The Model of Self Care Behaviour and the Relationship with Quality Of Life, Metabolic Control and Lipid Control of Type 2 Diabetes Mellitus Patients in Binjai City, Indonesia

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Abstract

BACKGROUND: Diabetes is a type of chronic disease with exceptional medical care for a patient's lifetime, which ultimately requires lifestyle and behavioural adjustments to prevent complications to death. Patients with good self-care behaviour will cause diabetes to be controlled to avoid complications to death and make patients have a better quality of life.

AIM: This study aims (1) to determine the model of self-care behaviour in Type 2 diabetes patients in Binjai City (2) to analyse the effect of self-care behaviour on quality of life, metabolic control and lipid control of Type 2 diabetes patients in Binjai City.

METHODS: This type of research is survey-based and explanatory using a cross-sectional approach. The study population was Type 2 Diabetes Mellitus (T2DM) patients who remained patients in 8 primary health centres in Binjai City. The consecutive sampling yielded a sample size of 115 people. Data analysis method uses descriptive statistics and Structural Equation Modeling (SEM) using SPSS and Amos 16.0.

RESULTS: The results showed that all factors that build T2DM patient self-care behaviour were able to be predictors that shape the patient's self-care behaviour. The self-care behaviour model consists of knowledge, attitudes, communication, financing, family support, motivation, and self-efficacy. Motivation is the most significant predictor of its contribution to the self-care behaviour of Type 2 diabetes patients. Self-care behaviour was also known to be significantly related to the quality of life, metabolic control and lipid control of T2DM patients (p < 0.05).

CONCLUSION: Self-care behaviour in T2DM patients can have a substantial and significant impact on quality of life, metabolic control and lipid control possessed by Type 2 Diabetes patients.

Introduction

Population in Indonesia will be dominated by people with diabetes, which is predicted to increase continues to increase from 8.4 million patients in 2000 to 21.3 million in 2030 [1]. Indonesia is also the seventh-ranked country with 8.5 million diabetes patients after China, India and the United States, Brazil, Russia, Mexico [2]. Even today Indonesia's position has moved up, from the seventh rank to fifth as a country with the world's most significant number of people with diabetes. The prevalence of diabetics in North Sumatra in 2013 was 1.8% higher than the national rate, and the results of the previous Indonesian Basic Health Research were 0.8% and 2.3%, the prevalence of diabetes diagnosed by doctors based on symptom interviews was also higher than the national figure (2.1%) [3].

American Association of Diabetes (ADA) states diabetic patients in desperate need of behavioural self-care to care for them to improve their

quality of life and reduce the complications of diabetes [4]. Self-care is the ability of the patient with the family, and the community to promote health, prevent illness, maintain health, and deal with disease and disability with or without the help of health care providers [5]. There are 98% of diabetes care is self-care behaviour [6]. There are 7 main behaviors in self-care, namely: healthy eating (healthy diet), being active (adequate physical activity), monitoring (blood sugar control), taking medicine (consumption of anti-diabetic or insulin drugs, problem solving (problem-solving), healthy coping (healthy coping) and reducing risk (reducing risk) [7].

All of these self-care activities are positively related to the control of the patient's blood sugar levels, reducing complications and improving the quality of life of diabetic patients. Based on several studies it is known that the factors that influence the level of self-care are categorized (1) elements derived from the patient's self, namely knowledge, attitudes, beliefs, concern for their health, low adherence, social, economic, demographic and cultural support (2) factors come from doctors, namely: effective doctor-patient communication, less pleasant doctor-patient relationships, less knowledge about diabetes (3) factors related to healthcare facilities, namely: access to health services, health financing expensive, uneven distribution of health workers [8].

The quality of life of patients with T2DM is influenced by age, gender, social demography, complications, duration of illness, BGL control, psychosocial factors (social support), and therapeutic regimens [9]. Assessment of the quality of life of patients with type 2 diabetes mellitus, using instruments that have been developed, namely the WHOQOL-BREF questionnaire. Besides, the quality assessment uses an examination of the patient's laboratory results by looking at parameters such as HbA1C and fat profile as an indicator that diabetes has been well controlled, to improve the quality of life of people with diabetes [10].

The city of Binjai has now become a city with the rapid economic growth of its population and has an impact on changes in people's lifestyles, as evidenced by increasing the number of Type 2 Diabetes Mellitus patients every year [11]. There have been eight primary health centres in the city of Binjai in recent years, experiencing an increase in the number of people with type 2 diabetes. Data in 2015 states that Type 2 diabetes is ranked as the 10th most disease with 712 cases, while data in 2016 indicates that diabetes has an increase in rank. Seventh with the highest number of illnesses with 1,419 cases [12]. This is in line with the research conducted by [13] in one of the most prominent modern shopping centers (malls) in Binjai city, which shows that out of 1,554 visitors who participated in this study there were 1,238 people (79.7%) who were obese and at risk of developing metabolic disorders such as Type 2 diabetes mellitus. Therefore this condition describes the health of the Binjai community which is related to consumption patterns, eating habits which resulted in an increased prevalence of obesity and diabetes.

This study aims to design a self-care behaviour model for T2DM patients and analyse the effect of the self-care behaviour model on quality of life, metabolic control, and lipid control of T2DM patients in Binjai city. This model is expected to be a reference to improve diabetes patient's self-care behaviour, especially at the level of primary care, and become input to the health services to find out and fulfil the indicators of self-care behaviour so that all diabetic patients have good self-care behaviour.

Methods

This research is analytical research using a cross-sectional approach, consists of 2 steps, i.e. (1) designing a model of self-care behaviour; and (2) analyze the influence of self-care behavior model that has been formulated by research results by the quality of life (QoL) and metabolic control (BGL and HbA1C) and lipid control (total cholesterol, HDL cholesterol, LDL cholesterol, and triglycerides) of T2DM patients. The research was conducted in eight main Primary Health Center (PHC) in Binjai for one month. The study population consists of T2DM patients WHO routinely receive treatment at eight main Primary health centre in Binjai. They are specified based on the following criteria: (1) diabetic patients recorded on eight PHC in Binjai, (2) the patient come themselves without the help of others (3) patients aged 40-65 years, (4) patients are willing and committed to participate in the research. However, there was exceptions, (1) diabetes in pregnant women (2) patients with complications and interfere with physical activity, mental and emotional (3) patients can't work well together for the research. (1) Diabetic patients recorded on eight PHC in Binjai (aged 40-65 years) and had attended diabetes service programs regularly, and (2) patients are willing and committed to participate in the research. However, there were exceptions, (1) diabetes in pregnant women, and (2) patients with complications and interfere with physical activity, mental and emotional (from anamneses and medical record). The technique of sampling with continuous sampling, with the number of samples of research, is the 115 people. The technique of sampling with continuous sampling, with the number of samples of research, is the 115 people. Before the research study, the research study protocol was approved by the Research Ethics Committee of the Faculty of Medicine, Universitas Sumatera Utara, and all patients participated voluntarily and signed the informed consent.

The primary data was collected through interviews and direct blood tests. The formation of a

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self-care behaviour model uses a questionnaire containing seven aspects of self-care forming that have been designed beforehand and have been tested for their validity and reliability. Laboratory tests include glycemic control and lipid control. The glycemic control was consisting of BGL and HbA1C by taking venous blood and examined with a Colorimeter + Full Spectrophotometer Automatic method and HbA1 examination using Doronad affinity + Modified HPLC method examination. Assessment of lipid control (total cholesterol, HDL cholesterol, LDL cholesterol, and triglycerides) was carried out by direct examination of venous blood (after 10 hours fasting) and then examined using the full automatic colourimeter + full-colour spectrophotometer method using a Pentra 400 device.

The technique of data analysis was descriptive statistics analysis and Structural Equation Models (SEM) with Software of SPSS and Amos. The researchers get Ethical Clearance from The Commission On The Ethics Of Health Research Faculty Of Medicine, Universitas Sumatera Utara and research is funded entirely by the researchers and not burdening the respondent.

Results

Binjai City has eight main PHC located in five sub-districts, namely: Binjai Estate PHC, Rambung PHC, Binjai Kota PHC, Tanah Tinggi PHC, Kebun Lada PHC, Jati Makmur PHC, H.A.H. Hasan PHC, and Bandar Senembah PHC. The characteristics of the studied T2DM patients in Binjai City are summarised in Table 1 below.

Table 1: Basic Characteristics of Diabetes Melitus Type 2 patients in Binjai City (n = 115)

Characteristics	Frequency (person)	Percentage (%)
Age Group		
Early adolescent (26-35 years old))	3	2,6
Late adolescent (36-45 years old)	9	7,8
Early Elderly (46-55 years old)	39	33,9
End Elderly (56-65 years old)	64	55,7
Gender		
Man	30	26,1
Woman	85	73,9
Level of education		
Illiterate	7	6,0
Primary	22	19,0
Secondary	28	24,3
High school	37	32,1
Graduate school	26	22,6
Occupation		
Haphazard workers	58	50,4
Laborers	4	3,4
Farmers	5	3,5
Private workers	9	7,8
Government workers	20	17,4
Others	19	16,5
Monthly Income		
Below Regional Income Rate	58	50,4
Within Regional Income Rate	36	31,3
Above Regional Income Rate	21	18,3
Marital Status		
Married	89	77,4
Single/Divorced	26	22,6
Ethnic		
Javanese	51	44,4
Bataknese	9	7,8
Melayunese	11	9,6
Padangnese	10	8,7
Banjarnese	3	2,6
Karonese	8	6,9
Others	23	20

Table 1 shows the basic characteristics of the study population. As presented in Table 1, a total of 115 participants with diabetes type 2 participated in the study. The majority were over 56-65 years old (55.7%), female (73.9%) and married (77.4%), high school graduate (32.1%), haphazard workers (50.4%), and with ethnic of Javanese ethnicity (44.4%).

Self-care characteristics and Self-care Forming Dimension of Type 2 Diabetes Mellitus Patients in Binjai City

Seven indicators form the dimension of self-care behaviour with 28 questions. The seven forming indicators are then categorised into two, namely good and poor (Table 2)

Table 2: Distribution of Self Care Behavior Dimensions of Diabetes patient

Dimensions Self-Care Behavior	Good		Poor	
	n	%	N	%
Knowledge	63	55	52	45
Attitude	67	58	48	42
Communication	58	50	57	50
Financing	62	54	53	46
Family Support	78	68	37	32
Motivation	82	71	33	29
Self-efficacy	58	50	56	49

According to Table 2, the best dimension of self-care is the dimension of patient motivation in treatment (71%), while the small aspect is self-efficacy and communication (50%).

The level of Quality of Life and Dimensions of Quality of Life for Type 2 Diabetes Mellitus Patients in Binjai City

The Quality of life assessments was made using the World Health Organization Quality of Life (WHOQoL questionnaire, which assesses quality that consists of the physical health domain, psychological domain, and social health domain (Table 3).

Table 3: Distribution of Quality Life of Diabetes Patients

Quality of Life	Frequency (person)	Percentage (%)
Good	4	3,5
Enough	110	95,7
Poor	1	0,9

Table 3 shows the majority of T2DM patients in Binjai City have enough/sufficient quality of life that there are 110 people (95.7%), and only one person (0.9%) who have a poor quality of life. The World Health Organisation Quality of Life assesses the quality of life based on four domains, namely the quality of life of diabetic patients in an adequate category, as many as 88 people (76.5%) for the physical area, as many as 63 people (54.8%) for the psychological domain, as many as 97 people (84, 3%) for the social field and 79 people (68.7%) for the environmental area.

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Metabolic Control of Type 2 DM Patients in Binjai City

The metabolic controls examined in this study included BGL random (momentary), HbA1C levels and examination of fat profiles (Total Cholesterol, HDL Cholesterol, LDL Cholesterol, and Triglycerides).

Table 4: Distribution of Metabolic Control Parameters for Diabetes Patients

Control of Metabolic	Mean	SD	Value Minimum	Value Maximum
BGL (mg/dL)	267.5	103.2	95.0	600.0
HbA1C (%)	9.9	2.3	4.9	15.5
Total Cholesterol (mg/dL)	219.5	42.8	115.0	385.0
LDL Cholesterol (mg/dL)	132.5	37.4	53.0	257.0
HDL Cholesterol (mg/dL)	45.7	12.4	25.0	91.0
Triglyceride (mg/dL)	207.6	113.9	54.0	753.0

Table 4 shows the average value of BGL is 267.5 mg/dL, HbA1C is 9.9%, Total Cholesterol is 219.5 mg/dL (hypercholesterolemia), LDL: 132.5 mg/dL HDL: 45.7 mg/dL TG: 207.6 mg/dL.

From the results of the data above, then a self-care behaviour model is formulated by the available data.

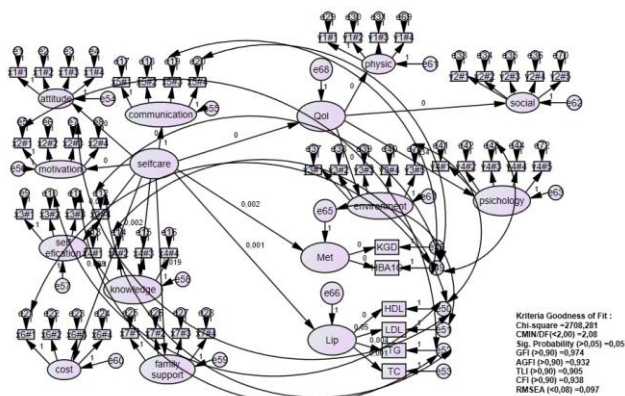The analysis scheme for this research model can be seen in Figure 1 below:

Figure 1: Full Model Research Analysis

Based on Figure 1, an explanation is obtained for the feasibility test of the following models, namely:

Table 5: Feasibility Testing Index for SEM Models

The goodness of Fit Index	Cut-off Value	Result of Analysis	Model Evaluation Analysis
χ2 - Chi-square	Diharapkan kecil	1301	Marginal
Probability	≥ 0,05	0.001	Marginal
RMSEA	≤ 0,08	0,097	Marginal
GFI	≥ 0,90	0,974	Good
AGFI	≥ 0,90	0,932	Good
TLI	≥ 0,90	0,905	Good
CFI	≥ 0,90	0,938	Good

From Table 5, it is known that this research has been included in the fit or feasible category so that it is continued in the next analysis to test the research hypothesis. The test results to find out the truth of the hypothesis are the following:

Table 6: Regression Weight Test Results

Relationship Between Variables			Est.	P	Information	Hypothesis
Self-care	→	Quality of life (Qol)	0,879	0,000	Significant	Ha = Accepted
Self-care	←	Communication	0,976	0,000	Significant	Ha = Accepted
Self-care	←	Attitude	0,150	0,000	Significant	Ha = Accepted
Self-care	←	Motivation	1,013	0,000	Significant	Ha = Accepted
Self-care	←	Self-efficacy	0,974	0,003	Significant	Ha = Accepted
Self-care	←	Knowledge	0,961	0,002	Significant	Ha = Accepted
Self-care	←	Financing	0,182	0,009	Significant	Ha = Accepted
Self-care	←	Family support	0,041	0,019	Significant	Ha = Accepted
Self-care	→	Metabolic control	0,413	0,002	Significant	Ha = Accepted
Self-care	→	Lipid control	0,301	0,001	Significant	Ha = Accepted

The results suggest that:

1. Self-care has seven factors capable of measuring or forming a self-care variable for a patient with Type 2 diabetes in Binjai City.

2. The self-care variable has a positive and significant effect on quality of life with a p-value (0.0001), and the magnitude of the effect is 0.879 (87.9%).

3. All domains of quality of life factors have a significant impact on changes in the quality of life of patients suffering from Type 2 diabetes mellitus in Binjai City.

4. The self-care variable has a positive effect and significant to metabolic variables with a p-value (0.002), and the magnitude of the effect is 0.413 (41.3%).

5. The Blood Glucose level and HbA1C have a significant role in the metabolic control of patients with a significance value of BGL (p = 0.0001), and the amount of the estimated effect on the patient's metabolic control is 0.842. Whereas HbA1c had a significant role or impact on the metabolic control of patients with a significance value of HbA1c (p = 0.0001) and the estimated value of its effect on the patient's metabolic control was 0.788.

Discussion

Actions in self-care diabetes are the same as self-management that must be carried out and become a responsibility during the patient's life [14]. Self-care is done to control blood sugar levels and control diabetes to treat and prevent complications [15].

Researchers succeeded in directing T2DM patients in Binjai City to form self-care behaviours namely: knowledge, attitude, communication,

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financing, family/social support, motivation, and self-efficacy. The average self-care behaviour of T2DM patients in Binjai City is 359.8 (SD 29.5). From these results, it is known that self-care behavior of Type 2 DM patients in Binjai City can be categorized as good (66.4%). Good self-care behavior in Type 2 DM patients can be seen from the seven forming indicators of self-care behaviors that have been formulated at the beginning of the study, in general, are in a proper category. The quality of life of diabetic patients in Binjai City is in the sufficient category (95.7%). Based on the four domains, all domains are in an adequate category.

The result of this study shows that only a few T2DM patients experience deterioration in the quality of life due to DM. This may be due to good self-care behaviour and low rates of complications in diabetic patients. Psychological domains and environmental domains are domains that have a better quality of life than other domains that are 44.3% for psychological and 31.3% for the environment. The psychological domain of diabetic patients in Binjai City is known to be better than domains because there are powerful family and religious support. This relates to research that states family support related to the psychological health of patients is better for the disease [16]. However, keep in mind the patient's perception of the quality of life is different in each country [17] [18].

The results also showed that there was a significant relationship between self-care behavior with HbA1C levels and BGL of Type 2 DM patients in Binjai City where the better the self-care behavior, the more controlled HbA1c levels of diabetic patients [9] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21]. HbA1C is the best indicator for the risk of future complications so that the HbA1C examination is better than fasting blood sugar examination. The higher the HbA1C value, the higher the patient is at risk for complications. Every 1% reduction in HbA1C levels can reduce the risk of microvascular vascular disorders by 35%, reduce other complications by 21% and reduce the risk of death by 21%. This research is supported by the opinion that there is a significant effect between the level of self-care with HbA1C levels in patients who came to Hasan Sadikin General Hospital Bandung Endocrine polyclinic [22]. It is even known that there is a relationship between self-care, self-efficacy, and social support with HbA1C levels at the Public Health Centers in Boyolali in Java Province [19] [23] [24]. Patients with appropriate lifestyle strategies and self-care are critical elements in the prevention of diabetes. Cause more severe complications [25]. Healthy behaviour leads to better treatment adherence than patients who carry out therapy [26]. Control measures for DM are essential, primarily by trying to get the blood sugar level as close to normal as possible, is one of the best prevention efforts against the possibility of developing complications in the long term. The criteria for stating good control include: no or minimal glucosuria, no ketonuria, no ketoacidosis, rarely occurs. Hypoglycemia, normal pp glucose, and normal HbA1c (glycated haemoglobin or glycosylated haemoglobin). HbA1c examination results are a very accurate single examination to assess long-term glycemic status and are useful for all types of people with diabetes, especially patients in Binjai City.

Fat profiles are also known to be one of the parameters assessed as glycemic control of diabetic patients. The results of the analysis stated that there was an influence between self-care behaviour and fat profile of Type 2 DM patients in Binjai City. In uncontrolled Type 2 DM, triglyceride and chylomicron levels and plasma FFA increase due to decreased transport of triglycerides into fat depots. The decrease in lipoprotein lipase activity also plays a role in this decrease in traffic [23]. Based on the above concept, it is known that the tendency to increase the big profile in diabetic patients [27] [28] [29].

Self-care can affect the quality of life of diabetic patients where there is a feeling of satisfaction and happiness to live their daily lives as they should. Some aspects of diabetes that affect the quality of life is the existence of special needs that are sustainable in the treatment of DM, such as diet regulation, limitation of physical activity, controlling blood sugar levels, any symptoms that may arise when blood sugar levels are unstable, complications that can occur as a result of diabetes and sexual dysfunction. All patients who have chronic diseases are involved in behaviours that influence their decisions and health, namely disease control and the results depend on the significant degree of self-management effectiveness.

In conclusion, self-care behaviour has a positive and significant effect on quality of life, metabolic levels and lipid control in Type 2 DM patients in Binjai City. The results of this study are input to all primary services to improve aspects improve diabetes patient self-care behaviour in Binjai City and throughout Indonesia. Patients need education and enhance the role of families to support Type 2 DM patients in Binjai City, especially in controlling periodic metabolic and lipid control.

Acknowledgements

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