People with Type 2 Diabetes Mellitus (T2DM)

Hertuida Clara[1], Dewi Irawaty[2], and Debie Dahlia[2]

[1]Lecturer at the Nursing Academy of Pasar Rebo: Jl. Tanah Merdeka No 16, 17, 18, Ciracas, East Jakarta
[2]Department of Medical-Surgical Nursing, Faculty of Nursing, University of Indonesia, Depok, Indonesia

ORCID:
Hertuida Clara: https://orcid.org/0000-0002-0532-8932

Corresponding Author:
Hertuida Clara
clarahertuida@gmail.com

Abstract

Diabetes mellitus is a major health challenge associated with morbidity and mortality. Self-management behaviors are a critical part of diabetes disease management. Empowered or activated patients are more likely to practice better implementation of self-management behaviors. However, self-management behavior practice has not always been applied effectively among these populations. Further investigations are necessary to evaluate the status and factors that influence the practice of self-management behaviors among patients with diabetes. The purpose of this research is to identify the relationship between self-efficacy and self-management behaviors of people with type 2 Diabetes Mellitus. A cross-sectional research design was used in this study; 112 eligible people with type 2 Diabetes were recruited. Several questionnaires were used in this study including demographic and patient characteristics, Diabetes Management Self Efficacy Scale (DMSES), Summary Diabetes Self Care Activity (SDSCA), and Diabetes Knowledge (DKN) Scale. Data analysis was performed through univariate, bivariate, and multivariate analyzes. Most of the respondents studied were women, aged 34-74 years and the highest educational background was secondary education, 33.9% of respondents have a good level of knowledge, and 59.8% have good self-efficacy. The results show the significant relationship between self-efficacy and self-management behaviors (p-value < 0.001). The results of multivariate analysis showed that there was a relationship between self-efficacy and self-management behavior after being controlled by the knowledge and the duration of diabetes. Therefore, nurses need to improve the self-efficacy of people with type 2 Diabetes by providing education about the management of Diabetes, as well as supporting and motivating them.

Keywords: self-efficacy, self-management behaviors, people with type 2 Diabetes Mellitus

1. Introduction

Diabetes mellitus (DM) is a chronic disease that contributes to morbidity, mortality & disability [1]. *The International Diabetes Federation* [IDF] reports that 415 million people have diabetes today, and is predicted to increase to 640 million by 2040 [2]. Complications that can arise in people with diabetes mellitus are quite severe because they involve damage to other organs such as nephropathy, neuropathy, retinopathy, coronary heart disease, stroke, and even the risk of amputation. Applied Self-Management Behaviors in patient's daily basis might improve the ability of glycemic control which in turn can prevent various complications [3]. In fact, diabetes self-management behavior has not been carried out routinely every day by people with diabetes (information obtained based on the interview result from pilot study), patients with T2DM struggle to apply self-management behaviors in their lifestyle. Patien's said that they are not quite sure about their ability to perform self-management behaviors. Various factors cause this. It is assumed that if people with DM do not have good self-efficacy, they will perform bad diabetes self-management behavior.

Several studies related to self-efficacy have been carried out, including research conducted by Hunt et al.[4]; Wattanakul [1]; and Wilson [5], with results showing a significant correlation between self-efficacy and diabetes self-management behavior (p-value <0.01). However, other studies show insignificant results, namely, Wong and, Sarkar, Fisher & Schillinger [6], [7], for diabetes management: medication, self-efficacy is not positively correlated with diabetes self-management behavior. Also, Caulfield's study [8], which was conducted on a limited basis on the relationship between self-efficacy and diabetes self-management behavior: healthy eating and physical activity also gave results that varied insignificance, namely on healthy eating, the results were significant (p value = 0.04), meanwhile, on physical activity, self-efficacy was not a significant predictor because the p value was 0.54.

The above phenomenon raises the authors' curiosity further whether self-efficacy is a predictor of diabetes self-management behavior because not all related studies show significant results. Two different facts trigger the author's desire to conduct more research on a relationship between self-efficacy and diabetes self-management behavior. Also, previous researchers who have researched the factors contributing to diabetes self-care have not examined self-efficacy as one of the contributing factors and recommend these factors to be studied [9]. Therefore the research question that the writer wants to find answers to is "is there a relationship between self-efficacy and diabetes self-management behavior in people with type 2 diabetes mellitus

2. Methods

2.1. Design

This study used a descriptive-analytic design with a cross-sectional approach and the sampling technique was purposive sampling [10], [11].

2.2. Sample and Settings

Samples were taken from outpatients at the Bekasi Hospital, with a total sample of 112 people. The sample size of this study was calculated based on the correlation coefficient formula according to Sastroasmoro and Ismael [11], with inclusion criteria: adult age, DM $\geq$ 1 year old, able to communicate well verbally, able to read, write and speak Indonesian, and willing to be research respondents. Meanwhile, the exclusion criteria in the sample of this study were people with type 2 diabetes who had weak health conditions that made it impossible for them to participate in the study.

2.3. Instruments

This study using several instruments which involves demographic and characteristics of respondent, Diabetes Knowledge questionnaires (DKN), Diabetes Management Self Efficacy Scale/DMSES, and Summary Diabetes Self Care Activity/SDSCA [4], [12]–[14]

2.3.1. Questionnaire involves demographic and characteristics of respondents

The characteristic questionnaire contains questions related to the respondent's age, gender, respondent's education, socio-economy (income), and duration of diabetes.

2.3.2. Diabetes Knowledge questionnaires (DKN)

A questionnaire used to measure the knowledge of people with type 2 diabetes which was designed by Beeney, Dunn, & Welch in 2003 [12]. This questionnaire consists of 14 question items which are then modified into 10 questions covering general knowledge of DM and DM management principles. Each question item has 4 answer options with the last choice being "I don't know". Respondents were asked to choose one answer from 4 available answer choices for each question item, then for the correct answer, they

would be given a score of 1, while the wrong or no answer would be given a score of 0. Then the researcher gave the final score as an assessment of knowledge by adding up score of all question items, so that the score is in the range 0–10, where a high score indicates good knowledge of the respondent, while a low score indicates that the respondent's knowledge is less related to knowledge of DM and diabetes management principles.

2.3.3. Diabetic Management Self Efficacy Scale (DMSES) questionnaire

The questionnaire used to measure self-efficacy was the Diabetic Management Self Efficacy Scale (DMSES) questionnaire designed by Van der Bijl, Poelgeest-Eeltnik, & Shortridge-Baggett [4]. This instrument has been conducted research related to the validity and reliability by Sturt, Hearnshaw, and Wakelin in 2010 in the United States with validity and reliability values, namely r> 0.30 and alpha chronbach's 0.89. Therefore, in this study, researchers used the DMSES questionnaire. Sturt, et al. and modifications were made to accommodate the dimensions of self-efficacy based on Bandura's theory [15] which consists of dimensions of magnitude, strength, and generality. The questionnaire consisted of 16 question items about self-efficacy which included diet (meal planning and weight maintenance); Sports; blood sugar monitoring; therapy; and foot care. The scale used is the Likert scale 1-5 where for each question the respondent is asked to give an answer by giving a check list ($\sqrt{}$) on one of the scales between the 1-5 scale. Then the researcher gave the final score as an assessment of the respondent's self-efficacy, namely by adding up the value of each question (total score) so that the highest score was 80 and the lowest score was 16.

2.3.4. Diabetes Self Care Activities (SDSCA) questionnaire

The questionnaire used to measure self-management behavior in this study is a modified Summary of Diabetes Self Care Activities (SDSCA) questionnaire which has been developed and research related to its validity and reliability has been conducted by Toobert, D. J, et al [16]. The questionnaire consists of 15 question items that measure or assess how many days from the last 7 days people with type 2 diabetes participate in self-management behaviors that include diet or meal planning; Sports; therapy; blood sugar monitoring; and foot care. The scale used is the Likert scale 0 - 7. For each question, the respondent is asked to give an answer by giving a check list ($\sqrt{}$) on one of the scales between the 0-7 scale. Then the researcher gave the final score

as an assessment of the respondent's self-management behavior, namely by adding up the value of each question and then dividing it with the 15 question items in the questionnaire. So that the highest value is 7 and the lowest value is 0.

All of these instruments have been tested for validity and reliability. To test the reliability of the instrument (questionnaire) used in this study is the Cronbach alpha method where the results are above 0.7 so that it is declared reliable. For the validity test, it is necessary to revise several question items because these items are considered important and are still used or included in the instrument, while other items are valid because r> 0.3

2.4. Data collection Procedure

The data was collected by interviewing the respondents one by one, then explaining the research objectives, the benefits of the research and the research procedures. Respondents who are willing to participate in this research activity are asked to sign an informed consent statement. After that the researcher and the assistant conducted an interview process with each respondent for approximately 30 minutes. After that, check the completeness of the questionnaire, if there is incomplete data, it will be asked again to the respondent.

2.5. Data Analysis

Data analysis was performed through univariate, bivariate, and multivariate analyzes [17]. Univariate analysis aims to explain or describe the characteristics of each variable to be studied. Bivariate analysis aims to determine whether there is a significant relationship between the two variables. Multivariate analysis is to determine whether the independent variable is related to the dependent variable is influenced by other variables or not. Univariate analysis to describe the characteristics of each variable to be studied. Bivariate analysis to prove the relationship between self-efficacy and diabetes self-management behavior in people with type 2 diabetes and prove that there is a relationship between confounding variables (age, sex, education, socioeconomic, knowledge, and diabetes duration) with diabetes self-management behavioral. Meanwhile, multivariate analysis proves a relationship between self-efficacy and diabetes self-management behavior of people with type 2 diabetes after being controlled by confounding variables. The statistical tests used for bivariate analysis were the

Pearson correlation test and Spearman rank (for numerical variables), independent t-test, and one-way ANOVA (for categorical variables). Whereas for multivariate analysis using multiple linear regression analysis [17], [18]. The data processing included editing, coding, processing, or data entry and cleaning. This research was also conducted by applying the principles of research ethics, namely the principles of Beneficence, the Principles of Respect for Human Dignity, and the Principles of Justice [19].

3. Results

3.1. Demographics and Patients Characteristics

Out of a total of 112 participants, 59,8% was female with the highest level of education was secondary education (40.2%). The average age of the respondents was 57.9 years with the youngest 34 years old and the oldest 74 years old, and 50% of the respondents' monthly income was above the regional minimum wage (UMR) where the respondents lived. 33.9% of respondents have a good level of knowledge, and 59.8% of respondents have good self-efficacy.

Self-Management Behaviors among patients with Type 2 Diabetes Mellitus (T2DM)

The following is a table describing the respondent's diabetes self-management behavior

TABLE 1: Characteristics of Respondents by Diabetes self-management behaviors

Variable	Mean	Median	SD	Min-Max	CI 95%
Self -Management Behaviors	4,0	4,1	1,1	1,6 - 6,9	3,8 - 4,2
Diet	4,4	4,5	1,3	1,5 - 7,0	4,1 – 4,6
Physical Exercise	2,5	3,2	1,8	0 – 7	2,2 – 2,9
Therapy	6,3	7,0	1,5	0 – 7	6,0 – 6,6
Monitoring Blood Glucose	1,4	1,0	1,5	0 – 7	1,0 – 1,7
Foot Care	4,1	4,2	2,0	0 – 7	3,8 – 4,5

Note. SD = Standard Deviation

The total mean of self-management behaviors was 4.0 (SD =1,1). Following therapy was ranked the most likely performed (mean score 6,3; SD 1,5) while monitoring blood glucose was ranked the least self-care performed by patients (Table 1)

3.2. The relation between Age, Gender, Education, Socioeconomic, Knowledge, Duration of diabetes, Self-efficacy and self-management behaviors

TABLE 2: Analysis of the Relation between Age, Gender, Education, Socioeconomic, Knowledge, Duration of diabetes, Self-efficacy and self-management behaviors

Independent variable	Dependent variable	P-value
Age	Self -Management Behaviors	0,934
Gender	Self -Management Behaviors	0,195
Education	Self -Management Behaviors	0,654
Socioeconomic	Self -Management Behaviors	0,290
Knowledge	Self -Management Behaviors	0,008*
Duration of Diabetes	Self -Management Behaviors	0,004*
Self Efficacy	Self -Management Behaviors	0,000*

Note. *p-value < α 0,05

The table 2 showed a significant relationship between self-efficacy, duration of diabetes, and knowledge with diabetes self-management behavior. Furthermore, the results also showed no relationship between the confounding variables of age, gender, education, and socioeconomy with diabetes self-management behavior.

3.3. Predictors of Self-Management Behaviors

Multivariate analysis in this study was carried out to know the relationship between the independent variable (self-efficacy) and the dependent variable (diabetes self-management behavior) after being controlled by confounding variables (age, gender, education, socioeconomic, knowledge, and duration of diabetes). The statistical analysis used was multiple linear regression analyses because the dependent variable (diabetes self-management behavior) had a numerical scale. The steps taken in the multiple linear regression test include two phases, namely bivariate selection (candidate selection) and multivariate modeling steps.

3.3.1. Bivariate selection

Table 3 Bivariate Selection Results (Candidate Test) Independent Variables For Multiple Linear Regression Analysis

In multivariate analysis, before multivariate modeling is carried out, the bivariate selection is first carried out. Only variables that have *a P* value <0,25 are included

TABLE 3

No	Independent variable / *Confounding*	Bivariate test	*p* value
1.	Self-efficacy	Pearson correlation	0,001*
2.	Age (years)	Pearson correlation	0,934
3.	Gender	Independent t-test	0,195*
4.	Education	Anova	0,654
5.	Socioeconomic	Independent t-test	0,290
6.	Knowledge	Independen t-test	0,008*
7.	Duration of diabetes (years)	Spearman rank correlation	0,004*

Note. *Variables included in modeling (p-value < 0,25)

in the modeling. In Table 3, we can see the results of bivariate selection, there are four variables selected because they were matched with the criteria: self-efficacy, gender, knowledge, and duration of diabetes.

3.3.2. Multivariate Modeling

The final model shows that three factors contribute to self-management behavior of people with type 2 diabetes: self-efficacy, knowledge and diabetes duration, as shown in the table 4

TABLE 4: Final Modeling of Multivariate Analysis Relationship between Self Efficacy & Diabetes Self-Management Behavior After being Controlled by Confounding Variables

No	Variable	*Coefficients* B	The coefficient B is standardized	p-value	*R square* (R^2)
1.	Constant	1,300		0,178	0,248
2.	Self-efficacy	0,060	0,314	0,001	
3.	Knowledge	-0,657	-0,274	0,002	
4.	Duration of diabetes	0,042	0,237	0,007	

Based on the final modeling, the linear regression equation can be determined as follows:

Self -Management Behaviors = 1,300 + 0,060 Self efficacy − 0,657 Knowledge + 0,042 Duration of diabetes. The following is an interpretation of the formula: each increase of 1 self-efficacy score will increase self-management behavior by 0.060 days after being controlled by the knowledge and duration of diabetes; the self-management behavior of people with DM who have less knowledge will decrease by 0.657 days after controlling by the self-efficacy and the duration of diabetes; every additional one year of the duration of diabetes will increase self-management behavior by 0.042 days after controlling by self-efficacy and knowledge variables.

4. Discussion

Seeing from the age characteristics of the respondents studied, the average age of the respondents was 57.9 years, this is in line with the age of the respondents from other researchers. A study conducted by Wattanakul [1] showed that the respondents studied had an average age of 57.2 years, with the youngest being 30 years old and the oldest being 79 years old. Likewise, research conducted by Hunt et al. [4], namely the majority of respondents studied had an age between 51 to 70 years, for the ages of 31 - 40 years only slightly, then the number of respondents increased at the age of 41 - 60 years. It is indicated that at the age above 40 years, Type 2DM will emerge among people with high risk factors. Controlling modifiable risk factors which targeting young people might be necessary to prevent the development of T2DM [3, 20]

Analysis of the relationship between age and diabetes self-management behavior showed no association between age and self-management behavior of respondents. This is in line with Wattanakul's research results which also showed a P-value > 0.05, which means that there is no relationship between the two variables [1]. The results showed that most of the respondents were female, while the rest were male. These data indicate that type 2 diabetes is more common in women than men. The high incidence of type 2 diabetes mellitus in women can be related to obesity, where the majority of all people with type 2 diabetes are obese before being diagnosed [21].

Analysis of the relationship between gender and diabetes self-management behavior showed no significant association. That is, there is no difference in diabetes self-management behavior between men and women. The results of this study are in line with research conducted by Wattanakul [1]. According to the researcher's analysis, men and women have no differences in self-management if they both believe in diabetes self-management benefits. As stated by Bandura [15, 22] regarding the dimensions of self-efficacy: the generality dimension.

Analysis of the relationship between education and diabetes self-management behavior showed no significant relationship, which means no difference in diabetes self-management behavior between respondents with primary, secondary, or high educational backgrounds. This is in line with the results of Xu research that education does not directly affect self-management behavior, but involves knowledge first so that education about diabetes self-management is needed for people with type 2 diabetes [12].

Analysis of the socioeconomic relationship with diabetes self-management behavior showed no significant association. These results are not in line with the results of

research by Adwan and Najjar [23], where the diabetes self-management behavior can influence by socioeconomic. According to the researcher's analysis, the two variables are not related because not all aspects of self-management behavior require high costs, besides that currently, the costs of medical examinations (including blood sugar checks) and medication have been borne by the government through the public health insurance program, so socioeconomic problems not an obstacle anymore.

Analysis of the relationship between knowledge and diabetes self-management behavior showed a significant relationship. This study's results are in line with research conducted by Wattanakul [1], where the results showed a significant relationship between knowledge of diabetes and diabetes self-management behavior. Coates and Boore [12] explain that knowledge is an essential factor in diabetes management. Without knowing diabetes management, it is not enough to carry out a correct self-management behavior, as has been stated by WHO that a person's health behavior is determined among others by knowledge, perceptions, beliefs, and attitudes [24]. It is evident from the data in this study that respondents who have good knowledge of implementing diabetes self-management are better than respondents who have less knowledge. Therefore it can be concluded that knowledge is indeed related to diabetes self-management behavior, because knowledge about diabetes management is the basis or guide for people with diabetes to implement self-management behavior.

The analysis of the relationship between duration of diabetes and diabetes self-management behavior shows a significant relationship, which means that the longer the respondent has diabetes, the more diabetes self-management behavior increases. This study's results are in line with the results of Xu [12], which also showed a significant relationship between the length of time with diabetes and diabetes self-management behavior. Similar results are also shown by research by Adwan and Najjar [23]. A person who has had diabetes for a long time may have adapted better to his disease and would not be too resistant if he was advised to integrate healthy lifestyle changes.

Analysis of the relationship between self-efficacy and diabetes self-management behavior shows a significant relationship, which means that the higher the respondent's self-efficacy, the higher his self-management behavior. The results of this study are in line with research conducted by Hunt et al. [4]; Xu [12]; Wattanakul [1]; and Wilson [5], where the results showed a significant relationship between self-efficacy and diabetes self-management behavior. The results of this study also reinforce the opinion of Hunt et al. [4], which suggests that self-efficacy is predicted to increase self-management behavior in people with type 2 diabetes because someone who has low self-efficacy

tends to avoid being involved in specific tasks, while someone those with high self-efficacy tend to be stronger and more persistent in their efforts to achieve maximum performance.

The analysis showing the positive relationship between self-efficacy, knowledge, and duration of DM with diabetes self-management behavior. This means that the three variables (self-efficacy, knowledge, and duration of diabetes) play a role in explaining diabetes self-management behavior. Based on the line equation, respondents who can increase their self-efficacy every single unit of self-efficacy can increase their self-management behavior by 0.060 days after being controlled by the knowledge variable and duration of diabetes

The results of this study can be an input for nursing services, especially medical surgical nursing, regarding the main fa]ctors that support the implementation of diabetes self-management behavior in people with type 2 diabetes, namely self-efficacy, so that nurses can understand the importance of increasing the self-efficacy of people with DM in carrying out diabetes self-management by providing education, support, and motivation for diabetes self-management. This study's results are also inputting for educational institutions by adding special material to the learning curriculum about educational strategies and strategies to increase self-efficacy for people with diabetes. Also, it provides input or inspiration for other researchers to research the factors that influence the increase in the self-efficacy of people with type 2 DM.

5. Conclusion

There are three factors that influence the behavior of people with type 2 diabetes mellitus in implementing diabetes self-management, namely knowledge, duration of diabetes, and self-efficacy. The three of them play a role in increasing or decreasing the performance of their self-management behavior, such as knowledge, if people with diabetes have a good understanding of the importance of diabetes self-management, they will carry out diabetes self-care every day regularly. Then for the duration of diabetes, the longer the respondent has diabetes, the more his self-management behavior increases. This may be because someone who has had diabetes for a long time may have adapted better to the disease and not too resistant to being advised to adopt a healthy lifestyle. Meanwhile, the influence of self-efficacy on diabetes self-management behavior is that the higher the respondent's self-efficacy, the higher the self-management behavior because someone who has high self-efficacy tends to be stronger and more persistent in trying to achieve maximum performance. Thus

without having sufficient self-efficacy, people with DM will not be able to carry out self-management behavior effectively.

Recommendations that can be given include nurses who need to help improve people's self-efficacy with type 2 diabetes by providing education, support, and motivation. Educational institutions need to add learning curriculum materials about ways to carry out diabetes self-management education and strategies to increase people's self-efficacy with DM. Further research can be carried out, including research on the factors that affect people's self-efficacy with type 2 diabetes mellitus.

The limitations that the authors find in the implementation of this research are not many because researchers get a lot of support or assistance from various parties, only when the data collection process takes a long time because some respondents have limitations in seeing the writing so that researchers and assistants have to wait a long time or read out a questionnaire if Respondents find it difficult to read, but in the end the data collection process can be completed properly.

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Conflict of interest

There was no conflict of interest in the conduct of this research or the completion of the manuscript.

References

[1] Wattanakul, B. (2013). Factors Influencing Diabetes Self-Management Behaviors among Patients with T2DM in Rural Thailand. Retrieved from http://search.proquest.com/docview/1284417065

[2] Pradeepa, R. and Mohan, V. (2017). Prevalence of Type 2 Diabetes and its Complications in India and Economic Costs to the Nation. *European Journal of Clinical Nutrition*, vol. 71, issue 7, pp. 816–824.

[3] Black, J. M. and Hawks, J. H. (2014). *Medical Surgical Nursing: Clinical Management for Positive Outcomes*. Singapore: Elsevier Inc.

[4] Hunt, C. W., *et al*. (2012). Relationships among Self-Efficacy, Social Support, Social Problem Solving, and Self-Management in a Rural Sample Living with Type 2 Diabetes Mellitus. *Research and Theory for Nursing Practice*, vol. 26, issue 2, pp. 126–141.

[5] Wilson, B. A. T. (2012). Health Literacy and Self-efficacy as correlates of Self-Management of Type 2 Diabetes in Middle-Aged and Older Adults. Retrieved from http://search.proquest.com/docview/1095738477.

[6] Wong, L. C. K. (2009). Investigation into the Relationship Between Worry and Self-Efficacy and Self Management in an Asian Pacific Islander Population with Type 2 Diabetes. Retrieved from http://search.proquest.com/docview/304893377.

[7] Sarkar, U., Fisher, L. and Schillinger, D. (2006). Is Self-Efficacy Associated with Diabetes Self-Management across Race/Ethnicity and Health Literacy? *Diabetes Care*, vol. 29, issue 4, pp. 823-829.

[8] Caulfield, K. J. (2013). Relationships among Self-Efficacy, Health Beliefs and the Self-Management Behaviors of Healthy Eating and Physical Activity among Adults with Type 2 Diabetes. Retrieved from http://search.proquest.com/docview/1284928314.

[9] Kusniawati. (2011). Analisis Faktor-Faktor Yang Berkontribusi Terhadap self care Diabetes Pada Klien Diabetes Melitus Tipe 2 Di Rumah Sakit Umum Tangerang. Depok: Universitas Indonesia.

[10] Dharma, K. K. (2011). *Metodologi Penelitian Keperawatan: Panduan Melaksanakan Dan Menerapkan Hasil Penelitian*. Jakarta: Trans Info Media.

[11] Sastroasmoro, S. and Ismael, S. (2011). *Dasar-Dasar Metodologi Penelitian Klinis* (4th ed.). Jakarta: CV Sagung Seto.

[12] Xu, Y. (2005). Understanding the Factors Influencing Diabetes Self-management in Chinese People with Type 2 Diabetes Using Structural Equation Modeling. Retrieved from http://search.proquest.com/docview/305004492

[13] Sturt, J., Hearnshaw, H. and Wakelin, M. (2010). Validity and reliability of the DMSES UK: A Measure of Self-efficacy for Type 2 diabetes. *Primary Health Care Research & Development*, issue 11, pp. 374–381, https://doi.org/10.1017/S1463423610000101.

[14] Diane, K., *et al*. (2010). Self-Efficacy, Problem Solving, and Social-Environmental Support are Associated with Diabetes Self-management Behaviors. *Diabetes Care*, vol. 33, issue 4, pp 751-753.

[15] Hanna, H. (2006). The Influence of Self-Efficacy and Spirituality on Self Care Behaviors and Glycemic Control in Older African Americans with Type 2 Diabetes. Retrieved from http://search.proquest.com/docview/304925169.

[16] Toobert, D. J., Hampson, S. H. and Glasgow, R. E. (2000). The Summary of Diabetes Self-Care Activities Measure: Results from 7 Studies and a Revised Scale. *Diabetes Care*, vol. 23, issue 7, pp. 943-50.

[17] Hastono, S. (2007). *Analisis Data Kesehatan*. Depok: FKM-UI

[18] Dahlan, S. M. (2012). *Regresi Linier: disertai praktek dengan SPSS*. Jakarta: PT. Epidemiologi Indonesia.

[19] Polit, D. F. and Beck, C. T. (2006). *Essentials of Nursing Research: Methods, Appraisal, and Utilization*. Philippine: Lippincott. W.

[20] Smeltzer, S.C. and Bare, B. (2008). *Brunner's and Suddarth's Textbook of Medical Surgical Nursing*. Philippine: Lippincott. W.

[21] Price, S. A. and Wilson, L. M. (2006). *Patofisiologi: Konsep Klinis Proses-Proses Penyakit*. Jakarta: EGC.

[22] Bandura, A. (1977). Self-Efficacy: Toward a Unifying Theory of Behavioral Change. *Psychological Review*. Vol. 84, issue 2, pp. 191–215.

[23] Adwan, M. A. and Najjar, Y. W. (2013). The Relationship between Demographic Variables and Diabetes Self-Management in Diabetic Patients in Amman City/Jordan. *Global Journal of Health Science*, vol. 5, issue 2, pp. 213–221.

[24] Notoatmodjo, S. (2010). *Ilmu Perilaku Kesehatan*. Jakarta: Rineka Cipta.