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Research Paper

Relationship Between Quality of Life and Health Locus of Control in Patients With Diabetes: With an Emphasis on Mediating Role of Medication Adherence

Seyyed Mohammadreza Hosseini[1], Behnam Makvandi[1*], Karim Sevari[2], Saeed Bakhtiarpour[1]

1. Department of Psychology, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran.
2. Department of Educational Psychology, Payame Noor University, Tehran, Iran.

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Running Title Quality of Life in Patients With Diabetes

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ABSTRACT

Background: Diabetes is one of the most common chronic diseases, and its management is difficult and requires long-term self-care to improve the perceived quality of life (QoL) of patients.

Objectives: The present study aimed to investigate the mediating role of medication adherence in the relationship between the QoL and health locus of control (HLC) in patients with diabetes.

Materials & Methods: The research method was descriptive cross-sectional study in which 232 patients with diabetes were selected through convenience sampling method. They were then asked to complete the research questionnaires on quality of life, health locus of control, and medication adherence. The proposed model was investigated using structural equation modeling (SEM), and indirect relationships were examined using the Bootstrap method. Data were analyzed through SPSS software, version 27 and Amos software, version 25.

Results: The results showed a significant relationship between medication adherence and QoL ($P<0.001$), but no significant relationship was observed between HLC and QoL. The results also showed that medication adherence significantly mediated the relationship between HLC and QoL in patients with diabetes ($P=0.003$).

Conclusion: The study results indicated that the proposed modified model was well-fitted to the data. Therefore, it can be used for identifying the most important factors affecting the QoL of patients with diabetes.

Keywords: Quality of life, Medication adherence, Health locus of control, Diabetes

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*** Corresponding Author:**
Behnam Makvandi, PhD.
Address: *Department of Psychology, Ahvaz Branch, Islamic Azad University, Ahvaz, Iran.*
Tel: *+98 (61) 33348420*
E-mail: *makvandi203@gmail.com*

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1. Introduction

Diabetes is a costly condition, a major risk factor for cardiovascular disease and the leading cause of amputation, advanced kidney failure, and blindness in many countries [1-3]. Diabetes prevents the body from using or storing glucose [4, 5]. Type-I and type-ii diabetes are the two main subtypes of this illness [6]. According to the literature, one leg is amputated every 30 seconds worldwide due to low knowledge about diabetes or its treatment options [7]. Diabetes is currently estimated to affect over 462 million people worldwide [8]. Diabetes affects more than 5.3 million people in Iran, and domestic studies show that one out of every five adults (over 30 years old) is at risk of developing this disease [9]. Diabetes is one of the most common chronic diseases, and its management is difficult and requires long-term self-care to improve the perceived quality of life (QoL) of patients [10].

There is no strong consensus on the QoL definition because of the complexities and subjective nature of this concept. Numerous areas of life that make up the general QoL are very individual. Complexity is added when evaluating how diabetes affects these facets of life [11]. Other psychological factors, in particular, may compromise the compliance and adherence of patients, and this may increase mortality independent of many confounding factors [12]. QoL is a multidimensional construct defined by a person's physical, cognitive, social, emotional, psychological, and spiritual well-being. However, compared to the general population, the QoL of patients with diabetes is regarded as an acceptable result of self-care [13].

The outcome of diabetes treatments, which necessitates patient involvement, is influenced by the patient's health beliefs and knowledge of the condition [14]. Health locus of control (HLC) is a variable that affects how people practice self-care. HLC is a social learning theory-based concept focusing on people's beliefs on the factors affecting their health status [15, 16]. HLC is a psychological factor studied as one of the health outcome predictors or determinants in chronic diseases. People with diabetes must control their behavior to control blood sugar. Consequently, they can enhance their QoL with the right HLC [17, 18].

Medication adherence is a critical factor that can influence patients' HLC and improve their QoL [19]. Medication non-adherence is one of the major obstacles to managing diabetes and enhancing the QoL of patients with diabetes [20]. Patients with type-II diabetes frequently engage in medication non-adherence, associated with more complications, higher mortality rates, and medical costs [21]. According to the World Health Organization (WHO) estimates, on average, patients with chronic diseases adhere to their medications about 50% of the time in developed countries, compared to much lower rates in underdeveloped or developing countries [22]. Considering the increased number of efficient self-prescribed treatments, there is a basic need for a better understanding and management of medication non-adherence, as the complications of diabetes are primarily caused by poor medication adherence [23]. Baghi et al. [24] reported that medication adherence was a predictor of the quality of life of patients with hypertension. Sakkaki et al. [25] reported that medication adherence had a mediating role in the relationship between health-related quality of life and depression in patients with cervical cancer.

Diabetes is generally ranked 20th among the diseases that debilitate life conditions due to its high prevalence [20]. Some people do not believe it is necessary to evaluate their health and put off doing so until they become ill, and some others would rather not be aware of their disease and visit the doctor when it is too late. Therefore, based on the issues outlined above, the present study aimed to investigate the mediating role of medication adherence in the relationship between the QoL and HLC in patients with diabetes.

2. Materials and Methods

This descriptive-cross-sectional study used structural equation modeling (SEM) to examine the relationship between variables. The study population consisted of all patients with diabetes who visited health centers in Ahvaz, Iran, in 2020. The sample were selected through convenience sampling method. According to Loehlin and Beaujean [26], the minimum sample size for an SEM-based study is 220; considering an attrition rate of about 13%, 250 patients with diabetes were calculated. After excluding the incomplete or distorted questionnaires, the final sample was equal to 232. The inclusion criteria were; definite diagnosis of diabetes type II for at least two years, having a middle school education, the absence of acute or chronic mental disorders, and the absence of psychiatric medication. The exclusion criteria were unwillingness to continue the study and failure to complete all questionnaire items.

Measures

Diabetes quality-of-life brief clinical inventory (DQoL-BCI): The original version of DQoL-BCI consisted of 60 items. Burroughs et al. [27] assessed the validity and reliability of this tool for the first time and reduced its items to 15. The 15-item DQoL-BCI measures the QoL of patients with type-i and type-II diabetes in two dimensions: Self-care behavior and satisfaction with disease control. Their results indicated that the short form of DQoL-BCI was more effective than the original version in diabetes screening programs. Answers to the items are ranked on a 5-point Likert scale, with an evaluation protocol that ranges from 1 to 5. The total sum of all items demonstrates a score ranging from 15 to 75. The lower scores imply a satisfactory QoL in patients with diabetes. Mirfeizi et al. [28] reported that the Persian version of IDQOL-BCI showed good content validity (CVI >0.75 and CVR >0.99), internal consistency (α=0.75), and test re-test reliability (ICC=0.81).

Multidimensional health locus of control scale (MHLC): Walston et al. [29] developed MHLC to determine the HLC of people. This scale consists of 18 items in 3 subscales: Powerful other health locus of control (PHLC) (the health of a person is affected by other people), internal health locus of control (IHLC) (reflects the internal part of perceived control and refers to the individual's tendency to believe that health outcomes are principally due to the individual's behavior and within their control), and chance health locus of control (CHLC) (refers to the individual's tendency to believe that health outcomes are principally due to chance factors). The items are scored on a 6-point scale: Strongly agree, agree, slightly agree, slightly disagree, disagree, and strongly disagree. Notably, the first six items of this scale assess people's beliefs in the area of IHLC, while the remaining twelve assess people's perceptions of the influence of external factors on their health, such as luck, the power of others, doctors, and other people. The range of scores for each subscale is between 1 and 36. Jafari et al. [30] reported a Cronbach' s α coefficient of 0.86 for the MHLC.

Morisky medication adherence scale (MMAS-8): Morisky et al. [31] developed this scale to measure medication adherence in patients with hypertension. However, many studies have used it to measure medication adherence in patients with other diseases, such as diabetes and hypertension [32, 33]. The items are so simple that even people with minimum literacy can understand and answer them. This scale consists of seven yes/no items and a multiple-choice item, and item 5 is scored inversely. The total score on this scale ranges from 0 to 8, and lower scores represent higher levels of medication adherence. The reliability of the Persian version of MMAS-8 was reported 0.70 using Cronbach's α [33].

Statistical analyses

Data analysis was done using descriptive statistics (Mean±SD). The relationship between the research variables was examined using Pearson's correlation coefficient and SEM in SPSS software, version 27 and Amos software, version 25. The Bootstrap method was also employed to test the significance of mediation relationships. Tucker-Lewis index (TLI), comparative fit index (CFI), relative fit index (RFI), normative fit index (NFI), and root mean square error of approximation (RMSEA) were used to evaluate model fit. In this research medication adherence was the mediating variable of the model, which was defined as a latent variable, and health locus of control and quality of life were defined as observed variables.

3. Results

According to the demographic data, 105 participants were female and 127 were male, and the mean age of participants was 38.15±4.36. Regarding marital status, 113 participants were single, and 119 were married. The mean duration of diabetes in the participants was 8.62±3.17 years. The majority of participants had high school education (50%) followed by bachelor's degree (27.2%), and middle school education (19.4%), and only 8% participants had master degree education. Table 1 presents the Mean±SD, and Pearson's correlation coefficient of the research variables.

Table 1. Mean±SD and Pearson's correlation coefficient of the research variables

Variables	Mean±SD	1	2	3
1- QoL	44.26±16.00	1		
2- HLC	44.66±7.82	0.29**	1	
3- Medication adherence	3.81±2.52	0.48**	0.54**	1

**P<0.01

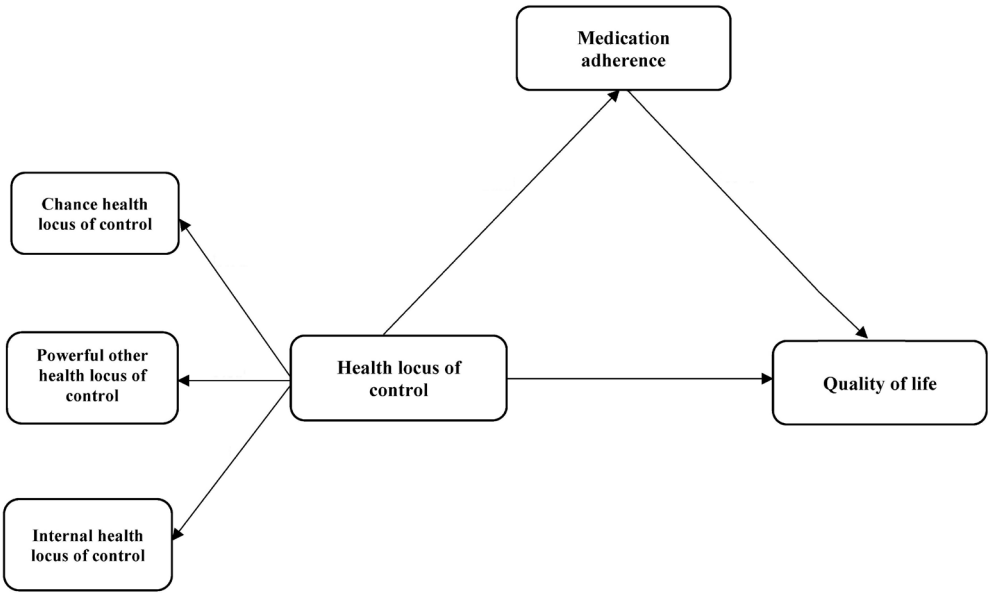

Figure 1. The proposed model in standard mode

Pearson's correlation coefficients (Table 2) showed a significant correlation between all research variables (P<0.001). Figure 1 shows the initial proposed model to explain the QoL based on HLC and medication adherence.

The root mean square error of approximation (RMSEA) was equal to 0.086 (Table 2), indicating that the proposed model was not well fitted to the data and needed to be modified. Therefore, the relationship between HLC and QoL was eliminated. Figure 2 shows the finalized model. Based on the data in Table 3, all goodness of fit indices, such as normalized chi-square (χ^2/df), TLI, CFI, RFI, NFI and RMSEA, showed the acceptable fit of the finalized model with the data.

Table 3 reports the path coefficients for the direct and indirect relationships. According to the results, there was a direct and significant relationship between HLC and medication adherence (β=0.53, P=0.001), and between medication adherence and QoL (β=0.22, P=0.001) in patients with diabetes. The confidence levels in Table 3 indicated medication adherence significantly mediated the indirect path of HLC to QoL (β=0.42, P=0.003).

Table 2. The fit indices of the proposed and final models

Fit Indicators	χ^2	df	(χ^2/df)	TLI	CFI	RFI	NFI	RMSEA
Proposed model	8.30	4	2.08	0.96	0.98	0.94	0.97	0.086
Final model	9.10	5	1.82	0.97	0.98	0.94	0.97	0.060

Table 3. Path coefficients of direct and indirect relationship between research variables

Path	Proposed Model		Final Model	
	β	P	β	P
HLC→QoL	0.08	0.371	-	-
HLC→Medication adherence	0.53	0.001	0.53	0.001
Medication adherence→QoL	0.18	0.022	0.22	0.001
HLC→QoL through the mediating role of medication adherence	0.34	0.026	0.42	0.003

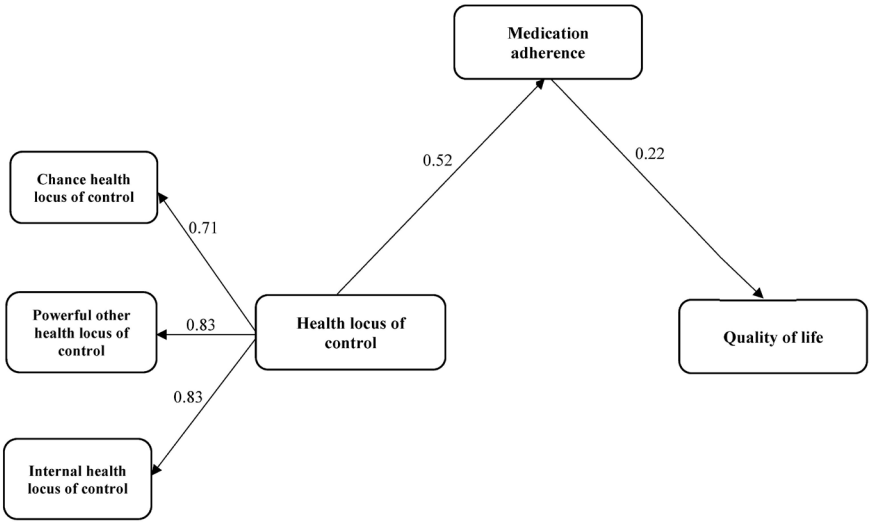

Figure 2. The final model in standard mode

4. Discussion

The present study aimed to investigate the mediating role of medication adherence in the relationship between the QoL and HLC in patients with diabetes. The results showed a significant relationship between HLC and QoL, which is inconsistent with the findings of Soltani et al. [34] and Octari et al. [35]. They used correlation coefficient and regression analysis to measure the relationship between HLC and QoL and found a significant relationship between them. In contrast, this study employed path analysis to examine the hypotheses. Pearson's correlation coefficients show a significant relationship between HLC and QoL in this study. However, the model's inclusion of a mediator variable means that the mediator variable or the indirect relationship explains all the effects of medication adherence on QoL. In other words, HLC indirectly affected QoL in this model. HLC generally means that if patients are constantly monitored and cared for, their QoL will most likely improve compared to those not under health control [35]. HLC encompasses the efforts of doctors, nurses, and other health professionals' efforts to help patients diagnose, treat, and monitor their medical conditions. These efforts include regular checkups, medications, proper diet and nutrition, physical activity, and therapeutic counseling. Patients can experience higher QoL levels if they can access appropriate and correct health services, treatments, and regular follow-up services. This refers to reducing disease symptoms, increasing energy and activity levels, enhancing mental and emotional well-being, enhancing sleep and rest, and raising overall satisfaction [34]. In general, HLC can make improving patients' QoL easier. To get the best treatment plan based on their circumstances, patients with diabetes should consult their doctor about how to take care of their health.

The results also showed a significant relationship between medication adherence and QoL, indicating a significant, positive relationship between medication adherence and QoL, consistent with the findings of Sakkaki et al. [25] and Pacheco et al [36]. This finding can be explained by the fact that medication adherence in patients with diabetes can significantly affect the course of the disease and their QoL. Medication adherence entails following what nurses and doctors advise regarding disease management, including taking medications regularly, performing tests and seeking medical advice, following a healthy diet, and exercising regularly [35]. Because diabetes affects the patients' daily lives, poor treatment planning may cause some risk factors. In addition, delaying treatment results in new complications such as exhaustion, muscle weakness, heart palpitations, etc. and raises medical costs [36]. As a result, medication adherence can significantly affect the patient's QoL. It may also be affected by poor blood sugar control and complications related to diabetes, such as impotence, mental and emotional disorders, and difficulty performing daily tasks.

The findings demonstrated that medication adherence significantly mediated the relationship between HLC and QoL. The researcher found no comparable studies about this finding. The results demonstrated no significant relationship between HLC and QoL. However, HLC could indirectly enhance the QoL of patients with diabetes by promoting their medication adherence. Diabetes is a chronic disease characterized by elevated blood sugar levels. Diabetes occurs when the body is unable to use or produce sugar properly. Diabetes symptoms include frequent urination, seizures, fatigue, weight fluctuations,

poor vision, and unhealable wounds. Diabetes can cause serious problems such as cardiovascular disease, kidney disease, and nerve damage if not managed correctly. It is typically necessary to follow a healthy diet, engage in regular physical activity, and, if necessary, take blood sugar-lowering medications to control diabetes. Moreover, patients with diabetes should work closely with their doctors and monitor their blood sugar levels using glucometers. The results suggested that medication adherence mediated the relationship between HLC and QoL.

Since the study population was restricted to patients with diabetes in Ahvaz, the findings should be cautiously generalized to patients with other chronic diseases in other cities. The use of a self-report tool, which may have influenced the accuracy of reports due to social desirability bias, was another limitation of this study. Also, another limitation of the current research was the selection of the sample using the convenience method, which can cause bias in the results. It is recommended that researchers carry out similar studies in various areas to increase the external validity of this study. Future studies are also recommended to control other important factors such as gender, age, and diabetes duration.

5. Conclusion

The results showed a relationship between medication adherence and QoL in patients with diabetes. The indirect path and significance were also demonstrated through treatment adherence and QoL. The final and modified model was well-fitted to the data; thus, it can be regarded as a novel innovation and scientific discovery that has the potential to enhance the QoL of patients with diabetes significantly. Based on the findings, the QoL of patients with diabetes can be improved by training them in HLC and medication adherence. Since medication adherence and HLC are critical issues that can be learned, medical planners and consultants should pay more attention to these issues and teach them to patients with diabetes and other chronic diseases through mass media.

Ethical Considerations

Compliance with ethical guidelines

The study was approved by the Ethical Committee of Ahvaz Branch, Islamic Azad University (Code: IR.IAU.AHVAZ.REC.1401.008).

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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