



A Correlational Study on Diabetes - related Stress and Self-management Behaviors in Middle-aged and Young Patients with Type 2 Diabetes

Xule Wang^{1*}, Siriluck Jittrabiab², Thanawat Imsomboon³ and Yanli Hu⁴

^{1,2,3}Public Health Program, Graduate School, Suan Sunandha Rajabhat University, Thailand

⁴Guangzhou Medical University, China

^{1*}E-mail: 12014170@xcu.edu.cn, ORCID ID: <https://orcid.org/0009-0004-8196-1715>

²E-mail: siriluck.ji@ssru.ac.th, ORCID ID: <https://orcid.org/0009-0003-5284-2023>

³E-mail: thanawat.im@ssru.ac.th, ORCID ID: <https://orcid.org/0009-0008-3878-8397>

⁴E-mail: huyanli1212@126.com, ORCID ID: <https://orcid.org/0000-0002-1517-616X>

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Abstract

Background and Aim: As a common chronic metabolic disease, Type 2 diabetes mellitus affects a large number of people globally and in China, with a notable trend of younger onset. Middle-aged and young diabetic patients often face multiple stressors. This study aims to investigate the relationship between diabetes-related stress and self-management behaviors in middle-aged and young patients with type 2 diabetes, providing insights for blood glucose control and health improvement.

Materials and Methods: Using convenience sampling, we recruited type 2 diabetic patients aged 18–59 years admitted to the endocrinology departments of two hospitals in Xuchang City between October 2024 and February 2025. Data were collected via a cross-sectional survey using a demographic questionnaire, the Summary of Diabetes Self-Care Activities Measure (SDSCA), and the Appraisal of Diabetes Stress Scale (ADS). Descriptive statistics, univariate analysis, and Pearson correlation analysis were performed to analyze the data.

Results: A total of 317 questionnaires were collected, with 286 valid responses (response rate: 90.2%). The mean score on the diabetes stress scale was 3.12 ± 0.57 , and the mean score on the self-management scale was 3.89 ± 0.98 . Significant differences in self-management behaviors were observed by gender and the presence of diabetic complications, with male patients and those with complications demonstrating lower behavioral compliance. Diabetes-related stress was negatively correlated with self-management behaviors ($r = -0.561$, $P < 0.01$).

Conclusion: There is a significant correlation between diabetes-related stress and self-management behaviors in middle-aged and young type 2 diabetic patients, where higher stress is associated with lower self-management behavior levels. Among self-management behaviors, foot care scored the lowest, with male patients and those with diabetic complications exhibiting poorer self-management. It is recommended to establish a multi-dimensional support system, address psychological stress in complicated cases, and enhance foot care capabilities among male patients. However, the study's limitation in sampling from only two hospitals necessitates further validation of the findings' generalizability.

Keywords: Diabetes; Middle-aged and Young Adults; Self-management Behaviors; Diabetes-related Stress

Introduction

Type 2 diabetes mellitus (T2DM) has emerged as a major global public health challenge, with a significant trend of younger onset worldwide (Khan et al., 2020). In China, the prevalence rate of chronic diseases among middle-aged and young adults has increased by 87.4%–144.4%, significantly higher than in other groups (Liu & Liu, 2025). The prevalence of T2DM reaches 2% in individuals aged 18–29 years and rises to 6.3% in those aged 30–39 years (Li et al., 2020), making middle-aged and young adults the population with the fastest-growing prevalence. Self-management serves as the cornerstone of diabetes treatment, and effective management can reduce reliance on medications. As the core workforce in society and families, middle-aged and young patients experience multidimensional diabetes-related stress: young patients often suffer from stigma due to societal misunderstandings about diabetes, with those refusing to accept their disease identity showing significantly lower self-management compliance (Dong & Guo, 2024). Among middle-aged patients, 47.1% perceive the burden of medical costs as "heavy," and 28% are forced to reduce monitoring frequency, delay medical visits, or decrease insulin doses due to financial stress, directly impacting disease control (Leng et al., 2021).

Previous studies on stress and self-management have found that interpersonal stress (DDS4) has a more significant impact on self-management in early-onset T2DM patients (<40 years) compared to late-

onset groups (S. K. W. Wong, 2022). Another study showed that the "physician-related distress" score in the 45–59-year-old group reached 1.8 ± 1.5 , ranking equally with "emotional stress" (M. H. Wong et al., 2024). Stress has been confirmed to induce emotional disturbances such as anxiety and depression and affect glycemic homeostasis through the hypothalamic-pituitary-adrenal axis (Joseph & Golden, 2017). Despite the extensive exploration of the association between stress and self-management, research on diabetes stress in middle-aged and young subgroups has significant gaps: ① Lack of age-stratified research: Most studies broadly categorize individuals aged 18–59 years as "middle-aged and young," ignoring the differences in psychological impact of newly diagnosed diseases among 18–25-year-olds and the comorbidity risks of chronic diseases among 45–59-year-olds. ② Unclear weighting of stressors: Existing literature has not systematically compared stress dimension differences across age groups, leading to a lack of precision in intervention strategies.

Research Questions

- (1) To reveal the differential effects of sociodemographic and clinical characteristics on diabetes-related stress.
- (2) To reveal the differential effects of sociodemographic and clinical characteristics on diabetes self-management behaviors.
- (3) To analyze how different dimensions of diabetes-related stress in three groups—young adults (18–25 years), adults (26–44 years), and middle-aged adults (45–59 years)—correlate with specific self-management behaviors.

Literature Review

Diabetes-related stress encompasses the multiple burdens experienced by patients during disease diagnosis, treatment, and long-term management. Ranjan et al. (2023) noted that this stress includes not only the burden of disease management, such as strict daily dietary control and frequent blood glucose monitoring, but also the lack of social support, such as insufficient family understanding and limited social activities. Economic stress, including long-term treatment costs and expenses for special medications and medical devices, is also a critical component (Ranjan et al., 2023). When these stresses remain unmanaged over time, they can evolve into diabetes distress (DD) through the pathway of "stress perception → emotional arousal → the solidification of negative emotions." This transformation fundamentally reflects an imbalance between an individual's stress-coping resources (e.g., psychological resilience, social support) and stress load: when patients lack effective emotional release channels or sufficient disease knowledge to interpret stressors, prolonged stress stimuli activate negative emotional processing pathways, transforming transient experiences of worry, fear, and frustration into chronic distress states (Vaughan et al., 2022).

Globally, approximately 36% of adult T2DM patients experience DD, with potentially higher rates in China (Zhang et al., 2022). Middle-aged and young T2DM patients face particularly high stress levels due to their roles in career development and family responsibilities, requiring them to balance multiple roles such as work and family, which often leads to significantly higher DD levels than other age groups. Perrin et al. demonstrated that DD has a more pronounced impact on self-management behaviors than depression (Perrin et al., 2017). Because DD directly focuses on "frustration in disease management," patients may actively enhance self-management behaviors (e.g., stricter blood glucose monitoring, better medication adherence) to alleviate negative emotions by continuously worrying about glycemic control and complication risks. This "emotion-driven self-management" is particularly evident in younger patients with shorter disease duration and unstable disease cognition.

However, research conclusions are not entirely consistent. Chlebowy et al. found no significant correlation between DD and self-management behaviors such as blood glucose monitoring, foot care, and medication adherence (Chlebowy et al., 2019). Some patients adopt "avoidant coping" strategies (e.g., deliberately ignoring blood glucose fluctuations or delaying complication management), weakening the

driving effect of DD on behavior. Given the current gaps in understanding the "emotion-behavior" association mechanism and the precision of intervention strategies, this study examines the correlation between diabetes-related stress and self-management behaviors in middle-aged and young T2DM patients based on the pathway of "stressor → emotional transformation → behavioral impact."

Conceptual Framework

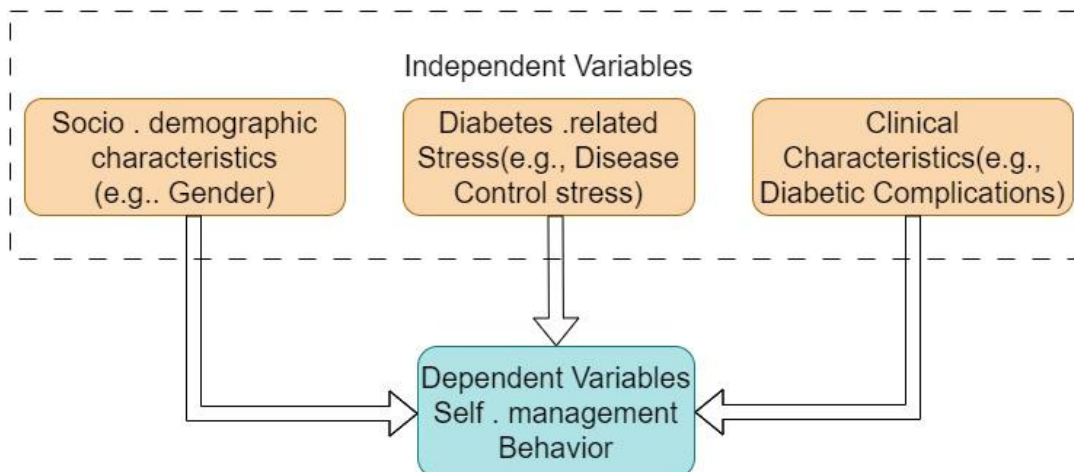


Figure 1 Conceptual Framework
Note: Constructed by the author

Methodology

Sampling and Participants

Using convenience sampling, middle-aged and young patients with type 2 diabetes mellitus (T2DM) admitted to the endocrinology departments of Xuchang People's Hospital and Xuchang Hongyue Hospital between October 2024 and February 2025 were recruited. This study was approved by the Ethics Committee of Xuchang University (Approval No. [2024015]). During recruitment, participants were fully informed about the study's purpose, methods, content, potential risks, and benefits. After obtaining voluntary consent, age information was collected, and participants were stratified into three subgroups: young adults (18–25 years), adults (26–44 years), and middle-aged adults (45–59 years).

Inclusion Criteria: (1) Diagnosed with T2DM according to the *Chinese Type 2 Diabetes Prevention and Treatment Guidelines (2020 Edition)*, confirmed by reviewing medical records (including blood glucose test results and glycosylated hemoglobin levels) and verified by attending endocrinologists. (2) Aged 18–59 years according to WHO age classification standards.

Exclusion Criteria: (1) Pregnant or lactating patients. (2) Patients with severe impairment of vital organs (e.g., liver, lung, kidney) or other serious diseases. (3) Patients with cognitive or mental disorders. A total of 317 questionnaires were collected, and 286 valid questionnaires were obtained after excluding invalid ones, with a valid response rate of 90.2%.

Research Instruments

Demographic Questionnaire

Designed by the researchers, the sociodemographic section includes 10 items: gender, age, ethnicity, marital status, living arrangement, residential location, education level, occupation, monthly income, and medical payment method. The disease-related section includes 7 items: diabetes duration, diabetic complications, treatment modality, fasting blood glucose level, glycosylated hemoglobin level, history of hypoglycemia, and alcohol consumption.

Diabetes Self-Management Behavior Scale



The Summary of Diabetes Self-Care Activities (SDSCA) scale developed by Toobert and colleagues was used. This scale contains 13 items covering six dimensions: diet, exercise, blood glucose monitoring, foot care, medication adherence, and smoking status. Except for the smoking status item, all items ask about the number of days (0–7 days) participants performed the corresponding behaviors in the past week. The score for each dimension is the average of the items within that dimension. The smoking status item only records the number of smokers and daily cigarette consumption, which is not included in the total score. The total scale score is the sum of all dimension scores, with higher scores indicating better self-management behaviors. This scale has been validated to have good reliability and validity in China, with a Cronbach's α of 0.895 in this study.

Diabetes Stress Scale

The Appraisal of Diabetes Scale (ADS), initially developed by Carey, was translated into Chinese by Chinese scholar Cheng Li and has been confirmed to have good internal consistency (Cronbach's $\alpha = 0.73$). The scale contains 7 items across three dimensions: 1) diabetes control, reflecting self-management ability; 2) psychological impact, reflecting the psychological burden of diabetes; and 3) cognition and attitude toward symptom management, reflecting the perceived effort required for good diabetes control. A 5-point Likert scale is used for scoring, with total scores ranging from 7 to 35. In this study, the Cronbach's α was 0.857.

Statistical Methods

Data were analyzed using SPSS 27.0. Measurement data were described using mean and standard deviation, while categorical data were described using frequency and percentage. Univariate analysis was performed using variance analysis or t-tests. Correlation analysis was used to describe the relationship between two variables.

Results

Self-Management Behaviors in Middle-Aged and Young T2DM Patients

The mean score for self-management behavior items was 3.89 ± 0.98 . The medication adherence dimension had the highest mean score (4.93 ± 1.70), while the foot care dimension had the lowest (3.01 ± 1.95). Referencing the self-management behavior recommendations in the *Chinese Type 2 Diabetes Prevention and Treatment Guidelines*, a total SDSCA score ≥ 5 was defined as "good self-management behavior," indicating poor self-management overall in this cohort. Specific results of self-management behavior dimensions across age groups are shown in Table 1.

Table 1. Self-Management Behavior Scores of Middle-Aged and Young T2DM Patients (n=286)

Age Group (years old)	Medication Adherence	Blood Glucose Monitoring	Exercise	Diet	Foot Care
18 - 25	4.96 ± 1.10	3.88 ± 1.01	4.12 ± 1.04	4.31 ± 0.85	2.93 ± 1.20
26 - 44	4.60 ± 1.53	3.52 ± 1.21	4.21 ± 0.74	4.32 ± 0.88	2.94 ± 0.92
45 - 59	4.91 ± 1.12	3.68 ± 0.95	4.23 ± 0.78	4.38 ± 0.70	3.05 ± 1.22

Table 2. Scores of Diabetes-Related Stress Dimensions in Middle-Aged and Young T2DM Patients (n=286)

Age Group (years old)	Psychological Impact	Diabetes Control	Cognition and Attitude
18 - 25	3.30 ± 0.74	2.17 ± 0.74	2.77 ± 0.86
26 - 44	2.63 ± 0.91	3.65 ± 0.54	2.86 ± 0.58



Age Group (years old)	Psychological Impact	Diabetes Control	Cognition and Attitude
45 - 59	2.79±0.65	3.20±0.77	3.97±0.75

Diabetes-Related Stress in Middle-Aged and Young T2DM Patients

The survey showed that the mean score of diabetes-related stress items among middle-aged and young T2DM patients was 3.12 ± 0.57 . The mean scores for each dimension were as follows: psychological impact dimension (2.80 ± 0.82), diabetes control dimension (3.57 ± 0.64), and cognition and attitude dimension (2.99 ± 0.69). Specific results of diabetes-related stress dimensions across different age groups are shown in Table 2.

Comparison of Self-Management Behavior Scores Among Middle-Aged and Young T2DM Patients with Different Characteristics

Significant differences in self-management behavior levels were observed among middle-aged and young T2DM patients in terms of gender and the presence of diabetic complications ($P < 0.05$). Male patients and those with complications showed relatively lower behavioral compliance. Specific data are presented in Tables 3 and 4.

Table 3 General Demographic Data (n = 286)

Variable	Category	Frequency	Item Average Score	t/F	P
Gender	Male	130	3.76±0.93	-2.091	0.037
	Female	156	4.00±1.01		
Age	18 - 25 years old	52	3.96±0.89	1.534	0.679
	26 - 44	134	3.91±0.96		
	45-59 years old	100	4.65±0.73		
Ethnicity	Han	283	3.89±0.98	-0.005	0.996
	Others	3	3.90±0.92		
Marital Status	Married	266	3.89±0.99	0.051	0.959
	Unmarried	3	3.88±0.79		
Residential Pattern	Living Alone	24	4.23±1.15	1.746	0.082
	Not Living Alone	262	3.86±0.96		
Residential Location	City	98	4.01±0.98	0.439	0.725
	Town	56	3.72±0.94		
	Rural Area	132	3.88±0.99		
	Primary School and Below	64	3.84±1.00		
Educational Attainment	Junior High School	112	3.87±0.96	1.375	0.243
	Senior High School	65	3.88±0.99		
	College and Above	45	4.04±0.99		
	Cadre	6	4.72±1.05		
Occupation	Worker	51	3.75±0.76	0.669	0.572
	Farmer	120	3.88±0.97		
	Intellectual	20	3.96±1.01		
	Others	89	3.91±1.07		
Monthly Income	Below 3000 Yuan	162	3.85±0.96	0.619	0.537
	3000 - 4999 Yuan	78	3.88±0.99		
	5000 - 7999 Yuan	38	4.09±1.02		
	Above 8000 Yuan	8	3.77±1.21		
	Medical Insurance	219	3.91±0.97		



Variable	Category	Frequency	Item Average Score	t/F	P
Medical Payment Method	Self-payment or Others	67	3.83±1.00		

Table 4 Disease-related Data of Patients (n = 286)

Variable	Category	Number of Cases	Item Average Score	t/F	P
Diabetes Duration	Half a year to 2 years	81	3.78±0.92	0.464	0.762
	3 - 5 years	79	3.94±0.97	-	-
	6 - 10 years	74	3.91±1.04	-	-
	11 - 20 years	33	3.90±1.11	-	-
	>20 years	19	4.06±0.83	-	-
Diabetes Complications	Yes	128	3.74±0.92	2.940	0.007
	No	158	4.08±1.02		
Treatment Method	Lifestyle Modification	51	3.92±1.03	0.678	0.542
	Oral Hypoglycemic	175	4.03±0.95		
	Insulin Injection	60	3.77±0.94		
FPG (mmol/L)	<6.1	137	3.87±0.99		
	6.1 - 7.0	105	3.85±1.00		
	≥7.0	151	3.95±0.96	1.155	0.284
HbA1c (%)	<7.0	135	3.82±0.99		
	≥7.0	99	4.02±0.94	1.710	0.088
Hypoglycemia Occurrence	Yes	187	3.82±0.99		
	No	55	3.79±0.97	-0.868	0.386
Alcohol Consumption	Yes	187	3.91±0.98		
	No	137	3.87±0.99		

Correlation Between Psychological Stress and Self-Management Behaviors in Middle-Aged and Young T2DM Patients

Analysis revealed a negative correlation between diabetes-related stress scores and self-management behavior scores in middle-aged and young T2DM patients ($r=-0.561$, $P<0.01$), as shown in Table 5.

Table 5 Correlation between Diabetes - related Stress and Self-management Behaviors in Middle-aged and Young Patients with Type 2 Diabetes Mellitus

	Psychological	Control	Cognition	Total Score
Diet	-0.349**	-0.316**	-0.159**	-0.368**
Exercise	-0.334**	-0.253**	-0.124*	-0.328**
Blood Glucose Monitoring	-0.304**	-0.378**	-0.163**	-0.387**
Foot Care	-0.372**	-0.296**	-0.180**	-0.367**
Medication Compliance	-0.092	-0.189**	0.952	-0.157**
Total Self-Management Score	-0.510**	-0.498**	-0.219**	-0.561**

Note: *: $P<0.05$, **: $P<0.01$

Discussion

Analysis of Current Self-Management Behaviors in Middle-Aged and Young T2DM Patients

This study found that the average self-management behavior score of middle-aged and young T2DM patients was 3.89 ± 0.98 , indicating a moderately low level, consistent with the findings of Yu Miao(Yu,



2022). Analyzing five self-management behaviors—medication adherence, blood glucose monitoring, exercise, diet, and foot care—across different age groups revealed imbalances between age differences and behavioral dimensions.

In terms of medication adherence, younger groups (18–25 years) initially showed better compliance due to newly established disease awareness. However, compliance declined in the 26–44-year-old group due to work-life stress and long-term medication fatigue. The 45–59-year-old group demonstrated improved compliance due to increased health awareness. These age-related fluctuations in attitudes toward medication require targeted interventions, such as optimizing medication reminders and providing psychological support for the 26–44-year-old group.

The overall low score in blood glucose monitoring indicates widespread insufficient attention among middle-aged and young patients. Younger patients initially pay more attention to monitoring, but their focus fluctuates with age due to the tediousness of monitoring and unclear result interpretation. It is necessary to strengthen education on the significance and practical operation of monitoring, helping patients understand the value of regular monitoring for glycemic control and complication prevention, while simplifying procedures to enhance participation.

Exercise and diet management showed relatively stable but still improvable performance. Although all age groups have a basic awareness of exercise, this has not been fully translated into effective behavior. Fun-oriented exercise programs tailored to the characteristics of middle-aged and young adults could be designed. While diet management receives attention, there is a gap in ideal control; personalized meal plans that balance taste and glycemic control are needed to enhance patients' motivation to adhere.

Analysis of Current Diabetes-Related Stress in Middle-Aged and Young T2DM Patients

This study showed that the total diabetes-related stress score among middle-aged and young T2DM patients was 22.92 ± 4.04 , indicating a moderately high level. This value is slightly higher than the results reported by. In the 18–25-year-old group, the "psychological impact" dimension scored the highest, reflecting the profound emotional upheaval (e.g., anxiety and confusion) caused by a diabetes diagnosis, which disrupts daily life and social activities. The shock during the psychological adaptation phase becomes the core stressor for young patients.

In the 26–44-year-old group, the "diabetes control" dimension reached the highest stress level. At this stage, patients are in the critical period of career development and family responsibilities, requiring them to balance blood glucose control with work-related social engagements and daily routines. The practical difficulty of maintaining long-term glycemic stability, combined with concerns about how poor control might affect family and career, amplifies stress related to "diabetes control."

Among the 45–59-year-old group, the "cognition and attitude" dimension scored the highest. With age and prolonged disease duration, patients develop a deeper understanding of diabetic complications and the irreversibility of the disease. The cumulative fatigue of living with a chronic illness and negative expectations for health outcomes together generate stress in the "cognition and attitude" domain, reflecting psychological burnout and cognitive burden under long-term disease impact.

In summary, patients of different age groups face distinct primary stress dimensions due to varying life roles and disease stages. Targeted interventions are needed: psychological adaptation counseling for young adults, enhanced glycemic control support and time management for middle-aged adults, and cognitive restructuring and psychological empowerment for older adults (note: "older adults" here refers to the 45–59 age group defined in this study) to comprehensively alleviate psychological stress.

Gender Differences

This study identified gender as a significant influencing factor on self-management behaviors in T2DM patients. Data showed that male patients had significantly lower self-management behavior scores than female patients, consistent with the findings of Zeng Qifeng (Zeng et al., 2024). The advantages females demonstrate in disease management may stem from health information-seeking habits and greater attention to physical changes, rather than solely from social roles. Future research should expand sample sizes and incorporate variables such as cultural background for deeper exploration. In clinical practice,



healthcare providers must acknowledge the impact of gender differences on self-management. For male patients, health education should be designed according to their behavioral patterns (e.g., preference for concise and practical information), and personalized management plans should be developed to improve compliance. Meanwhile, it is essential to avoid gender stereotypes and adopt a comprehensive perspective to understand and intervene in disease management behaviors across genders.

Impact of Complications

This study found that diabetic complications are a factor influencing self-management behaviors in T2DM patients, with patients experiencing complications demonstrating significantly lower self-management behavior scores than those without complications. This may be attributed to the fact that most participants were inpatients; compared to home-based patients, inpatients are more prone to anxiety and depression when facing complications (Jiang et al., 2025). Such negative psychological states can induce "learned helplessness" in disease management, leading to reduced compliance. This suggests that healthcare providers should pay special attention to the psychological status of inpatients, using psychological interventions such as cognitive behavioral therapy to help patients identify and correct negative cognitions of "ineffective management," thereby enhancing their confidence and sense of control over health behaviors.

Impact of Psychological Stress

The results of this study showed a significant negative correlation between self-management behaviors and total diabetes-related stress scores in middle-aged and young T2DM patients, meaning that higher psychological stress is associated with lower self-management behavior levels. This finding is consistent with research by. On one hand, long-term stress easily triggers negative emotions such as anxiety and depression, which significantly reduce patients' confidence in disease control (Guo, 2025), leading them to neglect blood glucose monitoring, arbitrarily adjust medication dosages, or reduce investment in healthy behaviors. On the other hand, the continuous release of stress hormones (such as cortisol) exacerbates insulin resistance, causing blood glucose fluctuations and forming a vicious cycle of "stress-glycemic control failure-decreased self-efficacy" (Chen M. & Song, 2023). These results have important implications for clinical practice. It is recommended to incorporate diabetes stress assessment into routine management for middle-aged and young diabetic patients, using interventions such as cognitive behavioral therapy and mindfulness-based stress reduction training to help patients regulate emotions and alleviate stress. Meanwhile, a multi-dimensional support system should be established, including collaborative interventions from families, communities, and medical teams, to enhance patients' self-management capabilities.

Conclusion

Through a questionnaire survey, this study deeply analyzed the internal relationship between disease-related stress and self-management behaviors in middle-aged and young patients with type 2 diabetes mellitus (T2DM), confirming a significant negative correlation: the higher the level of diabetes-related stress, the poorer the patients' performance in key self-management behaviors, including diet control, regular exercise, medication adherence, and blood glucose monitoring. Notably, foot care, a crucial dimension of self-management, scored the lowest among all dimensions, indicating widespread neglect of foot health management, a critical aspect in preventing severe complications such as diabetic foot. Additionally, stress related to diabetes control remained high, and factors such as gender and the presence of complications influenced disease management behaviors by affecting patients' cognition, behavioral patterns, and access to resources.

Recommendations

The findings of this study provide critical references for optimizing public health programs and personalized treatment plans. At the public health level, targeted diabetes management promotion programs covering the entire population should be designed, incorporating foot care and stress management as core



components. Community screenings, educational campaigns, and other initiatives can enhance patients' awareness of these weak areas. In terms of personalized treatment, healthcare teams should fully consider differences in gender, complication status, and other factors to develop stratified intervention strategies. For example, health behavior guidance should be strengthened for male patients, and comprehensive management of complications should be prioritized for those with existing complications. Through precise interventions, patients can improve self-management behaviors and reduce disease-related stress, laying a solid foundation for building a more efficient diabetes prevention and control system and offering practical evidence for innovating chronic disease management models.

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