Diabetes Self-Management, Fasting Blood Sugar and Quality of Life among Type 2 Diabetic Patients with Foot Ulcers

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Background: *Diabetic foot ulcers have a negative impact on quality of life and diabetes self-management of the condition is a key component of diabetes treatment. However, no study has yet been conducted to determine the relationship between diabetes self-management, fasting blood sugar and quality of life among type 2 diabetic patients with foot ulcers in Thailand.*
Objective: *To examine the relationship between diabetes self-management, fasting blood sugar and quality of life (QOL) among type 2 diabetic patients with foot ulcers who received the diabetes treatment in King Chulalongkorn Memorial Hospital, Thailand.*
Material and Method: *This was a cross-sectional study of 80 participants with type 2 diabetes who had foot ulcers in King Chulalongkorn Memorial Hospital, Bangkok, Thailand. Participants with diabetic foot ulcers were given a questionnaire regarding demographic data, fasting blood sugar, diabetes self-management and quality of life. Self-management was assessed by evaluating dietary intake, exercise, medication, self-monitoring, hygienic and foot care. WHOQOL-BREF-THAI, comprising of 26 items, was used to investigate quality of life. A purposive sampling technique was used for selecting patients from two outpatient departments, surgical and rehabilitation. Data were collected between September 2009 and October 2010. Simple descriptive statistics were used to provide the basic information and Pearson's product moment was applied.*
Results: *The majority (51.3%) of study participants were males and in the age group of > 60 years (50%). Over half (61.5%) of the participants had a severity of foot ulcer at the first level. The analysis revealed that there was a negative significant association between fasting blood sugar and quality of life ($r = -0.30$, $p < 0.05$). Furthermore, diabetes self-management had a significant association with quality of life ($r = 0.35$, $p < 0.05$).*
Conclusion: *The results in the present study suggest that good quality of life is significantly related to good diabetes self-management and fasting blood sugar control in type 2 diabetes patients with foot ulcers. Therefore, these patients should be encouraged to perform self-management for controlling their blood sugar and improving their quality of life.*

Keywords: *Quality of life, Self-management, Diabetes, Foot ulcer*

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A chronic complication with diabetes is a full-thickness disruption foot ulcer, which can become a major disability[1,2]. Although it is not easy to obtain for exact figures regarding the prevalence or incidence of foot ulcers, the results of cross sectional community surveys in Thailand shows that 1.5% of people with diabetes had a history of active or previous foot ulcer[3]. According to study of patient experience, diabetic foot ulcers often result in a negative self-image and emotional distress, for example, fear, anxiety, depression, isolation, and decreased self-esteem due to the lifelong disability, reduced work hours, and increased the health care costs[1]. It is clear that foot ulcers can greatly affect a patient's quality of life.

The term "quality of life" is used in evaluating the general well-being of individuals and societies[4]. For health care, quality of life is often regarded in terms of how an illness that is not life threatening negatively affects an individual. This concept can be the subjective perception of patients who have different experiences, occupations, interests, education levels and cultures[5]. The literature reviewed regarding quality of life of patients with diabetic foot ulcers revealed that they suffered pain, sleep alteration and decreased home living conditions and social interaction[6].

Two main objectives in caring for people with diabetes have been established by the World Health

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Organization (WHO). Firstly, health care providers should maintain the health and quality of life of individuals with diabetes through effective patient care and education. Secondly, providers should treat complications of the disease and work to prevent such complication from developing. This would reduce treatment of health care cost as well as decrease morbidity and mortality[7].

Diabetes self-management and self-testing of fasting blood sugar are common among diabetes patients. Difficulties with diabetes self-management or non-adherence and poor control of blood sugar levels have been reported for diabetic patients[8]. Although studies have shown that diabetic self-management and FBS positively impact the quality of life in patients without diabetic foot ulcers[9], the effects of diabetes self-management and fasting blood sugar on quality of life in patients with diabetic foots ulcer have not been adequately examined in Thailand. The objective of this study was to examine the relationship between diabetes self-management, fasting blood sugar and quality of life in patients with diabetic foot ulcers.

Material and Method

This descriptive correlational research aimed to study the relationship between diabetes self-management, fasting blood sugar, and quality of life among patients with diabetic foot ulcers attending a surgical outpatient unit and rehabilitation unit. The inclusion criteria of the samples were that they were: diabetes patients over 18 years of age with type 1 and type 2 diabetes, were able to understand the Thai language, could read and complete an interview form, and attended the outpatient clinic of surgery and rehabilitation, Chulalongkorn Memorial Hospital. The exclusion criteria included cognitive impairments or mental illnesses as assessed by the researcher. Patients with other forms of foot ulcers (*e.g.* ingrown toenail) were excluded by clinical history and examination.

All patients were treated at the outpatient clinic between October 2002 and October 2003. The purposive sampling technique was used with a sample size calculated adopting Thorndike's formula: 10 (k) +50 when k was three variables; two independent variables including diabetes self-management and fasting blood sugar levels and one dependent variable which was quality of life. The resulting sample size was 80 subjects. These subjects were recruited from outpatient department surgery and the rehabilitation clinic. Both type 1 and type 2 patients were invited to participate in the present study. All participants had a foot ulcer grade 1 to grade 5 using Wagner's classification[10]. The present study was approved by the Human Subjects Review Committee of the Faculty of Medicine, Chulalongkorn University Institution Review Board (COA No 947/2009, IRB No. 380/52).

Instrument

The collection of data was performed through indirect and direct methods. The indirect method included a closed-end questionnaire comprised of a Quality of Life Questionnaire and Diabetes Self-Management Questionnaire.

Quality of life was assessed using the WHO BRIEF[11], which is a short form and well validated self -report questionnaire assessing health-related QOL within four domains: physical, psychological, social relationship and environment. The questionnaire was translated into the Thai language. The translations were reviewed and synthesized into a Thai version[12] of the questionnaire. On average, it took 10 minutes to the complete 26 items of the questionnaire. The scale is a 5-point Likert scale in which the subjects indicated three levels of quality of life. Scores ranged from 1-130. The level of 24-60 means poor quality of life, the level of 61-95 means moderate quality of life and the level of 96-130 means good quality of life. The Cronbrach's alpha coefficient of the scales for the Thai-version WHO BRIEF was 0.81.

The Diabetes Self-Management Questionnaire was assessed using the Summary of Diabetes Self-Care Activities (SDSCA) measure[13]. The questionnaire was translated into the Thai language and used with people with NIDDM in Thailand[14]. It included five components, namely: diet control, exercise, medication, self-monitoring and hygiene and foot care. This measurement assessed self-reported behavior, consisting of 19 items that required a response on an interval scale. The subjects had to answer regarding the previous seven days, addressing on how many days they performed each behavior. For the self-report questionnaire on diabetes self-management, the full mark for each dimension was seven days. The participants' diabetes self-management period would be considered as the minimum if the participant did not perform self-management at all and it would be considered as the maximum if the participant performed self-management seven days a week (every day). The marks for each component were added together and then divided by seven to form a single measure of diabetes self-management. The

Cronbrach's alpha coefficient of the scales for SDSCA was 0.77.

The direct method was blood analysis of the fasting blood sugar level. In accordance with the health system policy in Thailand, the fasting blood sugar value was determined for evaluation of the adherence of diabetes management in various health care settings. Therefore, fasting blood sugar value was collected from the patients' records for the last blood sugar assessment available within the past one month. The diabetes self-management level could be appropriately determined by the optimal mean fasting blood sugar of less than 130 mg/dl[15].

Data analysis

Data were analyzed using descriptive statistics to summarize the data. The Statistical Package for Social Sciences (SPSS) was used for the analyses. Descriptive statistics was used to analyze means, standard deviation (SD) and frequency of sociodemographic data. Bivariate correlation coefficiencies by Pearson product moment correlation coefficients were used to analyze associations between diabetes self-management, fasting blood sugar and quality of life. The specific statistical significance type I error was set at the < 0.05 level.

Results

Sociodemographic characteristics of participants with diabetic foot ulcers

Eighty participants were recruited. The characteristics of participants are shown in Table 1. Data are expressed as means, SD, or percentage (Table 1). Fifty one point three percent were male and 50% were more than sixty years old. In the present study, 37.5% of diabetic patients had no income. Moreover, 35% were primary school education level and 72.5% were married. In this group, 61.3% had a duration of diabetes of more than 10 years and 61.5% had severity at the first level. There were four settings where the participants received the diabetic care service: 47.5% of participants received general medical care, 5% preventive medical care, 15% from a diabetic care specialist and 32.5% were referred from other hospitals.

Fasting blood sugar

The American Diabetes Association (2011) suggests the blood sugar targets for non-pregnant adults with diabetes are dependent upon the individual. However, the assessment of fasting plasma glucose (before a meal) lower than 130 mg/dl was an appropriate control, but greater than or equal to 130 mg/dl was inappropriate. The analysis was based on 80 participants' pre-prandial plasma glucose results. In our study, 26.3% had FBS < 130 mg/dl, while 73% had FBS equal to or > 130 mg/dl.

Table 1. Demographic and disease characteristics of the participants

Variables	Number (n = 80)	Percentage
Sex		
Male	41	51.3
Female	39	48.8
Age (year)		
20-39	2	2.5
40-49	16	20.0
50-59	22	27.5
> 60	40	50.0
Income (Baht)		
No income	30	37.5
< 5,000	15	18.8
5,000-10,000	7	8.8
> 10,000	28	35.0
Education level		
No education	4	5.0
Primary school	28	35.0
Middle school	22	27.5
Certificated	9	11.3
Bachelor degree or higher	17	21.3
Status		
Single	13	16.3
Married	58	72.5
Widow	9	11.3
Duration of diabetes		
< 5 years	18	22.5
5-10 years	13	16.3
> 10 years	49	61.3
Setting		
Outpatient 1 (general medicine)	38	47.5
Outpatient 2 (preventive medicine)	4	5.0
Outpatient 3 (diabetic care unit)	12	15.0
Other hospital	26	32.5
Severity of foot ulcer		
Level 1	59	61.5
Level 2	24	25.0
Level 3	6	6.3
Level 4	2	2.1
Level 5	5	5.2
Fasting blood sugar		
< 130 mg/dl	21	26.3
≥ 130 mg/dl	59	73.8

Diabetes self-management

Medication was the highest mean score (mean = 5.58, SD = 2.39). The mean score for diet control was 4.16 (SD = 1.25), hygiene and foot care was 4.14 (SD = 2.79), self-monitoring was 3.72 (SD = 2.09) and exercise behavior was 1.03 (SD = 1.88), which was the lowest mean score (Table 2).

Table 3 shows that the highest mean score was "washed the feet carefully" (mean = 4.19, SD = 3.40) and the lowest score was "checked the feet carefully" (mean = 3.65, SD = 3.40). The total mean score of the four components was 3.87 (SD = 2.87).

In the present study, the self-report questionnaire on quality of life addresses physical health, psychosocial health, social relationship and environment. Table 4 shows the quality of life level displays the number and percentage of participants. The participants assessed their health to be "good", "moderate" or "poor". Sixty-three (78.8%) participants with diabetic foot ulcers had "moderate" total scores on the quality of life, while 10 participants (12.5%) had "good" quality of life and seven participants (8.8%) had "poor" quality of life. Considering each dimension, 22 (27%) participants perceived their physical health to be "good", 54 (67.5%) to be "moderate" and 4 (5.0%) to be "poor", while 25 (31.3%) participants perceived their psychosocial health to be "good", 54 (67.5%) to be "moderate" and 1 (1.3%) to be "poor". Regarding the social relationships dimension, 17 (21.3%) participants rated themselves as "good", 66.3% "moderate" and 12.5% "poor".

Correlation analyses

The relationships among diabetes self-management, fasting blood sugar and quality of life were investigated using Pearson product-moment correlation coefficient. There was a moderate correlation between diabetes self-management and quality of life ($r = 0.35$, $p < 0.01$). Furthermore, fasting blood sugar was negatively correlated with quality of life ($r = -0.30$, $p < 0.05$) (Table 5).

Discussion

In the present study, it was demonstrated that the quality of life of patients with diabetic foot ulcers is mainly at the moderate level (78.8%). The present study indicates that even though the largest percentage of patients were elderly (50%) and their physical condition was limited (including limitation from their treatment), most only had a severity of

Table 2. Diabetes self-management of participants with diabetic foot ulcers (n = 80)

Diabetes self-management	Mean	SD
Diet control	4.16	1.25
Exercise	1.03	1.88
Medication	5.58	2.39
Self-monitoring	3.72	2.09
Hygiene and foot care	4.14	2.79
Total	4.00	1.20

Table 3. Foot care behaviors of diabetic patients with foot ulcers (n = 80)

Foot care behavior	Mean	SD
Checked the feet carefully	3.65	3.40
Checked inside the shoe	3.89	3.40
Washed the feet carefully	4.19	3.40
Dried the feet carefully especially between toe after washing	3.79	3.45
Total	3.87	2.87

Table 4. Quality of life of diabetic patients with foot ulcers (n = 80)

Quality of life	Level					
	Good (96-130)		Moderate (61-95)		Poor (24-60)	
	Number	Percentage	Number	Percentage	Number	Percentage
Physical health	22	27.5	54	67.5	4	5.0
Psychosocial health	25	31.3	54	67.5	1	1.3
Social relationship	17	21.3	53	66.3	10	12.5
Environment	2	2.5	59	73.8	19	23.8
Total	10	12.5	63	78.8	7	8.8

Table 5. The relationships among FBS, diabetes self-management and quality of life

Variables	1	2	3
Total quality of life	1.00		
Total self-management	0.35**	1.00	
Fasting blood sugar	-0.30*	-0.17	1.00

** $p < 0.01$, * $p < 0.05$

foot ulcer at the first level (61.5%) with damage in the superficial skin or skin deep. Therefore, they were still able to perform many activities of daily life over the last four weeks. This finding agrees with the previous research that shows the overall quality of life of elderly patients with diabetes to be at the moderate level[15] and is consistent with the other studies related to diabetes complications. For example, the overall quality of life of end-stage renal disease patients was at the moderate level in physical, psychological, social relationships and environmental aspects[19].

The authors found that fasting blood sugar and diabetes self-management were associated with quality of life. It was indicated that there were many dimensions of diabetes self-management that patients had to perform such as diet control, regular exercise, medication adherence, self-monitoring, hygiene and foot care, which had an impact on their daily life. This result was also supported by other studies[16-18]. Before developing a foot ulcer, patients had to adapt their lifestyle to the diabetes regiment and after developing the foot ulcer, the degree of attention paid to their lifestyle increased.

Regarding the fasting blood sugar level of the participants, it was found that only 26.3% had appropriately controlled blood sugar lower than 130 mg/dl, while 73.8% had higher blood sugar than 130 mg/dl. This was because blood sugar values usually involve a number of behavioral changes that affect almost every aspect of a person's life including diet control, exercise, medication, self-monitoring of symptoms, and hygiene and foot care. Many participants had experienced nerve tissue damage and poor blood circulation that resulted in their needing to pay particular attention to their feet[19]. Therefore, some dimensions of diabetes self-management received low attention such as exercise. However, the results of the present study confirm a previous study reporting that the highest adherence for patients without diabetic foot ulcers was a medication regimen followed by self-monitoring at home with symptoms of hypoglycemia and hyperglycemia in the blood sugar level with the lowest adherence with lifestyle change of exercise[20,21]. It was indicated that participants with foot ulcers in the present study were more likely to adhere to the medication than to controlling diet, self-monitoring, foot care and exercise. Patients paid little attention to exercise with a mean of 2.05 days, indicating that participants were less likely to perform exercise. This could be due to having a foot ulcer, which limited their physical movement.

Conclusion

Patients with diabetic foot ulcers tend to experience a moderate quality of life. The highest percentage of these patients was elderly and had a severity at the first level. The majority also had a high level of fasting blood sugar. The efforts of the present study focused on patients with diabetic foot ulcers and encouragement for greater adherence is needed. Diabetes self-management education for patients with DM is an important strategy that may lead to improved fasting blood sugar, and better quality of life.

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Conflicts of interest

None.

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การจัดการตนเอง ระดับน้ำตาลในเลือดก่อนอาหารเช้าและคุณภาพชีวิตของผู้ที่เป็นเบาหวานชนิดที่ 2 ที่มีแผลที่เท้า

รุ้งระวี นาวีเจริญ

***ภูมิหลัง**: แผลที่เท้าในผู้ป่วยเบาหวานส่งผลกระทบด้านลบกับคุณภาพชีวิตและการจัดการตนเองถือเป็นองค์ประกอบสำคัญในการดูแลรักษาเบาหวาน อย่างไรก็ตามยังไม่มีการศึกษาที่แสดงถึงความสัมพันธ์ระหว่างการจัดการตนเอง ระดับน้ำตาล และคุณภาพชีวิตในผู้ที่เป็นเบาหวานชนิดที่ 2 ที่มีแผลเท้าที่เท้าในประเทศไทย*

***วัตถุประสงค์**: เพื่อศึกษาความสัมพันธ์ระหว่าการจัดการตนเอง ระดับน้ำตาลในเลือดและคุณภาพชีวิตในผู้ที่เป็นเบาหวานชนิดที่ 2 ที่มีแผลที่เท้า ซึ่งมารับการรักษาที่โรงพยาบาลจุฬาลงกรณ์ ประเทศไทย*

***วัสดุและวิธีการ**: การศึกษาครั้งนี้เป็นการศึกษาแบบตัดขวางในผู้ที่เป็นเบาหวานชนิดที่ 2 ที่มีแผลที่เท้าจำนวน 80 ราย ซึ่งได้รับการรักษาที่โรงพยาบาลจุฬาลงกรณ์ กลุ่มตัวอย่างตอบแบบสอบถามประกอบด้วย ข้อมูลพื้นฐาน ระดับน้ำตาลในเลือดก่อนอาหารเช้า แบบสอบถามการจัดการตนเองและคุณภาพชีวิตในผู้ที่เป็นเบาหวาน แบบสอบถามการจัดการตนเองประเมินเกี่ยวกับการรับประทานอาหาร การออกกำลังกาย การใช้ยา การเฝ้าระวังตนเอง สุขอนามัย และการดูแลเท้า แบบสอบถามคุณภาพชีวิตใช้แบบวัดคุณภาพชีวิต WHOQOL–BREF–THAI จำนวน 26 ข้อ เก็บข้อมูลเฉพาะเจาะจงจากคลินิกผู้ป่วยนอกศัลยกรรมและคลินิกเวชศาสตร์ฟื้นฟู ระยะเวลาการเก็บรวบรวมข้อมูลตั้งแต่เดือนกันยายน พ.ศ. 2552 ถึง ตุลาคม พ.ศ. 2553 วิเคราะห์ข้อมูลด้วยการใช้สถิติเชิงพรรณนา และสถิติสหสัมพันธ์เพียร์สัน*

***ผลการศึกษา**: พบว่าส่วนใหญ่เป็นเพศชาย ร้อยละ 51.3 อายุมากกว่า 60 ปี ร้อยละ 50 ในขณะที่เป็นผู้ป่วยที่มีความรุนแรงของแผลระดับ 1 ร้อยละ 61.5 เมื่อวิเคราะห์ความสัมพันธ์ ระหว่างระดับน้ำตาลในเลือดก่อนอาหารเช้าและคุณภาพชีวิตพบว่ามีความสัมพันธ์ทางลบอย่างมีนัยสำคัญ ($r = -0.30$, $p < 0.05$) และความสัมพันธ์ระหว่างการจัดการตนเองและคุณภาพชีวิตพบว่ามีความสัมพันธ์ทางบวกอย่างมีนัยสำคัญ ($r = 0.35$, $p < 0.05$)*

***สรุป**: จากผลการศึกษานี้เสนอแนะว่า คุณภาพชีวิตที่ดีสัมพันธ์กับการจัดการตนเองที่ดีและระดับน้ำตาลในเลือดก่อนอาหารเช้าในผู้ที่เป็นเบาหวานชนิดที่ 2 ที่มีแผลที่เท้า ดังนั้นผู้ที่เป็นเบาหวานมีแผลที่เท้าควรได้รับการส่งเสริมให้มีการจัดการตนเองเพิ่มขึ้น เพื่อนำไปสู่การควบคุมระดับน้ำตาลในเลือด และทำให้คุณภาพชีวิตดีขึ้น*