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Original Article

Nursing interventions guided by the theory of stress and adaptation improve the self-management ability of T2DM patients

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Abstract: Objective: To investigate the effects of nursing interventions based on stress and accommodation theory on the mental state and self-management competence of patients with type 2 diabetes mellitus (T2DM). Methods: Fifty-five T2DM patients admitted to our hospital in 2022 who received standard nursing interventions were selected as the control group, and 61 T2DM patients admitted in 2023 who received stress and adaptation theory-based nursing intervention in addition to standard nursing interventions were enrolled as the observation group. Changes of blood glucose levels, mood state score, self-management competence and life quality were compared between the two groups before and after intervention. Results: Post-intervention, HBA1c, fasting blood glucose and 2-hour postprandial blood glucose in both groups were remarkably reduced compared to pre-intervention levels (all $P<0.05$), with the observation group showing clearly lower levels than those in control group (all $P<0.05$). Post-intervention, both groups exhibited significant improvements in self-esteem and energy scores (all $P<0.05$), while the scores of panic, tension, fatigue, anger and depression all decreased (all $P<0.05$). The observation group showed greater improvements in mood state scores compared to the control group (all $P<0.05$). Self-management ability scores significantly improved across all dimensions in both groups ($P<0.05$), with the observation group outperforming the control group ($P<0.05$). The FoP-Q-SF score and DSQL score of life quality decreased significantly in both groups after the intervention (all $P<0.05$), with the observation group showing apparently lower post-intervention scores than the control group (all $P<0.05$). Conclusion: Nursing intervention based on stress and accommodation theory effectively improve blood sugar control, psychological well-being, self-management competence, and quality of life in T2DM patients, making it valuable for clinical promotion.

Keywords: Stress and accommodation theory, nursing intervention, T2DM, mood state, self-management ability

Introduction

Type 2 diabetes mellitus (T2DM) is a metabolic disorder characterized by hyperglycemia, which results from insufficient insulin secretion or islet dysfunction [1]. T2DM is the result of interaction of genetic and environmental factors. According to the International Diabetes Federation, the global number of diabetic patients will reach 592 million by 2035, with T2DM being the most prevalent type. As a result, diabetes has emerged as a serious global public health concern [2]. The pathogenesis of diabetes is complex, and there is currently no effective cure. Therefore, T2DM patients require lifelong treatment. As the disease progresses, a series of complications such as diabetic nephropathy, ketoacidosis, diabetic foot and blindness may occur. These complications impose a significant psychological burden on patients, leading to high levels of psychological stress and reducing their compliance to treatment [3, 4]. While conventional nursing interventions are commonly used in clinical practice, there is a lack of effective approaches to address patients' psychological well-being and self-management ability. Therefore, implementing proactive and effective nursing interventions to alleviate the psychological stress of T2DM patients is of great significance for improving their mental health, enhancing treatment adherence, and controlling disease [5, 6].

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Stress and adaptation theory is a nursing-related theory that helps individuals in managing their stress response by identifying and addressing their stressors. This theory suggests that stress can lead to adaptive responses in patients, which can affect both physiological and psychological well-being. Successful adaptation is crucial for long-term stress management. If the adaptive response effectively manages the stress, the patient can maintain a stable state; however, if the adaptive response fails, it may lead to physical and psychological imbalances [7, 8].

In recent years, nursing interventions based on stress and adaptation theory have been increasingly applied in the care of patients with chronic diseases such as coronary heart disease and malignant tumors. These interventions help patients cope with the stress associated with long-term illnesses and have been shown to effectively reduce patients' negative emotions and promote positive coping strategies, thus supporting the overall treatment process [9, 10]. The aim of this study is to investigate the effectiveness of stress and adaptation theory based nursing intervention in patients with T2DM.

Data and methods

Clinical data

This retrospective study involved 55 T2DM patients admitted to our hospital in 2022 who received standard nursing interventions (control group) and 61 T2DM patients admitted in 2023 who received stress adaptation theory-based nursing interventions (observation group). This study was approved by the ethics Committee of Wuhan Fourth Hospital.

Inclusion criteria

(1) Patients met diagnostic criteria for T2DM outlined in Chinese Guidelines for the Prevention and Treatment of T2DM (2017 Edition) [11]; (2) Aged between 30 and 80 years of age; (3) Patients with clear cognitive awareness and no language communication barriers; and (4) Patients with complete clinical data.

Exclusion criteria

(1) Patients with dysfunction in major organs such as heart, liver, kidney, and lungs; (2) Patients with malignant tumors and systemic immune diseases; (3) Patients with mental or cognitive impairments; (4) Patients with acute complications of diabetes, including diabetic ketoacidosis, hypoglycemia coma or hyperglycemia hyperosmotic state; or (5) Pregnant women.

Methods

The control group received standard nursing interventions, including health education, explanation of disease-related knowledge, education on the importance of exercise and dietary management in disease control, guidance on adhering to prescribed medications, and psychological counseling to alleviate negative emotions. Patients were also advised to have their blood sugar regularly monitored.

The observation group received stress adaptation theory-based nursing intervention in addition to the conventional nursing provided to the control group. The detailed procedures are as follows: (1) Establishing a nursing team: The head nurse of the department served as the team leader, subordinated by five nurses (bachelor's degree or above and junior professional titles) with solid theoretical knowledge and rich nursing experience. Before implementing the nursing, the members underwent training on stress-adaptation theory and reinforced their knowledge of T2DM. They passed an assessment upon completing their training before assuming their duties. (2) Identifying sources of stress: The team members warmly welcomed patients upon admission and assisted them in completing hospitalization procedures. The nursing team introduced the environment of hospital and the management system of the department to the patients, actively engaging with them to evaluate their understanding of the disease and identify sources of stress. Common stressors included lack of confidence in treatment, fear of the disease, loss of self-esteem, and insufficient family support. (3) Analyzing pressure response: Throughout their interactions, team members closely observed the stress response of patients to identified stressors, which manifested in various ways, such as anxiety, restlessness, fear, loneliness, withdrawal, tension, anger, and apathy. (4) Relieving stress: Based on the identified sources of stress and the evaluation of patients' stress responses, a customized stress-adapta-

tion nursing intervention program was developed. Nursing staff actively communicated with family members to gain their cooperation and jointly implement the intervention. In addition, sufficient family and social support were provided with patients to alleviate patients' inner stress, particularly when family support was insufficient. Nurses delivered one-on-one education to explain T2DM in detail, emphasizing the importance of treatment adherence for disease control and teaching self-care skills. Nurses also monitored patients' psychological states, explaining the causes of different stress responses triggered by various stressors. Psychological counseling was provided to help patients release internal pressure. Throughout the process, nurses maintained empathy, encouraged and comforted patients, alleviated pessimistic emotions, and helped build confidence in treatment. Both groups of patients were evaluated three months after the intervention.

Observation of indicators

(1) Blood sugar control: 5 ml of peripheral venous blood were collected from both groups before and after intervention and centrifuged for 10 min (3000 r/min). Glycated hemoglobin, fasting blood glucose, and 2-hour postprandial blood glucose were measured using a Mindray BS-280 automated biochemical analyzer (Shenzhen Mindray Biomedical Electronics Co., Ltd.).

(2) Mental state: The Profile of Mood States (POMS) was used to assess subjects' mental state before and after the intervention. The scale includes dimensions such as self-esteem, panic, tiredness, depression, anger, tension and energy [12]. The POMS scale consists of 40 items, scored from 0-4 points, with a total score ranging from 0 to 120. Higher scores indicate more severe mood disturbances.

(3) Self-management competence: The self-management competence was assessed by the Summary of Diabetes Self-Care Activities (SDSCA) [13] before and after intervention. The scale comprises four dimensions: total diet, specific diet, exercise, blood glucose monitoring and foot care, with each dimension containing two items. Each item is scored from 0 to 7, with one item reverse scored. A higher total score reflects better self-management competence.

(4) Fear of disease progression: The Fear of Progression Questionnaire-Short Form (FOP-Q-SF) was administered to assess fear of disease progression before and after intervention. The scale includes two dimensions of physical health and social family, with a total of 12 items. Each item is rated using a 5-point Likert scale, with total scores ranging from 12 to 60. Higher scores indicate a greater fear of disease progression.

(5) Quality of life: The Diabetes Specific Quality of Life (DSQL) [15] was used to assess patients' quality of life before and after the intervention. The scale consists of 27 items divided into 4 dimensions: physiological function (12 items), psychology/spirit (8 items), social relationship (4 items), and treatment plan (3 items). Each item is scored from 1 to 5, with higher scores indicating greater impairment in quality of life.

(6) Nursing satisfaction: Post-intervention nursing satisfaction was measured using a hospital-developed questionnaire. The scale includes 20 items, each with a score of 1 to 5 points. The higher the score, the higher the patient's satisfaction with nursing. Scores of 90-100 are considered "very satisfied", 80-89 "satisfied", and scores below 89 is considered "dissatisfied".

Statistical analysis

SPSS 27.0 was used for statistical analysis. The comparison of quantitative data (mean ± SD) was conducted by *t*-test, while the comparison of count data (n, %) was conducted by χ^2 test. The difference was statistically significant when $P<0.05$.

Results

Comparison of baseline data between the two groups

In the observation group, there were 35 males and 26 females, with an average age of (51.23±8.36) years, an average BMI of (24.52±3.06) kg/m^2, and an average disease duration of (5.68±1.78) years. Among them, 22 patients (36.07%) were smokers, 16 had hypertension (26.23%), 10 had coronary heart disease (16.39%), and 27 had a junior high school education or below, and 34 had a high school education or above. In the control group, there

Table 1. Comparison of baseline data between the two groups

Clinical data	Observation group (n=61)	Control group (n=55)	t/χ^2	*P*
Gender				
Male	35	32	0.008	0.930
Female	26	23		
Age (years, $\bar{x}\pm s$)	51.23±8.36	52.83±7.95	0.985	0.327
BMI (kg/m^2, $\bar{x}\pm s$)	24.52±3.06	24.19±2.73	0.610	0.543
Course of disease (years, $\bar{x}\pm s$)	5.68±1.78	5.85±1.84	0.506	0.614
Smoking (n, %)	22 (36.07)	19 (34.55)	0.029	0.864
Hypertension (n, %)	16 (26.23)	15 (27.27)	0.016	0.899
Coronary heart disease (n, %)	10 (16.39)	7 (12.72)	0.311	0.577
Education degree				
Junior high school and below	27 (44.26)	25 (45.45)	0.017	0.898
High school and above	34 (55.74)	30 (54.54)		

Note: BMI: Body mass index.

Table 2. Comparison of blood glucose control between the two groups ($\bar{x}\pm s$)

Group	Time	Glycosylated hemoglobin (%)	Fasting blood glucose (mmol/L)	2-hour postprandial blood glucose (mmol/L)
Observation group (n=61)	Pre-intervention	9.18±0.73	13.16±1.87	18.27±4.23
	Post-intervention	7.12±0.77*	6.84±0.93*	10.52±2.75*
	T	15.164	23.635	11.997
	P	<0.001	<0.001	<0.001
Control group (n=55)	Pre-intervention	9.09±0.81	12.97±1.69	19.63±3.93
	Post-intervention	7.85±0.63	9.64±1.32	14.30±3.15
	T	8.962	11.516	7.848
	P	<0.001	<0.001	<0.001

Note: Compared with the control group during the same period, *P<0.05.

were 32 males and 23 females, with an average age of (52.83±7.95) years, an average BMI of (24.19±2.73) kg/m^2, and an average disease duration of (5.85±1.84) years. In this group, 19 were smokers (34.55%), 15 had hypertension (27.27%), 7 had coronary heart disease (12.72%), and 25 had a junior high school education or below, and 30 had a high school education or above. There were no significant differences in the clinical data between the two groups (all P>0.05) (**Table 1**).

Comparison of blood sugar control between the two groups

After the intervention, HbA1c, fasting blood glucose, and 2-hour postprandial blood glucose levels in both groups was remarkably reduced compared to pre-intervention levels (all P< 0.05). Additionally, the observation group showed clearly lower levels than those in the control group after intervention (all P<0.05) (**Table 2**).

Comparison of mood state score between the two groups

After the intervention, both groups showed significant increases in self-esteem and energy scores (all P<0.05), while that of panic, tension, fatigue, anger and depression significantly decreased (all P<0.05). The observation group demonstrated greater improvements across all dimensions of mood state compared to the control group (all P<0.05), as listed in **Table 3**.

Comparison of self-management competence between the two groups

Post-intervention scores for all dimensions of self-management competence were significantly higher in both groups compared to pre-intervention levels (all P<0.05). Furthermore, the observation group had apparently higher scores than the control group across all measured dimensions (all P<0.05), as shown in **Table 4**.

Table 3. Comparison of mood state scores between the two groups ($\bar{x}$±s)

Index	Observation group (n=61)				Control group (n=55)			
	Pre-intervention	Post-intervention	t	P	Pre-intervention	Post-intervention	t	P
Sense of self-esteem	12.01±1.56	17.94±2.02*	18.147	<0.001	12.31±1.77	15.48±1.93	8.977	<0.001
Energy	14.97±2.30	21.17±3.42*	11.749	<0.001	15.13±2.41	18.39±3.08	6.182	<0.001
Panic	16.11±3.12	11.26±2.73*	9.137	<0.001	16.30±3.07	13.42±2.36	5.516	<0.001
Strain	20.35±3.18	14.57±2.64*	10.923	<0.001	20.64±2.97	17.35±2.32	6.474	<0.001
Fatigue	22.13±3.47	13.20±2.05*	17.305	<0.001	21.85±2.42	16.41±1.94	13.008	<0.001
Anger	21.82±3.21	12.04±2.74*	18.099	<0.001	22.17±2.84	15.30±3.12	12.076	<0.001
Suppression	19.84±2.51	11.73±1.98*	19.813	<0.001	19.15±2.77	15.74±2.12	7.250	<0.001

Note: Compared with the control group during the same period, *P<0.05.

Table 4. Comparison of self-management ability between two groups ($\bar{x}$±s)

Index	Observation group (n=61)				Control group (n=55)			
	Pre-intervention	Post-intervention	t	P	Pre-intervention	Post-intervention	t	P
Total diet	6.10±1.38	9.97±1.93*	12.739	<0.001	6.21±1.73	8.27±1.66	6.372	<0.001
Specific diet	5.25±1.33	9.44±1.75*	14.888	<0.001	5.37±1.40	7.82±1.68	8.309	<0.001
Exercise	5.11±1.47	8.94±1.16*	15.975	<0.001	5.03±1.39	7.21±1.08	9.185	<0.001
Blood glucose monitoring	4.97±1.60	11.03±2.17*	17.555	<0.001	4.82±1.57	8.29±2.01	10.090	<0.001
Foot care	4.73±1.02	10.26±2.41*	16.504	<0.001	4.82±1.19	7.94±2.20	9.251	<0.001

Note: Compared with the control group during the same period, *P<0.05.

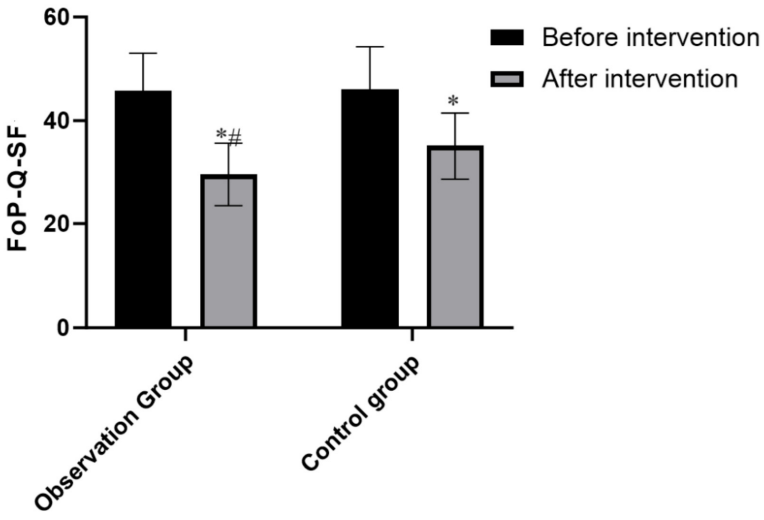

Figure 1. Comparison of FoP-Q-SF score between the two groups ($\bar{x}$±s). Note: FOP-Q-SF, Fear of Progression Questionnaire-Short Form; Compare with pre-treatment, *$P<0.05$; Compared with the control group, #$P<0.05$.

Comparison of fear of disease progression (FoP-Q-SF) between the two groups

The FoP-Q-SF scores decreased significantly in both groups after intervention (P<0.05), and the observation group demonstrated lower post-intervention scores compared to the control group (P<0.05) (**Figure 1**).

Comparison of quality of life between the two groups

Post-intervention, DSQL score in both groups decreased notably compared to pre-intervention levels (P<0.05). Additionally, the observation group had lower post-intervention DSQL scores than the control group (P<0.05) (**Figure 2**).

Comparison of nursing satisfaction between the two groups

In the observation group, 55 patients (90.16%) were very satisfied, 5 cases (81.97%) were satisfied, and 1 case (1.64%) was unsatisfied. In the control group, 38 cases (69.09%) were very satisfied, 11 cases (20.00%) were satisfied, and 5 cases (10.91%) were unsatisfied. The nursing satisfaction rate in the observation group was sig-

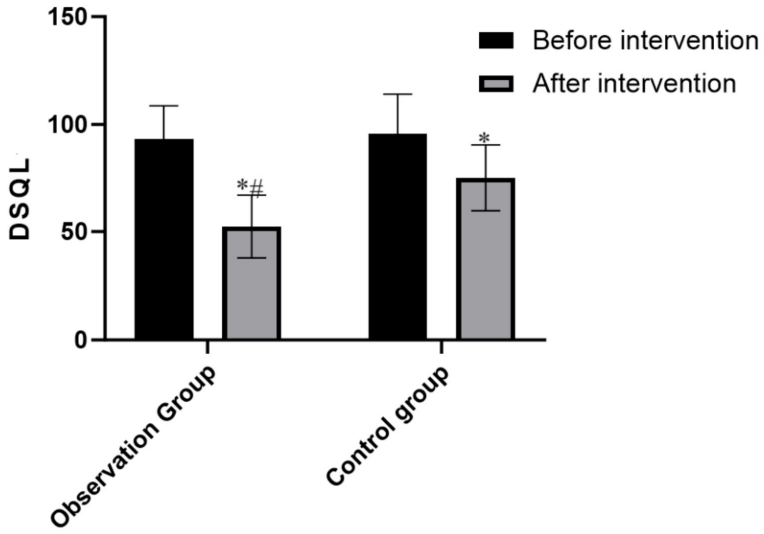

Figure 2. Comparison of DSQL between the two groups. Note: DSQL, Diabetes Specific Quality of Life; Compared with pre-treatment, $^{*}P<0.05$; Compared with the control group, $^{\#}P<0.05$.

Table 5. Comparison of nursing satisfaction rate between the two groups [n (%)]

Group	n	Very satisfied	Satisfied	Unsatisfied
Observation group	61	55 (90.16)	5 (81.97)	1 (1.64)
Control group	55	38 (69.09)	11 (20.00)	6 (10.91)
Z	-		2.891	
P	-		0.004	

nificantly higher than that in the control group ($P<0.05$) (**Table 5**).

Discussion

Type 2 diabetes mellitus (T2DM) has a high prevalence in middle-aged and elderly people. In China, the number of T2DM patients is increasing with the aggravation of population aging. After diagnosis, patients need long-term medication to control disease progression, which can lead to negative psychological emotions and an increased burden of self-perception regarding their condition [13-17]. Conventional nursing mainly focuses on the disease itself and the physiological needs of the patient, aiming to improve symptoms and alleviate pain. However, the overall effectiveness is often suboptimal due to insufficient attention to the psychological well-being of patients [18-21].

Research has reported that the changes in patients' mood state often stem from the psychological pressure brought by diseases and its complications. Individuals may develop both psychological and physiological adaptive behaviors in response to stress. The deviation of adaptive behavior will lead to individual imbalance and deterioration of the situation, which is the core of the application of stress and adaptation theory [22-24]. Based on the theory of stress and adaptation, nursing interventions help patients adapt to various stresses, thereby improving their negative psychological moods [25-27]. The aim of this research was to improve the mood state and self-management abilities of T2DM patients, ultimately improving their quality of life. The study demonstrated that the blood glucose control in the observation group was superior to that in control group after intervention, and the improvements in mood state scores across various dimensions were more significant than those of the control group. Moreover, the self-management ability scores in all dimensions were notably higher than those of the control group. These findings are consistent with results reported by other scholars [28-31]. By applying the theory of stress and adaptation, we focused on the patient's response to stressors and provided targeted interventions to enhance their adaptive responses. This approach can help improve patients' mental state, increase their enthusiasm and help them adherence to treatment, and strengthen their ability to control the disease, which further enhances their confidence in disease management, forming a positive cycle.

In addition, FoP-Q-SF scores of patients in the observation group was remarkably lower than that of control group, and DSQL score for quality of life was notably lower in the observation group. Through the application of stress and adaptability theory, nurses can quickly identify the primary stressors affecting patients. By implementing adaptive nursing interventions in response to these stressors, nursing staff can help patients improve both their psychological

and physiological states, improve their ability to control and manage the disease, reduce their fear of disease progression, and improve their quality of life [32-35].

However, due to the relatively small sample size and the lack of long-term follow-up data on patient prognosis, further studies with larger sample sizes and extended observation periods are necessary to obtain more reliable findings.

Conclusion

In summary, nursing intervention based on the theory of stress and adaption can help control blood sugar levels, improve psychological well-being, enhance self-management abilities, and improve the quality of life for T2DM patients, making this approach worthy of broader clinical application.

Disclosure of conflict of interest

None.

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