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Validity and Reliability of an Instrument for Assessing Self-Care Behaviours in Diabetes Mellitus Type 2 Patients in Binjai City, Indonesia

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Abstract

BACKGROUND: Self-care behaviour becomes very important for diabetic patients; good self-care behaviour will prevent complications and improving the quality of life.

AIM: The aim of this study was to provide a preliminary assessment of the validity and reliability of a new measure of self-care behaviour of Diabetes Mellitus Type 2.

METHODS: The research was a cross-sectional study. The study population was T2DM patients from Primary Health Centers (PHC) in Binjai City, Indonesia. Sample determination using a single simple formula for the hypothesis of one population with calculation is 115 patients; sampling was done by convenience sampling with inclusion and exclusion criteria. Research questionnaire Self-care behaviour of T2DM patients was forming by knowledge, attitudes, communication, family support, financing, motivation, and self-efficacy. Each of the predictors forms self-care behaviour and finally, the instrument consists of 28 questions. The data analysis techniques were Confirmatory Factor Analysis (CFA) tests with Structural Equation Models (SEM) with AMOS aids.

RESULTS: Based on the results of the confirmatory analysis proved that the instrument is valid and reliable, the measure the self-care behaviour of T2DM.

CONCLUSION: The new instrument for assessing self-care behaviour of T2DM patients is valid and reliable, besides being able to assess self-care behaviour, they can also know the components that make up self-care.

Introduction

The prevalence of diabetes in Indonesia that has been diagnosed by doctors is 1.4%; this number is expected to continue to increase [1]. The prevalence of diabetes in Indonesia based on the Indonesia Health Profile 2013 was 2.1%. This figure is higher than in 2007 (1.1%). A total of 31 provinces (93.9%) showed a significant increase in the prevalence of diabetes. The highest prevalence of diabetes at the age of > 15 years according to the doctor's diagnosis or based on symptoms was in Central Sulawesi Province (3.7%) [1]. Diabetes is a type of chronic disease that requires medical treatment and changes in the lifestyle of patients throughout life to prevent complications and affect death [2]. Changes in lifestyle are related to diabetes management for behavioural changes including physical activity, changes in diet, monitoring of blood glucose levels, and adherence to treatment to achieve a better quality of life in patients with Type 2 diabetes. This quality of life has associated with self-care behaviour. self-management education in helping patients manage their health conditions. People with diabetes desperately need the application of self-care behaviour to improve their quality of life while reducing complications related to their disease conditions [3].

Diabetes self-care is an action taken by individuals to control diabetes which includes.

Treatment measures and prevention of complications [4]. Self-care is the ability of individuals, families, and with the patient, community to prioritise health to prevent disease, deal with diseases and overcome disability using or not using health services [5]. This self-care behaviour is related to controlling blood sugar, planning a diet, physical activity of the patient, using drugs or insulin [2], [6]. There are 7 main self-care behaviors, namely: healthy eating (healthy diet), being active (adequate physical activity), monitoring (blood sugar level control), taking medicine (consumption of anti-diabetic drugs or insulin), problem solving (problem-solving), healthy coping (healthy coping) and reducing risk (reducing risk). The implementation of these seven behaviours has a positive correlation with controlled blood sugar levels, reducing complications and improving the quality of life of diabetic patients [7].

The results of a review of several studies revealed that several factors could affect the level of self-care can be categorized as 1) Factors are originating from patients, namely: knowledge, attitudes, beliefs, health literacy, low adherence, social, economic, demographic and cultural support; 2) Factors originating from the doctor, namely: effective doctor-patient communication, unpleasant doctor-patient relationship, lack of doctor's knowledge about diabetes; and 3) Factors related to health care facilities, namely: access to health services, expensive health financing, uneven distribution of health workers [8].

Some instruments already exist and are used for the assessment of self-care, but the instrument only measures without describing what components form self-care behaviour. This study will eventually produce an instrument that can assess the self-care behaviour of T2DM and also illustrates its forming factors, with this instrument, in the end, it will be able to provide input to the health services mainly primary health services to be able to provide these factors so that all patients diabetes has good self-care behaviour. The study aims to provide a preliminary assessment of the validity and reliability of a new measure of self-care behaviour of Type 2 DM and to determine factors as predictors of the self-care behaviour of Type 2 DM patients.

Methods

This research is descriptive with a cross-sectional approach.

Study Population and Sampling

The population of the study was patients with type 2 Diabetes mellitus from eight primary health centres in Binjai City. The study was conducted in the Binjai city, which is the closest small town to Medan City (the provincial capital). Based on health data in eight primary health centres, it is known that diabetes is one of the ten most diseases suffered by the people of Binjai and has an increasing prevalence every year. The determination of the sample size in this study uses a single simple formula for the hypothesis of the proportion of a population so that the sample size is 115 people.

Sampling is done by convenience sampling, which is a non-random method where samples are chosen based on the research criteria. The research criteria, namely: 1) patients who came to primary health care as routine treatment patients at the health centre; 2) patients were independent because they came for treatment without help from others; 3) had aged 40-65 years; 4) voluntarily want to be a research respondent; 5) not women who are pregnant or breastfeeding; 6) do not have complications that interfere physically, mentally and emotionally; and 7) can be invited to work together during observations or surveys.

The use of Structural Equation Model (SEM) requires a large sample size so that the results obtained have sufficient credibility (trustworthy results), Considering this, in general, the sample size needed for SEM models with significant latent variables up to 5 pieces, and 3 or more indicators explain each latent variable, it requires a sample of 100-150 data. In this study, 115 samples were considered representative of SEM analysis.

Study Tool

Based on the results of previous studies [8], self-care behaviour of Type 2 DM patients was forming by knowledge, attitudes, communication, family support, financing, motivation, and self-efficacy. Each predictor that forms self-care behaviour consists of 7 indicators given two questions in each predictor to be given to respondents so that the total becomes 28 questions. The self-care dimension categorised into two good self-care groups with poor self-care behaviour. Determination of the category is good if the total score of each self-care forming indicator is higher than the average score of each domain (normally distributed data), and the determination of the category is less if the total score of each domain is less than the average value of each domain.

Ethical Consideration

This research has received ethical approval with No: 630/TGL/KEPK FK USU-RSUP HAM/2016 from the Universitas Sumatera Utara Medical Faculty Health Research Ethics Commission, Indonesia. This research was also carried out without burdening patients or other parties. The information obtained is

entirely the support of surveys or interviews for research respondents who were voluntarily involved in this study and will be used only for research purposes.

Statistical Analysis

In this study will be carried out: 1) test the construct validity using confirmatory factor analysis and 2) perform a correlation test on each factor that measures the self-care behaviour of patients with Type 2 diabetes in Binjai City, Indonesia. The data obtained from the research are using confirmatory factor analysis (SEM). Data analysis using AMOS software.

Results

Characteristics of the Study Population

The survey results show data from research samples taken from eight primary health centres in Binjai City, described into several criteria, namely (1) age (2) sex (3) occupation (4) education (5) income (6) marital status. For more details, see Table 1 below:

Table 1: Basic Characteristics of Diabetes Mellitus Type 2 patients in Binjai City

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
Marital Status		
Married	89	77.4
Single / Divorced	26	22.6

The Table 1 shows the majority of patients who have Type 2 diabetes are the elderly group (age 56-65 years) about 55.7%, female (74%), married (77.4%), high school graduate (32.1%), haphazard workers (50.4%), and with ethnic Jawa (44.4%).

Self-care Characteristics and Self-care Forming Dimensions of Type 2 DM patients in Binjai City

Self-care behaviour of Type 2 DM patients was forming by knowledge, attitudes, communication, family support, financing, motivation, and self-efficacy. The following is the analysis of the self-care behaviour category of Type 2 DM patients in Binjai City.

Table 2: Results of Patient Self-care Behavior Analysis

The dimension of Self-care Behavior	Good		Less Good	
	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

Data in Table 2 prove that overall self-care behaviour of patients with type 2 diabetes mellitus in Binjai city is in a good category. Patients who have known themselves with diabetes and are included in Type 2 DM are beginning to realize the importance of maintaining a healthy body, maintaining the intake of food and drinks that enter the body so that they begin to routinely maintain sugar levels and fat levels in the blood and start routine many enjoyable activities for body metabolism.

Besides that, the best dimension of self-care is the patient's motivation to recover (71%). Patients are highly motivated to seek treatment and fulfil the doctor's advice in maintaining blood sugar and fat levels so that they can avoid long-term complications. The dimensions of family support are also the factors that have the most significant role in self-care behaviour (68%), meaning that families can help patients to maintain their health and support patients to change their lifestyle to be better and healthier, but the dimensions that have the least role in patient self-care behaviour Type 2 diabetes is self-efficacy and communication is 50%. It shows the patient is still trying to believe that he can heal to be able to care for himself better, and this also affects the quality of patient communication with other people so that patients will tend to be more sensitive and emotional.

Table 3: The goodness of Fit Index Cut-off Value Result of Model Evaluation Analysis

The goodness of Fit Index	Cut-off Value	Result of Analysis	Evaluation of The Model
χ2 - Chi-square	Expected small	10.620	Good Fit
Probability	≥ 0.05	0.031	Marginal Fit
RMSEA	≤ 0.08	0.066	Good fit
GFI	≥ 0.90	0.993	Good fit
AGFI	≥ 0.90	0.938	Good fit
TLI	≥ 0.90	0.840	Marginal Fit
CFI	≥ 0.90	0.977	Good fit

The data in Table 3 shows that this research model is appropriate and acceptable because it meets the specified Goodness of Fit Model Index Table criteria. Therefore, all predictors that measure self-care behaviour in this study can be accepted and assessed as a fit model, so that the construct validity of self-care behaviour tests for Type 2 DM patients in Binjai City is proven to be true in all factors that measure the patient's self-care variables. Then test the significance of each relationship between factors that measure or between predictors and the measured self-care behaviour variables. The level of significance shown in the following Table 4.

Table 4: Regression Weight on Predictor Factor Test Self-care

Variable			Estimate	P	Hypothesis
Communication	<--	SC	0.916	0.000	Valid and Reliable
Knowledge	<--	SC	0.876	0.036	Valid and Reliable
Self-Efficacy	<---	SC	0.964	0.0001	Valid and Reliable
Motivation	<---	SC	1.056	0.0001	Valid and Reliable
Attitude	<---	SC	0.813	0.0001	Valid and Reliable
Financing	<---	SC	0.330	0.041	Valid and Reliable
Family Support	<---	SC	0.320	0.003	Valid and Reliable

Discussion

All factors that are predictors that measure the self-care variables of DM Type 2 patients are known to be able to build the patient's self-care behaviour. The existence of motivation, family support, knowledge, self-efficacy, adequate communication, and financing will be able to shape self-care behaviour in patients with Type 2 DM. All of these predictors can help patients develop self-awareness to take care of themselves and their health so that they can control their blood sugar and fat levels and prevent complications that can interfere with the physical, mental, psychological and emotional condition of patients. Self-care of diabetic patients is a patient's action to treat and prevent complications [4], [9]. Self-care is the ability of individuals, families, and communities to promote health, prevent disease, maintain health, deal with diseases and disabilities with or without the help of health care providers [5], [10].

There are seven factors that play a role as a predictor of the self-care behavior of Type 2 DM patients in Binjai City, namely (1) knowledge (2) motivation (3) self-efficacy (4) communication (5) financing (6) attitude and (7) family support, proven the truth of the construct validity and statistically significant as a predictor for the self-care behavior of patients with Type 2 DM in Binjai City.

Knowledge contributes to shaping the self-care behaviour of Type 2 DM patient's Knowledge, in this case, the knowledge of people with diabetes about the disease and matters related to treatment and prevention is very decisive for the patient's independent behaviour. Research conducted in Nyatnyono Village, West Ungaran District, Semarang City Regency showed a significant relationship between the level of knowledge about diabetes and the lifestyle of diabetics [11]. Research conducted on patients in South India proves that patients who are given by education or counselling about diabetes can improve knowledge, attitudes and change the actions of patients to be more positive and have an impact on improving the quality of life of patients [12], [13]. Good knowledge and understanding of the disease will help patients accept their conditions and try to recover and live a healthy life [14].

Diabetic patients need to get minimal information given after diagnosis is established, including basic knowledge of diabetes, independent monitoring, causes of high blood glucose levels, oral hypoglycemic drugs, meal planning, care, physical activity, signs of hypoglycemia and complications. Diabetic patients who have enough knowledge about diabetes, then change their behaviour, so they will be able to control the condition of the disease and people with diabetes can live better quality. Knowledge of controlling blood sugar levels is the most important and knowledge of how to manage emotions so that patients do not become depressed because of the illness and treatment they are carrying out. Increased depression will impact on an increase in blood sugar levels, so doctors need to detect the level of depression of the patient early and give him an education in dealing with it which will help improve the patient's health and prevent complications [15].

Attitudes contribute to shaping self-care behaviour. The proper attitude of diabetic patients in Binjai as an impact from good knowledge about diabetes which results in a positive attitude. Excellent knowledge and attitude will produce good behaviour or actions because attitude can be said to be willing to act, and vice versa [16].

Based on the results of the analysis, doctor-patient communication contributes to forming self-care behaviour [17]. There is a significant relationship between the communication of health workers with self-care behaviour. The smoother the communication carried out, the better the self-care behaviour of diabetic patients [18]. Communication is an essential factor and the key to successful treatment of chronic patients such as diabetes. Excellent and effective communication between doctors/health workers with diabetic patients into positive energy, motivation and encouraging patients who will improve their health [14]. Communication training between doctors and patients in primary services shows training can improve the doctor's relationship with patients, resulting in satisfaction with both sides, the patient's willingness to be involved in medical decision making, as well as the patient commitment to the treatment plan, lifestyle changes and improvement of patient health [19]. Previous research also supported the results of this study that patients with Type 2 DM in Binjai were known to have sufficient quality of life well. The improvement of self-care behaviour is better because of an increase in physical health, social and environmental relations but not from the psychological side as an indication of communication that is attempted to run well between patients and doctors when performing patient self-care [20].

Based on the results of SEM analysis, health financing contributes to shaping diabetes patient's self-care behaviour in Binjai City. Financing is the availability of funds and the financial capacity of a diabetic patient in carrying out treatment. Availability of funds is necessary for the continuity of patient treatment. From the results of interviews conducted with diabetic patients in the city of Binjai, the most

patients already have health insurance (80%), so they get health services for diabetes such as blood sugar checks, laboratory tests and anti-diabetic medicines at the health centre or at home referral pain for free. The results showed that the dimensions of family support are one of the constituent components of diabetes patient's self-care behaviour in Binjai City.

In diabetic patients, the family support provided can help self-reliance and self-care behaviour. The usual support received from his family includes encouragement from the family to control his health to the hospital. Besides that, the family also assists patients in supporting their efforts to carry out diabetes-related care such as setting diet, regulation of taking medication and providing information related to treatment for example by using traditional plants that can reduce blood sugar levels. This kind of family support may improve the quality of life of DM patients with type 2 [21]. Family support in this study is of good value, and it can form by the pattern of community life in the city of Binjai is still very family and cooperation. They still pay attention to togetherness and help between them and of course, support each other in the family [22].

The results of the study showed that the motivation dimension was one of the constituent components of a diabetes patient's self-care behaviour in Binjai City. Motivation is an essential factor for patients with type 2 diabetes because the motivation that is present in type 2 DM patients will be able to provide a strong impetus for type 2 DM clients to conduct diabetes self-care behaviour so that optimal blood sugar control can be achieved and minimising the occurrence of complications diabetes. Self-motivation is a significant factor influencing type 2 DM patients in performing diabetes self-care, especially concerning maintaining the diet and monitoring blood sugar. Type 2 DM patients who have good motivation will perform diabetes self-care actions well as well to achieve the desired goal of controlling blood sugar so that ultimately DM complications can be minimised [17], [23].

The results showed that the dimension of self-efficacy is one of the constituent components of the diabetes patient's self-care behaviour in Binjai City. Self-efficacy is a strong predictor of DM self-management behaviour, someone who lives with DM who has a higher level of self-efficacy will participate in better DM self-management behaviour. Self-efficacy is related to specific behaviors in diabetes self-management. Low self-efficacy in each of the diabetic patient's recommended behaviors will reduce adherence to these specific behaviours [24], [25].

Limitations of the study: 1. The determinants of self-care behaviour which are ultimately formulated into forming factors of self-care behaviour, in theory, and their application in the field, are actually still many factors and indicators that are considered to shape and influence them, but in research only refers to 7 indicators. 2. This study uses a cross-sectional approach, and cross-sectional data has limitations in explaining the stability of influence between variables involved in a study from time to time. 3. The number of samples in this study only amounted to 115 patients who are considered still less representative, in future research, can be done with a more representative number of samples.

In conclusion, the new instrument for assessing self-care behaviour of T2DM patients is valid and reliable. Anyone interested in using this instrument may obtain a copy directly from the first author (there is no charge for its use). Knowledge (2) motivation (3) attitude (4) self-efficacy (5) communication (6) family support (7) financing are important things for diabetic patient. The good collaboration is important between diabetic patients, family doctors and patients' families for the formation of good self-care behaviour.

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