

Structural model of health-related quality of life in diabetic patients based on mental well-being and quality of sleep mediated by self-care behaviors

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Abstract

Background: Diabetes has long-term complications, and therefore, affects the health of both the community and individual. Diabetes can have significant psychological effects on health and delay the recovery of the disease.

Objectives: This study aimed to determine the causal model of health-related quality of life based on subjective well-being and sleep quality mediated by self-care behaviors in diabetic patients.

Methods: This correlational study was conducted using the path analysis statistical method. The statistical population (n=195) included all middle-aged patients with diabetes referred to the endocrinologists of Bushehr Province, Iran, in 2019 and selected by the availability sampling method. The instrument used to collect data were questionnaires, namely a demographic form, the SF-36 Health-Related Quality of Life Questionnaire, Diabetes Self-Care Questionnaire, Pittsburgh Sleep Quality Questionnaire, and Mental Well-Being Scale. The data were analyzed in SPSS software (version 22) and Amos software (version 22) using the path analysis method.

Results: The results showed that both the variables of sleep quality and mental well-being mediated by self-care had a direct and significant relationship with quality of life (P<0.001). The direct relationship between sleep quality and quality of life was not significant. However, there was a significant direct relationship between mental well-being and quality of life (P<0.001).

Conclusion: It can be concluded that sleep quality and mental well-being affected the self-care that the patient selected and could predict the quality of life of diabetic patients.

Keywords: Self-care, Sleep, Mental health, Quality of life

1. Introduction

Diabetes is a complex chronic condition that has serious physical, mental, and clinical complications for sufferers; therefore, it influences all aspects of life, which undoubtedly in a lifetime, widely impairs a diabetic patient's quality of life (1). The two main forms of this disease are type 1 and type 2 diabetes. Type 1 diabetes is a metabolic disorder whose main characteristic is a lack of insulin production and secretion (2). In type 2 diabetes or non-insulin-dependent diabetes, most commonly seen in adults over 30 years of age, insulin produced in the pancreas does not function well. In fact, in this disease either the pancreas does not secrete enough insulin or the secreted insulin lack the necessary quality and efficiency for the body (3). Regarding these, diabetes can affect the quality of life of patients with this disease.

In defining the quality of life, the World Health

Organization considers the individual's perception of his/her living conditions in the context of culture and value system of society and the relationship between these perceptions and the individual's goals, expectations, and priorities (4). In medicine, quality of life is used in two forms: 1) quality of life which examines general life, and 2) health-related quality of life which deals with the impact of different physical, mental, and social dimensions on patients (5). People with diabetes have a lower health-related quality of life, compared to those without diabetes, in the same age group, and this index decreases with progression and complications of the disease (6). One of these individual characteristics that affect both the disease process and the quality of life in diabetic patients is the individual's perception of the health control center (7).

Self-care of diabetic patients plays a highly important role in controlling the symptoms of the disease in such

cases. Psychological barriers are among the barriers of self-care in diabetic patients that their roles are clear in the incidence of health behaviors (8). Diabetes may isolate sufferers, affect their social adjustment, and limit their social activities to the extent that some patients may avoid talking to others about the disease and their concerns. Most diabetic patients experience the effects of diabetes in the areas of mental health, well-being, depression, and diabetes-related distress, both of which increase the risk of the affected person for poor self-care of the disease, the growth of complications of the disease, poor quality of life, and consequently, higher mortality (9). According to published statistics, two out of five adults with diabetes have depression, which in turn, will harm glucose control and may increase the likelihood of cardiovascular disease in diabetics. For this reason, the relevant organizations always emphasize the diagnosis and treatment of depression in patients with diabetes to better manage the disease (10).

The results of studies on diabetes indicate the lack of knowledge and appropriate attitude and practice in dealing with diabetes, and consequently, non-compliance with treatment and self-care measures. In recent years, a group of researchers in the field of mental health from positive psychology considered mental health the equivalent of positive psychological function and conceptualized it in the form of the term "mental well-being" (11). This group does not consider the lack of disease sufficient for feelings of health; rather, they believe that having a sense of life satisfaction, positive and sufficient progress, effective and efficient interaction with the world, positive energy and mood, and linkage and favorable relationship with community and society are characteristics of a healthy person (12). Subjective well-being includes important principles that affect all aspects of human behavior through influencing emotions and can impact the quality of life of diabetic patients (13).

The increased prevalence of diabetes and impaired glucose tolerance is associated with a sleep duration of less than 6 h or more than 9 h, and diabetic patients have lower sleep duration than normal sleep levels in the community (14). On the other hand, diabetic patients experience high anxiety due to the type of disease, which affects sleep quality, the quality of life, quality of social interaction, the activity of individuals during waking hours, physical and mental health, and is considered an important health variable. Sleep quality is defined as periodically energizing sleep that meets people's sleep-related needs and allows them to perform daily functions properly (15). According to the results of studies on the prevalence of sleep disorders, one-third of the adult population suffers from sleep disorders, and 5% of the population suffers from daily nap periods (16).

The necessity of this study is because diabetes is a chronic disease that has serious short-term and long-term consequences for patients and the total number of people with diabetes worldwide is expected to increase from about 170 million in 2000 to about 370 million in 2030 (17). In recent decades, several epidemiological studies have been conducted on the prevalence of type 2 diabetes in Iran, according to which the diabetic population of Iran

is estimated to be more than 1.5 million cases. The results of studies show that the prevalence of type 2 diabetes in Tehran, Iran, and its surrounding areas and Isfahan, Iran, is between 7% and 8%. In some cities of Iran, the prevalence of diabetes is higher than this rate; for instance, in Yazd (central Iran) and Bushehr port (south of Iran), the prevalence of type 2 diabetes is estimated to be 16.3% and 13.6%, respectively (18).

Considering the importance of psychological problems of diabetes and taking into account the need of diabetic patients is not limited to glycemic control and chronic diabetes affects the quality of life of these patients, it seems necessary and important to perform studies investigating such domains. This study aimed to test and compare the causal relationship between the health control center and health-related quality of life by mediating the psychological distress of diabetes among patients with type 1 and 2 diabetes.

2. Objectives

Considering the high prevalence of this disease and the importance of its treatment to improve the health of the community, it is necessary to investigate the factors related to the quality of life of these patients. Therefore, this study aimed to determine the causal model of health-related quality of life based on subjective well-being and sleep quality mediated by self-care behaviors in diabetic patients.

3. Methods

This correlational study was conducted using the path analysis statistical method. The statistical population of this study consisted of all patients with type 1 and 2 diabetes referred to endocrinologists in Bushehr Province in the winter of 2019, diagnosed with one of the two types of diabetes according to the approval of a specialist physician. The eligible age of patients to be entered into the study was determined at 35-70 years considering the age of type 2 diabetes, peering the two groups of type 1 diabetic patients, and two age requirements. To determine the number of samples in this study, 30 observations (30 cases) were considered for each observed variable, rendering for 150 subjects. However, it is believed that the number of samples in structural equations and pathways is not less than 200 cases. Therefore, to increase confidence, 171 patients with type 1 diabetes and 200 patients with type 2 diabetes (considering the probability of drop-out rate and eliminating confounding questionnaires and variable and multivariate outliers) were selected among diabetic patients referring to endocrinologists in Bushehr using the availability sampling method.

The inclusion criteria were having type 1 and 2 diabetes with physician approval for at least one year, a hemoglobin level of A1c above 6%, and minimum diploma education, and lacking acute or chronic medical disease (e.g., epilepsy, skeletal diseases, heart and respiratory failures) and severe mental disorders (e.g., psychotic and attention disorders). On the other hand, the patients who were unwilling to continue the study and those who did not respond to the questionnaire completely were excluded from the research. To consider the ethical

considerations of the research, the research objectives and procedures were explained to all subjects verbally, and they were informed of the right to leave the study at any time. Moreover, all participants were assured of anonymity and confidentiality in this study.

To conduct the research, initially, the participants filled out the demographic characteristics form, which included age, gender, and education, as well as the type of diabetes. Afterward, patients in two groups of type 1 and 2 diabetes were peered in terms of age and gender. No significant difference was observed between the genders and age intervals between the two groups. Subsequently, the questionnaires were distributed among the participants after that they were explained how to complete the questionnaires by the researcher and obtained informed consent to participate in the study. They were also assured of the confidentiality of their information. Finally, 371 questionnaires were filled out and analyzed (after eliminating the confounding questionnaires, including 183 patients with type 1 diabetes and 188 patients with type 2 diabetes). The test power and fitness indices of the model showed the adequacy of the sample size. In this study, to replace missing data, the method of replacing missing data with variable average was used. Furthermore, to detect multi-variable outliers, Mahalanobis distance-based methods were applied for variables. The demographic characteristics of participants are presented in Table 1. The measurement tools used in this study were:

SF-36 Health-Related Quality of Life Questionnaire:

The 36-item Health-Related Quality of Life Questionnaire, developed by Ware (1992), evaluates health policies and generally assesses the state of health in terms of physical and mental conditions. This questionnaire consists of eight subscales and measures the health-related quality of life rated on the Likert scale with such items as "Compared to last year, in general, how you assess your health now?". The eight subscales are physical performance (10 items), limitations of playing a role in physical health (4 items), limitations of playing a role in emotional problems (3 items), energy and vitality (4 items), emotional health (5 items), social performance (2 items), pain (2 items), and general health (5 items). Obtaining higher scores in this questionnaire indicates an individual's better quality of life. The results of confirmatory factor analysis indicate a suitable fit between the specified model and the data (19). In the present study, the reliability of this instrument was calculated by Cronbach's alpha coefficient method ($\alpha=0.81$).

Diabetes Self-Care Questionnaire (Diabetes Self-Care Summary):

This 15-items self-report questionnaire examines patients' self-care criteria over the past 7 days and consists of different aspects of a diabetes treatment regimen, including general diet and diabetes allocation diet (5 items), exercise (2 items), and blood glucose test (2 items). In this scale, except for smoking behavior with a score of 0-1, each behavior is given a score from 0-7, and a total score is obtained by collecting the scores of each question, rendering for a score range of 0-99. The content validity of this instrument was confirmed by 8 professors, the mean of which was obtained at 84.9, and its reliability

was estimated at 0.78 using Cronbach's alpha coefficient method (20). In the present study, the reliability of this instrument was calculated by Cronbach's alpha method ($\alpha=0.80$).

Pittsburgh Sleep Quality Questionnaire:

One of the best tools designed and developed in the field of sleep quality measurement is the Pittsburgh Sleep Quality Questionnaire. The questionnaire was created in 1989 by Boyce et al. at the Pittsburgh Institute of Psychiatry. The questionnaire originally has 9 items; however, since item 5 itself consists of 10 sub-items, so the whole questionnaire has 19 items that are scored on a 4-point Likert scale ranging from 0 to 3. The internal cohesion of the original version of the questionnaire was calculated at 0.83 using Cronbach's alpha coefficient method. In the Iranian version of this questionnaire, the validity and reliability of this tool were 0.86 and 0.89, respectively (21). In the present study, the reliability of the questionnaire was obtained by Cronbach's alpha method between 0.76 and 0.82.

Subjective Well-Being Scale:

The 45-item Subjective Well-Being Scale, designed by Keyes and Magiromow (2003), measures emotional, psychological, and social well-being. The first 12 items are related to emotional well-being, rated on a 5-point Likert scale to score it, from 1=the worst case to 5=the best emotional state. The next 18 items are related to psychological well-being scored on a 7-point Likert scale. Finally, the next 15 items are related to social well-being. The Likert scale is used to score this subscale. The internal validity values of the emotional well-being subscale were calculated at 0.91 and 0.78 in the positive and negative emotion sections. Psychological and social health subscales had moderate internal validity from 0.4 to 0.7 and the total validity of both these scales was 0.8 and higher (22). In this study, the reliability of the mental well-being scale and subscales of emotional well-being, psychological well-being, and social well-being were estimated at 0.75, 0.76, 0.64, and 0.76, respectively (23).

The collected data were analyzed in SPSS software (version 22) using descriptive information of variables, such as mean, and Pearson correlation coefficient between variables. In the next step, path analysis was used using AMOS software (version 22) to evaluate the proposed model of the research.

4. Results

The mean age scores of participants in the type 1 diabetes and type 2 diabetes groups were obtained at 36.5 ± 7.4 and 37.7 ± 7.1 years, respectively. The minimum and maximum ages of participants were respectively 35 and 67 years.

Table 1 presents the descriptive indicators of the participants in this study (i.e., mean, standard deviation, and minimum and maximum scores) and Pearson correlation test results investigating the relationship between the predictive, mediator, and criterion variables in this study. Based on the results of Table 1, all research variables have a significant correlation, indicating the appropriate selection of variables in this research based on research background and previous studies. These

correlational analyses provide insight into the two-variable relationships between the research variables. Path analysis was used to simultaneously test the model of contingency relationships in the present study. According to the assumptions, the fitness of the proposed model can be evaluated based on the fitness criteria. Table 2 tabulates the fitting of the proposed tested model based on fitness indicators. According to the obtained values, the proposed model lacked a favorable fit.

According to Table 2, the modified model has a good fit. The structural model, paths, and their standard coefficients in the modified model are following Table 5.

Based on Table 3, all the remaining paths in the model were significant. In this study, the bootstrap test was used to determine the significance of indirect relationships of variables. Table 6 shows the standard coefficients in indirect paths in the tested model.

Regarding the indirect effect of sleep quality on quality

of life through self-care, Table 4 shows that this indirect pathway is significant. Additionally, for the indirect effect of mental well-being on quality of life through self-care, the contents of Table 4 show that this pathway is significant.

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Table 1. Descriptive indicators and correlation of variables

Variables	M	SD	Quality of life	Subjective well-being	Self-care	Health-related quality of life
Sleep quality	4.70	5.02	1			
Subjective well-being	113.59	25.49	0.48**	1		
Self-care	133.48	24.61	0.30**	0.28**	1	
Health-related quality of life	46.80	18.73	0.25**	0.29**	0.29**	1

Table 2. Goodness of Fit of the final tested model based on fitness indicators

Fitness Indices	χ^2	df	χ^2/df	IFI	TLI	CFI	NFI	RMSEA
Model	1.85	1	1.85	0.99	0.94	0.99	0.98	0.06

Table 3. Standard path coefficients related to the direct effects of variables in the final modified model

Proposed Model			
Path	β	P	
Quality of Life \leftarrow Subjective well-being	0.22	0.002	
Self-care \leftarrow Quality of life	-0.21	0.006	
Self-care \leftarrow Subjective well-being	0.17	0.02	
Quality of life \leftarrow Self-care	0.23	0.001	

Table 4. Multiple mediation test of indirect effects of the model using the bootstrap method

Indirect Path	β	P
Quality of sleep to quality of life through self-care	-0.05	0.01
Subjective well-being to quality of life through self-care	0.04	0.03

5. Discussion

This study aimed to determine the causal model of health-related quality of life based on subjective well-being and sleep quality mediated by self-care behaviors

in diabetic patients. An important part of the treatment of diabetic patients depends on self-care behaviors in patients and insomnia and low sleep quality are common among such patients. Therefore, the present study aimed to test the

health-related quality of life in diabetic patients based on subjective well-being and sleep quality mediated by self-care behaviors. Data analysis showed that the relationship between sleep quality and quality of life, despite having a significant correlation in simple correlations, was not significant in the form of a direct path model and was excluded from the model.

Background of research strongly supports the relationship between sleep quality and quality of life in diabetic patients. For example, in a study, one of the factors of low quality of life in diabetic patients was determined as the prevalence of low sleep quality among such patients (7). However, no significant relationship was found in another study (24). The results of a study conducted by Lin et al. (25) showed that insomnia weakens patients' self-care behaviors, and in line with the findings of the present study, it was shown that insomnia could even reduce the effect of self-care behaviors on the quality of life.

Regarding the cause of the prevalence of insomnia among these patients, neuroendocrine mechanisms and pituitary-centered disorders of the hypothalamus, cerebral ischemia caused by vascular disorders, neuropathic pains, decreased glucose reach to the cell, or even reduced patient's authority to choose the type of food. According to the other findings of this study, sleep quality had a significant direct relationship with self-care behaviors. Moreover, there was a significant indirect relationship between sleep quality and quality of life through self-care behaviors. In explaining this finding, which is in line with the previous one (26), it can be said that the importance of investigating psychological problems in patients with diabetes is to understand how and in what way (e.g. diet, exercise, glycemic control) affects self-care behaviors. The literature review indicated that low mental well-being was correlated with smoking, inactivity, an unhealthy diet, and a lack of exercise. Depressed patients paid less attention to the symptoms of hypoglycemia and were less stable to take their medications (27), which confirmed the finding of this study that sleep quality had all its effect on the quality of life through affecting self-care behaviors, including such components as exercise and healthy nutrition.

Based on the findings of this study, a direct and significant relationship was observed between subjective well-being and the quality of life of self-care behaviors and there was an indirect and significant relationship between subjective well-being and quality of life through self-care behaviors, which was in line with the previous findings (13, 28). In explaining this finding, it can be said that since people with subjective well-being do not judge issues and events, they are patient, looking at the events and issues ahead as if they are encountering them for the first time. In other words, they try to make events a new way each time, rather than going through indifferent events or reacting with great emotions based on previous experiences. They can also trust themselves and their feelings, accept themselves as they are (29), accept internal and external realities without distortion, have a great ability to face a host of thoughts and emotions (22), respond to events with contemplation (30), and be more capable of recognizing, managing, and solving everyday problems (11).

These skills in people with mental well-being show that such individuals try to accept every problem and manage it in a new way. Considering that the treatment and prevention of diabetes are largely dependent on the management of the individual in self-care behaviors, it can be said that an increase in the patient's mental well-being will lead to an increase in better control of the disease and adherence to self-care behaviors. In other words, this finding shows that patients with diabetes need to be convinced that the behaviors they adopt in caring for themselves will be effective in the results they obtain in their self-care. Diabetic patients may have a series of negative thoughts regarding their abilities to control and manage the disease and its symptoms due to complications and have a higher quality of life (30).

The present study, like other studies, faced limitations since the sample consisted only of middle-aged people with diabetes in Bushehr Province; therefore, it is necessary to be more cautious in generalizing the results to other age groups and other patients. According to the results of this study, it is suggested that other therapists and counselors pay attention to the role of research variables in self-care behaviors that have great importance in controlling diabetes and reducing the cost of treatment and using their promotion to improve these behaviors. The results of this study can have implications to help these patients regarding the common sleep problems among diabetic patients. It is also suggested that the findings of this study be used to raise awareness in patients with diabetes. Considering the limitations of correlation methods in explaining cause and effect relationships, it is recommended to conduct empirical researches to promote self-care behaviors in patients through the education and promotion of subjective well-being and improvement of patients' sleep quality.

6. Conclusions

It can be concluded that sleep quality and mental well-being affected the self-care that the patient selected, which could predict the quality of life of diabetic patients.

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