

FACTORS PREDICTING QUALITY OF LIFE AMONG DIABETIC PATIENTS WITH EARLY STAGE OF CHRONIC KIDNEY DISEASE

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Abstract

A clear understanding of factors affecting patients' perception of the quality of life (QoL) would be useful for improving continuous care in diabetic patients with the early stage of chronic kidney disease (CKD). The early stage of CKD is defined as an estimated glomerular filtration rate (eGFR) of above 30 mL/min per 1.73 m², that can return to a normal stage. Thus, this research aims to assess and determine the factors predictive of the QoL among diabetic patients with the early stage of CKD. A cross-sectional survey using a stratified random sampling method was administered between March and May 2018. The participants were 335 diabetic patients with the early stage of CKD selected from 24 sub-district health promoting hospitals in Sakon Nakhon province. The data collected, using questionnaires, descriptive statistics, and a stepwise multiple regression analysis for the factors related to and predictive of the QoL, were analyzed. The results revealed that: the factors that could predict the QoL consisted of health condition satisfaction, self-care behavior, age, personal monthly income, CKD classification, and marital status. The best predictors for QoL in diabetic patients with the early stage of CKD were health condition satisfaction ($\beta = 0.305$, $p < 0.001$), followed by self-care behavior ($\beta = 0.280$, $p < 0.001$). Based on the findings of this study, health care providers should pay more attention to patients with low levels of health condition satisfaction and self-care behavior. All these features negatively affect the QoL. To improve a patient's QoL, the focus should be on different variables.

Keywords: Quality of life, early CKD, diabetes patients

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Introduction

Chronic kidney disease (CKD), as represented by albuminuria or reduced glomerular filtration rate (GFR), is a common complication of diabetes (Kidney Disease: Improving Global Outcomes (KDIGO), 2017; Lin *et al.*, 2018), which occurs in 20–40% of patients with diabetes (Perkovic *et al.*, 2016). KDIGO guidelines have been adopted by countries and institutions worldwide and form the basis for early detection and proper classification of CKD (Inker *et al.*, 2014; KDIGO, 2013, 2017). CKD is initially asymptomatic and the patient is unaware of the disease until it progresses to end-stage renal disease (ESRD), which is a significant contributor to mortality in the general population and which increases the risk of dying prematurely (Tuttle *et al.*, 2014; Navaneethan *et al.*, 2017; World Health Organization, 2017). The early stage of CKD is defined as an estimated glomerular filtration rate (eGFR) of above 30 mL/min per 1.73 m², that can return to normal (Johnson *et al.*, 2013). The eGFR was determined with the CKD-EPI (CKD Epidemiology Collaboration) formulae. The National Kidney Foundation, uses guidelines referred as the Kidney Disease Outcomes Quality Initiative classification (KDOQI) to divide CKD into groups (KDIGO, 2013). CKD typically develops after a diabetes duration of 10 years (American Diabetes Association, 2019). The duration of diabetes, glycemic control, and other CKD risk factors are known to be associated with the prevalence and incidence of CKD (KDIGO, 2017).

Therefore, clinical care may improve the early stage CKD with a low risk of progression towards ESRD. Patients with the early stage of CKD require lifestyle modifications and improved self-care behavior, especially the dietary restriction of sodium and protein, adequate exercise and weight reduction, and strictly taken medication. These are important steps in lowering the risk of CKD events and possibly slowing, halting, or reversing CKD progression during the early stages (Lin *et al.*, 2018). If it is uncontrolled, the disease can be severe and require renal replacement therapy which would affect life and reduce the quality

of life (QoL) (Ingsathit *et al.*, 2010; Piriyaakontorn *et al.*, 2014).

QoL is a concept that covers a broad range of human experience. The Constitution of the World Health Organization (World Health Organization, 2014) defines health as a state of complete physical, mental, and social well-being not merely the absence of disease. It follows that the measurement of health and the effects of health care must include not only an indication of changes in the frequency and severity of diseases, but also an estimation of well-being and this can be assessed by measuring the improvement in the QoL. In the health care service system, QoL is the goal of providing health care and is an indicator of the results of medical treatment. The current condition of an illness is an important factor affecting the QoL due to the QoL consisting of many health aspects including physical health, mental health, social health, and environmental health (Perkovic *et al.*, 2016; Vassalotti *et al.*, 2016).

A literature review found that studies on the QoL in diabetic patients with the early stage of CKD were limited. Most studies of pre-dialysis CKD patients show a moderate level of the QoL. The only factor that was found to affect the QoL at statistically significant levels was depression (Pongpoottipatchara *et al.*, 2011). Hemodialysis patients were found to have a moderate level of QoL, and diabetes and cost increases were associated with this reduced QoL (Yisunkaew *et al.*, 2016). The QoL of people with diabetes has been examined in previous studies; however, differences in background and culture were found to result in different outcomes. It was necessary to determine the factors that affect the QoL of people with diabetes in different societies. Therefore, this research aims to assess and determine the factors predictive of the QoL among diabetic patients with early stage CKD. This study took place in Sakon Nakhon province, Thailand, which was identified as one of the 15 areas where health issues would be highest in Thailand in 2018 (Ministry of Public Health, 2017). This study may provide

baseline information and help to improve the QoL in diabetic patients with the early stage of CKD.

Materials and Methods

Study Setting, Population, and Sample

A cross-sectional survey. The total population of diabetic patients in the 24 sub-district health promoting hospitals in Sakon Nakhon province, Thailand was found to be 6,818. The sample population was calculated using Cochran's sample size formula (Cochran, 1977) and found to be 335 patients. We invited participants who were receiving follow-up treatment and identified through medical records to participate in the study. The inclusion criteria were the diagnosis of diabetes, having been screened for CKD in 2018, an eGFR above 30 mL/min per 1.73 m², an ability to communicate in Thai, the absence of hearing or speaking limitations, and a willingness to participate freely in the study. The exclusion criteria were acute complications of diabetes or severe symptoms, such as hypoglycemia, dizziness, drowsiness, lethargy, and an inability to provide information throughout the inquiry. The researchers contacted the participants while they were waiting to see their physicians and used a stratified random sampling method, based on the number of patients who had registered in the 24 hospitals.

Data Collection

This study, which was conducted on diabetic patients in the 24 sub-district health promoting hospitals in Sakon Nakhon province, Thailand, was administered between March and May 2018.

Primary data: the data were collected using questionnaires on demographic characteristics, QoL, and self-care behavior. Literate participants answered the questionnaires by themselves, whereas those with limitations in reading or checking the answers were assisted by the researchers. The questionnaire took roughly 45 min to

complete; participation was voluntary and anonymous.

Secondary data: By searching the hospitals' databases, patients with eGFR were determined with the CKD-EPI formulae and the KDOQI was used for classification of the early stages of CKD as follows: G1, eGFR: ≥ 90 mL/min/1.75 m², G2, eGFR: 60-89 mL/min/1.75 m², G3a, eGFR: 45-59 mL/min/1.75 m² and G3b, eGFR: 30-44 mL/min/1.73 m². Glycemic control, based on hemoglobin A1c (HbA1c) and termed as "controlled" (lower than 7.0%) or "uncontrolled" (higher than 7.0%), was identified from the last blood test, provided that it was done not more than 6 months previously, from a search of the hospitals' databases; and body mass index (BMI) was termed as "overweight" (25 kg/m² or higher) or "non-overweight" (lower than 25 kg/m²).

Research Instruments

Data were collected using questionnaires on demographic characteristics, QoL, and self-care behavior. The questionnaire on demographic aspects covered the following: gender, age, marital status, personal monthly income and its adequacy for the costs of daily life, duration of diabetes, eGFR, and BMI.

The Quality of life questionnaire was modified from the Thai version of the World Health Organization's Quality of life - Brief version (WHOQOL-BREF-THAI) that was developed by Mahatnirankul *et al.* (1998), and the Diabetes 39 questionnaire in the Thai version originally developed by Songraksa and Lerkiatbundit (2009) to suit the population study and cultural context, such as the community support and health services. These were formed into a 27-item questionnaire reflecting 5 domains: physiological health (6 items), psychological health (8 items), social interaction (6 items), environmental situation (5 items), and 2 overall estimations of wellness that considered life satisfaction (1 item, scored separately) and health condition satisfaction (1 item, scored separately). The scoring for the QoL questionnaire is based on a five-point Likert scale (0-4 points)

(0, dissatisfied to 4, strongly satisfied). The overall score is between 0-100 points, and it is divided into 3 categories: low QoL (0-33), fair QoL (34-67), and good QoL (68-100). Then, the questionnaire was validated by 3 experts; its validity was 0.98 and reliability was 0.89.

The self-care behavior questionnaire was developed from the self-care behavior theory of Orem (1997) and was formed into a 28-item questionnaire reflecting 5 domains: nutrition (5 items), physical activity and exercise (7 items), medication (6 items), avoidance of risk factors (8 items), and stress management (3 items). The scoring for the self-care behavior questionnaire is based on frequency of self-care practice in 1 week from 0 to 7 day (0, never done to 7, done every day) with a seven-point numeric rating scale (possible scores range between 0-196 points). The overall score is between 0-196 points, and it is divided into 3 categories: low self-care (0-64), fair self-care (65- 130), and good self-care (131-196). Then, the questionnaire was validated by 3 experts; its validity was 0.98 and reliability was 0.71.

Statistical analysis

Demographic data were presented with descriptive statistics: frequency, percentage, mean score, and standard deviation (SD). We conducted multiple regression analysis using a forward stepwise method to identify significant factors for the QoL. An alpha value of less than 0.05 was considered significant.

Ethical Approval

This study was approved by the Ethics Committee for Research Involving Human Subjects, Mahasarakham University, Thailand (approval number 051/2018) and approved by the Human Research Ethics Committee of Sakon Nakhon Regional Hospital, Thailand (approval number ECSKH04/2018). The researchers explained the purpose and procedures of the study to the participants, and then answered some questions related to voluntary agreement. Informed written consent was obtained from all participants. They were informed of the nature and confidentiality of the research and that their

withdrawal at any time would not affect their supply of medication.

Results

The Demographic Characteristics Among Diabetic Patients with Early Stage of CKD

Of the 335 patients who participated in the study, the majority were women (77.3%), and the mean $\pm$ SD age was 63.2 $\pm$ 10.2 years, for the average duration of diabetes, the mean $\pm$ SD duration of diabetes was 11.15 $\pm$ 7.26 years, and 64.8% of the patients had uncontrolled HbA1c. Most of them (69.0%) were overweight and currently married (69.6%). A majority of them (80.9%) had a personal monthly income of less than or equal to 3,000 Thai baht and their average monthly income was insufficient for 57.6%.

Quality of Life Among Diabetic Patients with Early Stage of CKD

The QoL scores of diabetic patients with the early stage of CKD were presented as the mean $\pm$ SD and the total points available were 100. The average overall QoL score was 67.62 $\pm$ 11.86 points, and the 2 overall estimations of wellness were: a) life satisfaction had an average of 2.57 $\pm$ 0.63 (out of 4 points), and b) health condition satisfaction had an average of 2.37 $\pm$ 0.87 (out of 4 points). When we compare the QoL domains, the psychological domain score was highest, with had an average of 20.44 $\pm$ 4.47 (out of 32 points). This was followed by the social interaction domain which had an average of 16.26 $\pm$ 3.59 (out of 24 points), and the environmental domain which had an average of 14.60 $\pm$ 2.81 (out of 20 points). The physiological domain had the lowest score with an average of 14.43 $\pm$ 3.43 (out of 24 points).

The following were the items in each domain with the highest points out of the total of 4 points. From the social interaction domain, "satisfied with communication, discussion about illness with family members" with a mean of 2.84 $\pm$ 0.73 was the highest. The highest unit from the psychological domain

was “satisfaction to live just fine on their own” with a mean of 2.84 ± 0.72 . From the environmental domain, the item with the highest points was “satisfaction with the help received from the hospital” with a mean of 2.83 ± 0.74 , and from the physiological domain it was “enough power and strength to do something different each day” with a mean of 2.82 ± 0.85 . The items with low mean scores included “self-satisfaction that can benefit others” with a mean of 2.53 ± 0.87 , “the opportunity to do relaxing activities” with a mean of 2.19 ± 1.14 , and “satisfaction with sexual or life being” with a mean of 2.00 ± 1.22 .

Comparisons of the QoL domains with the CKD classification using the KDOQI for classification of the early stages of CKD were as follows: G1, eGFR: above 90 ml/min/1.75 m², G2, eGFR: 60-89 ml/min/1.75 m², G3a, eGFR: 45-59 ml/min/1.75 m² and G3b, eGFR: 30-44 ml/min/1.73². The average overall QoL score was 69.10 ± 10.94 in patients with the early stage of CKD G1-G2 and 64.34 ± 13.23 in G3a-G3b, showing a higher level of QoL in G1-G2 and a fair level of QoL in G3a-G3b, as shown in Table 1.

Self-Care Behavior Among Diabetic Patients with Early Stage of CKD

The self-care behavior score of diabetic patients with the early stage of CKD were presented as mean $\pm$ SD and the total points

available were 196. The average overall self-care behavior score was 136.59 ± 20.83 points. When we compare the self-care behavior domains, the avoidance of risk factors domain score was the highest, with an average of 39.35 ± 11.98 (out of 56 points). This was followed by the medication behaviors domain with an average of 38.66 ± 5.02 (out of 42 points), the nutrition domain which had an average of 24.81 ± 7.68 (out of 35 points), and the stress management domain which had an average of 15.55 ± 3.30 (out of 21 points). The physical activity and exercise domain had the lowest scores with an average of 18.22 ± 7.26 (out of 49 points).

Factors Correlated and Predictive QoL Among Diabetic Patients with Early Stage of CKD

The results showed that the following 9 factors which were comparable with the QoL among diabetic patients with the early stage of CKD included: CKD classification, age, currently married (CM), health condition satisfaction (HCS), personal monthly income (PMI), duration of diabetes, and self-care behavior (SCB) ($p < 0.05$), as shown in Table 2.

Several factors were predictive of the QoL among diabetes patients with the early stage of CKD. The results from a stepwise multiple regression analysis revealed that the factors predictive of the QoL among diabetes

Table 1. Comparisons level of QoL between diabetic patients with early stage of CKD separated by CKD classification: G1-G2 and G3a-G3b (n = 335)

CKD classification	Quality of life, n(%)		p	OR	95%CI for OR
	Fair	Good			
Stage G1-G2	93(57.8)	140(80.5)		1	
Stage G3a-G3b	68(42.2)	34(19.5)	<0.001	3.01	1.85-4.91
Total	161(48.1)	174(51.9)			

Table 2. Correlations between the continuous demographic characteristics variables and QoL using Pearson correlation/Spearman rank (n = 335)

Variable	Correlation (r ^a /p ^b)	p
Personal monthly income	0.194 ^{**b}	<0.001
Duration of diabetes	-0.120 ^{*b}	0.028
HbA1c	0.092 ^b	0.118
Body mass index	0.060 ^b	0.271
Self-care behavior	0.224 ^{**a}	<0.001

* $p < 0.05$, ** $p < 0.01$ Note: ^aPearson's r, ^bSpearman's rho

patients with the early stage of CKD were: HCS, SCB, age, PMI, CKD classification, and CM. The first variable that can predict the QoL is health condition satisfaction. The latter ones were self-care behavior, age, personal monthly income, CKD classification, and marital status, respectively ($R = 0.508$, $R^2 = 0.258$, $F = 18.99$, $SE_{est} \pm 10.32$, respectively). Altogether, they could explain the 25.8% of variability in the QoL.

The best predictors for the QoL in diabetic patients with the early stage of CKD were health condition satisfaction ($\beta = 0.305$, $p < .001$), followed by self-care behavior ($\beta = 0.280$, $p < .001$), as shown in Table 3.

Discussion

We conducted this study to identify factors predictive of the QoL among diabetic patients with the early stage of CKD. The researchers' findings were that the predictors of QoL were health condition satisfaction, self-care behavior, age, CKD classification, personal monthly income, and currently married. They could explain the 25.8% of variability in the QoL. The best predictors for the QoL in diabetic patients with the early stage of CKD were health condition satisfaction, followed by self-care behavior. Health condition satisfaction was the participants' assessment of their satisfaction with their health conditions. Pallavi *et al.* (2015) reported that they indicated the subjective well-being which is associated with the health and mortality status. It is one of the main determinants of well-being, which reflects the cognitive judgmental aspect of an individual. Moreover, there are many comorbidities which further deteriorate the

effect of diabetes in a patient's life (Trikkalinou *et al.*, 2014). In this finding most of the patients had poor glycemic control ($HbA1c > 7\%$) and were overweight (categorized using the BMI), conditions leading to the development of the complication of kidney dysfunction (MacIsaac *et al.*, 2017). Several studies have shown that an increased BMI was an independent risk factor for ESRD (Maric-Bilkan, 2013). The finding is similar to Altaher *et al.* (2019) who reported that diabetic complications affect the QoL in patients with diabetes leading to the development of psychological disorders. It is one of the main determinants of well-being, which reflects the cognitive judgmental aspect of an individual (Pallavi *et al.*, 2015). Self-care behavior is another factor that can predict the QoL. In a similar study, Babazadeh *et al.* (2017) reported that the self-care for diabetes is an essential part of controlling the disease and improves the QoL in diabetic patients. Orem (1997) reported that self-care is behavior-initiated or performed by individuals on their own behalf to save life and promote health. This refers to an individual's responsibility for a healthy lifestyle behavior which is required for human development and function, as well as those activities required to cope with health conditions. Phatiprasak *et al.* (2014) reported that it was one of the important factors for achieving optimal glycemic levels and CKD prevention, especially eating strictly, doing exercise, and taking medication. A major impact on patients, it forces them to make big changes in their lifestyle so that it will not affect their life and reduce the QoL.

The results of the study indicate that age, CKD classification, personal monthly income, and being currently married were factors

Table 3. Factors predictive of QoL using stepwise multiple regression analysis

Variable	b	β	t	p
Health condition satisfaction (HCS)	7.25	0.305	6.34	<0.001
Self-care behavior (SCB)	0.159	0.280	5.80	<0.001
Age	-3.54	-0.146	-2.86	0.005
Personal monthly income (PMI)	0.01	0.138	2.76	0.006
CKD classification	-2.61	-0.101	-2.03	0.043
Currently married	2.57	0.100	2.02	0.044
Constant 48.28; $SE_{est} = \pm 0.905$				

$R = 0.508$, $R^2 = 0.258$, $adj R^2 = 0.244$, $F = 18.99$, p -value <0.001

predictive of the QoL among the participants. The researchers' finding was that the average age of the participants in this study was 63.20. Eliadarous (2017) and Jing *et al.* (2018) reported that the increase in age causes the body to deteriorate, causes a reduction in work, reduces physical strength, affects daily life, and creates long-term diabetes and the complications which affect the QoL of patients. The findings are similar to Babazadeh *et al.* (2017) who reported that the older age groups had lower mean scores of the QoL in the physical health dimension. It might be the result of increased symptoms and the physical limitations that increase with age. The researchers' findings were that the psychological domain and social interaction domain had the highest mean score of the QoL. Many studies showed that social interaction or an interpersonal relationship enhances both the physical and mental health in the elderly (Kooshiar *et al.*, 2012). A similar study by Piriyaakontorn *et al.* (2014) reported that the old aged experienced an increased life span and understanding of the impermanence of life when they believed in fate, following the principles of Buddhism, and therefore they accepted the truth of life and their psychological domain of QoL was good. Personal monthly income was a factor that has a relationship with the QoL, because income allows people to access various services and resources, and enables them to provide facilities for their living conditions. A great many of them had a personal monthly income of less than or equal to 3,000 Thai baht; particularly, the population in the north-east region has the lowest per capita income in Thailand (National Statistical Office, 2012). The finding is similar to Bunyatnopparat and Anutrakulchai (2017) who reported that the cost of treatment for the patients will result in stress, and most of the patients were unable to pay the cost of treatment which affected the psychological QoL. Most of participants were currently married and satisfaction with sexual or life being was the lowest item of the QoL. The finding is similar to Wongsaree (2016), who reported that most of the elderly who were suffering from several chronic diseases often

also had a problem of erectile dysfunction which is an important health problem because it affects the QoL of patients and affects the relationship in a couple's lives. A similar study by Seangpraw *et al.* (2019) reported that currently married was a factor that can predict the QoL of older people with chronic diseases.

Conclusions

This study determined the factors that are predictive of the QoL among diabetic patients with the early stage of CKD. These factors include health condition satisfaction, self-care behavior, age, personal monthly income, CKD classification, and marital status. This study highlights that the best predictor of the QoL were health satisfaction and self-care behavior. These variables explained the 25.8% of the variance in the QoL. The findings suggest that health care providers should evaluate the health condition satisfaction and self-care behavior of patients, as such evaluation might help to improve the patients' QoL.

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Conflict of Interests

No conflicts of interest has been declared by the authors.

Limitations

A possible limitation might be the cross-sectional design of this study since the QoL is dynamic and can change at any time. The cross-sectional studies were only conducted at certain times and the data were based on the time of collection. Therefore, longitudinal studies should be undertaken and follow the QoL assessment of the diabetic patients with

the early stage of CKD in the next study. In addition, this design did not allow causality to be determined.

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