A Study on Oral Health-Related Quality of Life and Its Influencing Factors in Elderly Diabetic Patients

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Abstract: *Objective:* To investigate the oral health related quality of life in elderly diabetic patients and analyze its influencing factors. *Methods:* Convenience sampling was used to select 190 elderly patients with diabetes under the Department of Endocrinology and Department of Integrated Traditional Chinese and Western Medicine in the Affiliated Hospital of Hebei University as the research subjects. The Chinese version of the Oral Health Influence Scale (OHIP-14) was used to conduct a questionnaire survey, and univariate analysis and multiple stepwise regression analysis were used to analyze the influencing factors of oral health related quality of life in elderly diabetic patients. *Results:* The elderly diabetic patients' oral health related quality of life score was 34.48 ± 3.23, which is in the middle-lower range. The findings of multivariate stepwise regression analysis revealed that the course of disease, regular visits to the dentist, sleep quality, oral health knowledge, and oral health attitude together explained 58.9% of the total variance in elderly diabetic patients in terms of their oral health related quality of life ($p < 0.05$). *Conclusion:* The oral health related quality of life of elderly diabetic patients is generally low, and is affected by the duration of diabetes, sleep quality, and oral health knowledge, attitude, and behavior (regular visits to the dentist). Improving patients' attention to oral health problems by improving sleep as well as their own oral health knowledge, attitude, and behavior is an effective way to enhance oral health related quality of life.

Keywords: Elderly diabetic patients; Oral health knowledge; Oral health attitude; Oral health behavior; Sleep quality; Oral health related quality of life

1. Introduction

Diabetes mellitus (DM) is a common endocrine and metabolic disease, which belongs to the diabetes mellitus category in traditional Chinese medicine. Oral diseases caused by oral health issues in elderly diabetic patients are one of the complications. Oral health problems, such as gingival swelling and pain, bleeding, loose teeth, dentition defects, bad breath, etc., affect the oral health and quality of life of elderly diabetic patients to varying degrees [1]. However, the oral health related quality of life is also affected by many other factors [2]. This paper analyzes the oral health related quality of life and its influencing factors

in elderly diabetic patients, with the goal of increasing healthcare providers' awareness of oral problems in elderly diabetic patients and improving their oral health related quality of life.

2. Subjects and methods

2.1. Research subjects

From February 2020 to June 2021, convenience sampling was used to select 190 elderly DM patients under the Department of Endocrinology and the Department of Integrated Traditional Chinese and Western Medicine in a tertiary hospital in Baoding as the research subjects. Inclusion criteria: (1) age ≥ 60 years old; (2) patients who met the diagnostic criteria for DM based on the Chinese Diabetes Prevention and Control Guidelines formulated by the Diabetes Branch of the Chinese Medical Association; (3) barrier-free communication; (4) informed consent given. Exclusion criteria: (1) patients with oral diseases due to trauma or other reasons; (2) patients with acute complications, such as diabetic ketoacidosis requiring emergency treatment; (3) patients with severe liver and kidney injury or cardiovascular and cerebrovascular diseases.

2.2. Research methods

2.2.1. Research tools and measurement outcomes

2.2.1.1. Questionnaire on demographics

This includes the patient's gender, age, height, weight, educational level, marital status, household income, previous occupation, smoking, drinking, duration of DM, and treatment methods.

2.2.1.2. Questionnaire on knowledge, attitude, and behavior of oral health in elderly DM patients [3]

(1) Oral health knowledge: To investigate the understanding of DM patients on oral health care and common periodontal problems with a total of 9 questions, in which each question had three options: "Yes," "No," and "Don't know." Those who answered correctly were given 1 point, those who answered incorrectly were deducted a point (-1 point), and those who did not know were not given any points (0 point). The higher the score, the better the knowledge of oral hygiene.

(2) Oral health attitude: To understand the oral health attitude of DM patients with a total of 10 questions, in which each question had three options: "Agree," "Disagree," and "Don't know." Three points were given for positive attitude, three points were deducted for negative attitude (-3 points), and no points were given to those who do not know. The higher the score, the better the oral health attitude.

(3) Oral health behavior: To understand the oral hygiene habits and oral self-care status of DM patients with a total of 17 questions.

2.2.1.3. Pittsburgh Sleep Quality Index (PSQI)

The scale was developed by Buysse, et al. [4] in 1989 and translated by Liu Xianchen, et al., [5] in 1996 to evaluate the sleep quality of individuals in the previous month. Nineteen self-rating items and five other-rating items were combined into seven dimensions: subjective sleep quality, sleep latency, sleep time, sleep efficiency, sleep disturbance, hypnotic drug use, and daytime dysfunction. Each dimension was scored from 0 to 3 points. The total score ranged from 0 to 21 points. The higher the score, the worse the sleep quality.

2.2.1.4. Chinese version of Geriatric Oral Health Assessment Index (GOHAI)

Developed by Atchison, et al. [6] in 1990, the Chinese version of GOHAI was translated by Wang Adan, et al. [7,8]. The scale has 12 items in total under four dimensions: oral physiological function (3 items), pain and discomfort (3 items), psychological function (4 items), and behavioral influence (2 items). The items were scored using a 5-point scale: "Never" – 1 point; "Rarely" – 2 points; "Occasionally" – 3 points; "More often" – 4 points; "Often" – 5 points. Items 3, 7, and 11 used reverse scoring. The higher the score, the

worse the patient's oral health related quality of life.

2.2.2. Statistical processing
SPSS 22.0 statistical software was used to analyze the data, and the statistical methods used included descriptive statistics, t test, χ^2 test, and multiple stepwise regression analysis. $p < 0.05$ was considered statistically significant.

3. Results
3.1. Demographics
Among the 190 elderly diabetic patients, 102 were male patients (53.7%), while 88 were female patients (46.3%); the mean age was 71.68 ± 6.70, and the course of DM was 6 to 30 years; in terms of education level, there were 19 (10.0%) patients who had college qualification or above, 50 (26.3%) patients who had high school or technical secondary school qualification, and 121 (63.7%) patients who had junior high school qualification or lower; in terms of occupation before retirement, 88 (46.3%) patients were farmers, 77 (40.5%) were workers, 25 (13.2%) were cadres; in terms of per capita household monthly income, 26 (13.7%) patients had less than 1,000 yuan, 138 (72.6%) had between 1,000 and 5,000 yuan, and 26 (13.7%) had more than 5,000 yuan; in terms of the form of medical payment, 51 (26.9%) patients were self-paying, 61 (32.1%) were under employee medical insurance, 5 (2.6/%) received public funds, and 73 (38.4%) were under the new rural cooperative medical system.

3.2. Oral health knowledge, attitude, and behavior of elderly diabetic patients
In terms of oral health knowledge, the elderly diabetic patients' mean score was 3.50 ± 3.17 points; in terms of oral health attitude, their mean score was 18.20 ± 8.11 points; in terms of oral health behavior, more than 50% of them did not visit the dentist regularly; the main reason was that there were no issues with their teeth (93.40%). This shows that elderly diabetic patients do not pay much attention to their oral health; they still hold on to the concept of visiting the dentist only when they have a toothache. At least one-third of the patients brush their teeth more than twice a day and floss. Upon bleeding while flossing, 78.08% chose to ignore it, thinking that gargling is sufficient, while only 15.08% chose to seek medical attention. This shows that although some people practice good oral hygiene, they do not have the correct attitude towards oral health.

3.3. PSQI score
The total PSQI score of elderly diabetic patients was 7.68 ± 3.38 points, in which poor sleep quality (PSQI ≥ 8) accounted for 48.42% (92/190).

3.4. GOHAI scores
The GOHAI scores are shown in **Table 1**.

Table 1. GOHAI scores of elderly diabetic patients ($\bar{x} \pm s$)

Dimension	Score	Number of items
Total score	34.48 ± 3.23	12
Oral physiological function	8.98 ± 1.58	3
Pain and discomfort	9.05 ± 1.28	3
Psychological function	11.05 ± 1.81	4
Behavioral influence	6.18 ± 1.04	2

3.5. Influencing factors of oral health related quality of life of elderly diabetic patients
3.5.1. Univariate analysis
The univariate analysis of oral health related quality of life of elderly diabetic patients is shown in **Table 2**.

Table 2. Univariate analysis of oral health related quality of life of elderly DM patients (score, $\bar{x} \pm s$)

Variable	N (%)	GOHAI score	$t / \chi2$	p
Disease duration (years)			3.675	0.001
< 15	78 (41.1)	32.79 ± 6.03		
≥ 15	112 (58.9)	36.08 ± 2.23		
Educational level			-2.779	0.018
Junior high school and below	121 (63.7)	34.86 ± 5.34		
High school and above	69 (36.3)	32.68 ± 6.05		
Per capita household monthly income			-2.658	0.034
< 3000 yuan	94 (49.5)	35.89 ± 4.65		
≥ 3000 yuan	96 (50.5)	32.19 ± 6.10		
Blood sugar control			-2.708	0.023
HbA1c < 8	89 (46.8)	34.86 ± 5.34		
HbA1c ≥ 8	101 (53.2)	32.68 ± 6.00		
PSQI score			-3.785	0.001
PSQI ≥ 8	92 (48.4)	36.10 ± 2.34		
PSQI < 8	98 (51.6)	32.35 ± 6.06		
Oral health knowledge score			-3.009	0.001
< 4	119 (62.6)	36.11 ± 2.33		
≥ 4	71 (37.3)	32.34 ± 6.05		
Oral health attitude score			-2.941	0.005
< 18	65 (34.2)	35.80 ± 3.34		
≥ 18	125 (65.8)	32.76 ± 5.89		
Visit the dentist regularly			-5.346	0.001
Yes	78 (41.1)	32.16 ± 6.34		
No	112 (58.9)	36.28 ± 2.43		
Brush your teeth ≥ 2 times a day			-2.179	0.053
Yes	74 (38.9)	33.68 ± 5.00		
No	116 (61.1)	34.99 ± 5.99		
Habits of flossing			-2.158	0.054
Yes	77 (40.5)	33.77 ± 4.54		
No	113 (59.5)	34.86 ± 5.98		

3.5.2. Multivariate stepwise analysis

The multivariate analysis of the total GOHAI score is shown in **Table 3**.

Table 3. Multivariate analysis of total GOHAI score

Influencing factors	β	B	t	p
Constant		40.536	21.167	0.000
Course of disease	0.719	9.231	14.982	0.000
Visit the dentist regularly	-0.774	-4.307	-8.108	0.001
Sleep quality	0.645	3.512	6.425	0.002
Oral health knowledge	0.534	2.481	4.998	0.005
Oral health attitude	0.213	1.811	2.291	0.011

$R^2 = 0.589$

4. Discussion

The results of this study showed that the total GOHAI score of elderly diabetic patients was 34.48 ± 3.23 points, indicating that their oral health related quality of life is at a medium-low level, which is consistent with other studies [9]. Judging from the scores of each dimension, the oral health related quality of life in terms of oral physiological function, pain and discomfort, as well as behavioral influence needs to be improved, while the oral health related quality of life in terms of psychological function is relatively good. This suggests that oral problems cause physical distress to patients but have little effect on the psychological aspect. On one hand, it reflected the optimism in these patients, but on the other hand, it revealed that they did not participate in social activities.

The results of this study showed that the influencing factors of oral health related quality of life of elderly diabetic patients include disease duration, regular visits to the dentist, sleep quality, as well as oral health knowledge and attitude. The course of the disease was found to be negatively correlated with the patients' oral health related quality of life, mainly due to the bidirectional relationship between DM and oral diseases, such as periodontal disease. This means that the longer the course of the disease, the more serious the oral problems, resulting in a decline in oral health related quality of life [2].

The results of the regression analysis showed that sleep quality is an important factor predicting the oral health related quality of life of diabetic patients. Studies have shown that poor sleep induces an inflammatory response that increases the levels of pro-inflammatory cytokines, including C-reactive protein, interleukin-6, and tumor necrosis factor-α, while persistent inflammatory mediators may damage the hard tissues and soft tissues in the oral cavity, which further affects patients' oral health related quality of life [10]. Therefore, in clinical work, attention should be paid to the oral health status of patients with DM combined with sleep disorders, and timely and effective measures should be taken to improve their sleep quality, thereby promoting the oral health status of patients and improving their quality of life.

Studies have shown that the oral health status of DM patients in China is poor, and 78% of DM patients do not have proper DM-related oral health knowledge. Therefore, strengthening the understanding of oral knowledge in elderly diabetic patients can improve their oral health. A survey in Japan showed that the mastery of DM-related oral health knowledge affects the oral health related quality of life of patients, in which patients with higher awareness of DM-related oral health knowledge have better oral health related quality of life. Therefore, improving the oral health knowledge of elderly diabetic patients is crucial to improving their oral health related quality of life. This study shows that the oral health related quality of life of elderly diabetic patients is affected by their own oral health behavior. The oral health related quality of life of patients who brush more than or 2 times a day and visit the dentist regularly was significantly

higher than that of patients who do not ($p < 0.05$). The "Know-Trust-Do" model is a well-established model for cultivating health promotion behaviors. It is recommended that healthcare providers should strengthen oral health-related knowledge among patients, help patients develop positive and correct attitudes, as well as assist them in transforming their oral health behaviors and improving their oral health related quality of life.

The oral health related quality of life of elderly diabetic patients in China is generally low and requires improvements. The oral health related quality of life of patients is affected by the course of the disease, the quality of sleep, and oral health-related knowledge, attitude, and behaviors (regular visits to the dentist, etc.). Therefore, enhancing patients' attention to oral health problems caused by DM, improving sleep, and enhancing their oral health-related knowledge, attitude, and behaviors are effective methods to improving the oral health related quality of life.

Disclosure statement

The author declares no conflict of interest.

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