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Research Article

Self-Care Interventions as a Health Technology for Managing Type 2 Diabetes: A Population-Based Study in Iran

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Abstract

Background: The prevalence of type 2 diabetes represents a significant public health challenge, and effective disease management is essential for improving patient outcomes. Perceived social support and self-care are critical factors in the health of individuals with type 2 diabetes.

Objectives: This study aimed to explore the relationship between social support, perceived stress, and self-care behaviors in patients with type 2 diabetes in Rasht.

Methods: In this cross-sectional descriptive study, 384 participants were selected from a population of 40,000 people with type 2 diabetes in Rasht city, using the Karjesi and Morgan table. Tobert's self-care questionnaires, the Perceived Social Support Scale by Zimmet, Dalhem, Zimmet, and Farley, and the Perceived Stress Scale by Cohen, Kamark, and Mermelstein were utilized for data collection. The data obtained from field investigations were analyzed using descriptive and analytical statistical tests, including Pearson correlation and linear regression, at a significance level of 0.01 and a confidence interval of 0.99, in SPSS software version 16.

Results: The results of the study revealed a positive correlation between perceived social support and self-care (r = 0.35), family support and self-care (r = 0.25), friends' support and self-care (r = 0.33), and support from significant individuals and self-care (r = 0.37). Conversely, a negative relationship was observed between perceived stress and self-care (r = -0.22).

Conclusions: These findings can assist healthcare providers in expanding existing knowledge and designing diabetes self-care management education programs tailored to the psychosocial and cultural needs of adults in the study region.

Keywords: Social Support; Stress Disorders; Diabetes Mellitus; Perceived Stress Scale

1. Background

Type 2 diabetes is a metabolic condition characterized by elevated blood glucose levels. This occurs when the body's cells fail to respond properly to insulin, a hormone produced by the pancreas that regulates blood sugar levels (1). The prevalence of type 2 diabetes varies across regions, ranging from 1.2% to 14.6% in Asia, 4.6% to 40% in the Middle East, and 1.3% to 14.5% in Iran (2). Approximately 90% of diabetes cases are classified as type 2, making it a significant global public health concern. This condition not only imposes a substantial financial burden on individuals and society but also ranks as the sixth leading cause of death, affecting over 4 million individuals annually. Type 2 diabetes reduces life expectancy by approximately 15 years and is recognized as a severe global health threat (3). In recent years, the prevalence of type 2 diabetes has increased significantly due to sedentary lifestyles, affecting approximately 20% of the Iranian population (4, 5).

Although self-care behaviors have shown a positive impact on managing chronic diseases like diabetes, numerous studies emphasize the importance of patient involvement in disease management. Self-care refers to the practice of patients using their knowledge and skills to engage in health-promoting behaviors (6-8). These behaviors include maintaining a healthy diet, engaging in physical activity, monitoring blood sugar levels, taking prescribed medications, and caring for organs such as the feet. However, adopting these behaviors remains challenging for individuals with diabetes (9). The influence of factors such as knowledge, attitude, and self-efficacy on self-care behaviors in diabetic patients has been studied and validated. Furthermore, some research has explored the impact of psychosocial factors, including social support, on self-care practices (10-12).

Social support is recognized as a crucial psychosocial factor in promoting adherence to self-care behaviors and

managing chronic diseases (13). It encompasses the sense of belonging, acceptance, and emotional assistance that enhances individuals' ability to manage stressful situations more effectively (14). In the context of diabetes, social support is considered essential for improving mental health by fostering a sense of connection to social environments. Among the different types of social support, perceived social support holds greater significance than received support or social stability (15). Findings from previous studies indicate an inverse relationship between social support and levels of stress and emotional distress, with higher social support correlating with reduced emotional strain (16-18).

Psychological stress can influence glycemic control in type 2 diabetes through at least two mechanisms. The primary effect occurs via activation of the sympathetic nervous system and pituitary gland, which increases catabolic hormone levels while suppressing anabolic hormones (10). Additionally, self-care behaviors in diabetes are positively associated with improved blood sugar regulation and reduced complications. Recently, greater attention has been given to psychosocial factors, such as psychological stress, that may affect this relationship (19). Stress indirectly impacts glycemic control by disrupting self-care activities (20). Under stressful conditions, individuals with type 2 diabetes may experience weakened self-care routines, leading to behaviors such as increased food consumption and reduced physical activity, which can elevate HbA1c levels (21-23). Conversely, effective stress management through coping strategies can significantly improve control of this metabolic disorder (24, 25). However, the efficacy of such interventions and their suitability for specific populations, such as those in Rasht, Iran, remain underexplored.

2. Objectives

This study focuses on promoting self-care interventions in diabetes management to empower patients, reduce complications, and lower healthcare costs, particularly in resource-limited regions like Iran. It builds on prior research highlighting the benefits of self-management in diabetes care, emphasizing its relevance in Iran. The study aims to offer culturally appropriate self-care strategies, considering social and economic influences on diabetes management in the region. By analyzing the demographic characteristics of the participants, the study seeks to provide valuable insights into the potential benefits, challenges, and limitations of implementing such interventions within a specific geographical context. Ultimately, the study aims to deepen understanding of how health technology can be utilized to support self-care and improve outcomes for individuals with type 2 diabetes, particularly within the demographic profile of Rasht city.

3. Methods

3.1. Study Design

This study is a cross-sectional descriptive research project conducted on individuals with type 2 diabetes in Rasht city, Iran, in 2022. Data were collected through field questionnaires and interviews with participants. Informed consent was obtained from all subjects prior to their participation in the study.

3.2. Data Collection

The study population consisted of all diabetes patients residing in Rasht city in 2022, totaling 40,000 individuals. A sample of 384 participants was selected using the Karjesi and Morgan table method. The inclusion criteria for the sample included having at least a diploma, no history of being diagnosed with a mental disorder or hospitalization in a neuropsychiatric hospital, not using psychiatric drugs, meeting the age criteria (20 - 60 years), and providing consent to participate in the research. The exclusion criteria were a history of diagnosed mental disorder, addiction to drugs, alcohol, or psychotropic substances, unwillingness to participate in the research, prior attendance in classes, psychotherapy courses, or psychological interventions, and errors or defects in the questionnaires.

3.3. Research Tools

Three standard questionnaires were used to interview individuals with type 2 diabetes: The self-care questionnaires by Tobert, Hampson, and Glasgow; the perceived social support questionnaire by Zimmet, Dalhem, Zimmet, and Farley; and the perceived stress questionnaire by Cohen, Kamark, and Mermelstein. The main components of these questionnaires were as follows.

3.3.1. Perceived Social Support Questionnaire

The Perceived Social Support Scale is a 12-item questionnaire developed by Zimmet et al. This tool measures an individual's perceived level of social support across three key areas, using a 5-point scale ranging from "completely disagree" to "agree". To calculate the total score, the scores of all items are summed and divided by the total number of items (12). The score for each subscale is calculated by summing the scores of the relevant items and dividing by the number of items in that subscale (4). Zimmet et al. have reported the scale's validity and reliability. In 2013, Rostami et al. found that the Cronbach's alpha coefficient for the social support subscales ranged from 0.76 to 0.89 (26). Additionally, Kayed and Kazemian Moghadam reported the scale's reliability, with Cronbach's alpha coefficients of 0.86, 0.87, and 0.82 for the dimensions of social support from family, friends, and significant others, respectively (27).

3.3.2. Perceived Stress Questionnaire

This scale, developed by Cohen et al. in 1983, is used to assess perceived general stress over the past month, in-

cluding thoughts and feelings about stressful events, control, coping with psychological pressure, and experienced stress. It also evaluates risk factors for behavioral disorders and the dynamics of stressful relationships. A higher score indicates greater perceived stress. The scale consists of 14 items, each rated on a 5-point Likert scale (very high, high, medium, low, and none), with corresponding scores of 0, 1, 2, 3, and 4.

The scale includes two subscales: (a) The negative perception of stress subscale, which contains 7 items, and (b) the positive perception of stress subscale, also containing 7 items. In research by Mimura and Griffiths (28), the Cronbach's alpha for the original scale and the revised Japanese version were found to be 0.88 and 0.81, respectively. Cohen et al. reported the correlation coefficient for criterion validity to range between 0.52 and 0.76 with semiotic measures (29).

3.3.3. Questionnaire of Diabetes Self-Care Behaviors

The diabetes self-care behavior questionnaire, developed by Tobert et al. in 2000, assesses the self-care practices of diabetic patients, including diet adherence, blood sugar monitoring, physical activity, medication compliance, and foot care. In this questionnaire, patients indicate how many days in the past week they followed specific self-care behaviors. The questionnaire consists of 15 items across five areas, each rated on a Likert scale ranging from "not at all" (0) to "every day of the week" (7).

The overall self-care score is calculated by dividing the total score by 14, with higher scores indicating better adherence to self-care behaviors. The validity and reliability of the Persian version of this questionnaire were confirmed in a study by Morowatisharifabad and Tonekaboni in Yazd (30). In the study by Ghasemi et al., the Cronbach's alpha coefficient was 0.77, and the test-retest reliability was 0.96 (31).

3.4. Statistical Analysis

To analyze the collected data, statistical tests suitable for the research type and data distribution, including descriptive tests, Pearson's correlation, and linear regression, were performed using SPSS version 16 software.

4. Results

The demographic data indicate the relatively older age of the participants, the predominance of female participants, a range of educational backgrounds, a majority being married, and a varied number of children, as shown in Table 1. Additionally, the weight data provide further context regarding the physical characteristics of the study population.

Table 1. The participants' Demographic Attributes (n = 384) a

Characteristics	Values
Age (y)	48.51 ± 7.20
Gender	
Male	131 (34)
Female	253 (66)
Education	
Less than a diploma	83 (21.61)
Diploma	174 (45.31)
Bachelor's degree	91 (23.69)
Masters and above	36 (9.37)
Marriage	
Single	38 (9.89)
Married	266 (69.27)
Spouse-deceased or divorced	80 (20.83)
Number of children	
< 2	98 (28.32)
2 - 4	166 (47.97)
4 <	82 (20.8)
Weight (kg)	69.87 ± 25.3

[a] Values are expressed as mean ± SD or No. (%).

According to the results from the descriptive tests (Table 2), the mean and standard deviation for perceived social support were 39.95 ± 9.48, for perceived stress were 39.54 ± 8.97, and for self-care were 23 ± 8.59. Among the components of perceived social support, family support had the highest mean with a value of 13.45 ± 4.16, while support

from friends received the lowest score with a mean and standard deviation of 12.42 ± 3.79.

Table 2. Descriptive Statistics Related to the Scores of Research Variables (n = 384)

Variables	Minimum-Maximum	Mean ± SD
Perceived social support-family support	5 - 20	13.45 ± 4.16
Perceived social support-friends support	4 - 20	12.42 ± 3.79
Perceived social support-significant others support	4 - 20	13.23 ± 3.53
Perceived social support-total score	20 - 60	39.95 ± 9.48
Perceived stress	21 - 62	39.54 ± 8.97
Self-care	40 - 73	54.23 ± 8.59

To explore the association between perceived social support, perceived stress, and the self-care practices of type 2 diabetes patients in Rasht, Pearson's correlation test was utilized. The results, presented in Table 3, revealed correlation coefficients of 0.356, 0.252, 0.334, and 0.376 for the relationships between perceived social support and self-care, family support and self-care, friends' support and self-care, and support from significant individuals and self-care, respectively. Additionally, a negative correlation of -0.229 was observed between perceived stress and self-care, indicating an inverse relationship.

Table 3. Correlation and Regression Coefficients of Perceived Social Support and Perceived Stress on Self-Care

Factor	Non-standardized Coefficients	Standardized Beta	t	Significance Level
Constant	736.49	539.2	-	592.19
Perceived social support	314.0	0.042	346.0	409.7
Perceived stress	203.0	-0.045	212.0	540.4

The Pearson correlation analysis between perceived social support and self-care behaviors in individuals with type 2 diabetes demonstrates a significant positive relationship, with correlation coefficients ranging from 0.229 to 0.376 ($P < 0.001$). This indicates that individuals who perceive higher levels of social support are more likely to engage in self-care behaviors, such as blood sugar monitoring, following a healthy diet, and participating in physical activity.

Furthermore, the strength of the correlation, as indicated by the multiple correlation coefficient, was 0.06, and the adjusted R-squared value was 0.05. This suggests that 5% of the variation in the dependent variable, self-care, can be explained by the variables of perceived social support and perceived stress. Additionally, the F-value for self-care, with degrees of freedom of 2 and 381, was found to be less than 0.01, indicating that the regression model is significant at the 99% confidence level ($P < 0.01$, $F(2, 381) = 39.50$). This demonstrates that the variables of social support and perceived stress are strong predictors of self-care behaviors.

Perceived social support, with a significance level of 0.001 and a standardized regression coefficient of 0.346, and perceived stress, with a significance level of 0.001 and a standardized regression coefficient of -0.212, both contributed to explaining the variance in the self-care variable. Additionally, the constant value's significance level was found to be 0.001, emphasizing its impact on the dependent variable. Figure 1 also presents a box plot illustrating the data for perceived social support (a) and perceived stress (b).

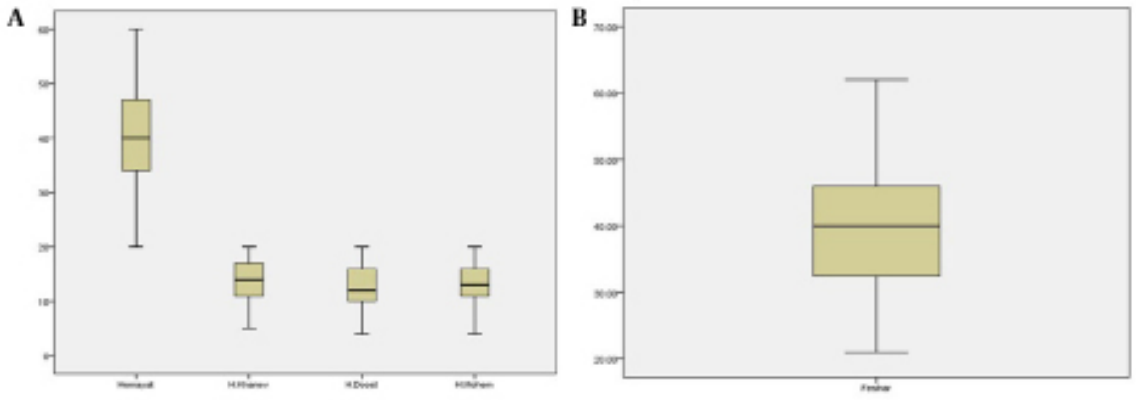

Figure 1. Scatterplot description of social support and perceived stress data

5. Discussion

Diabetes mellitus is characterized by elevated blood glucose levels (hyperglycemia) and may result from issues in insulin production, insulin function, or both (32). Perceived social support can help improve the self-care behaviors of individuals with type 2 diabetes. Additionally, perceived stress may influence the self-care practices of these patients (1, 33).

The average score for perceived social support indicates that participants, on average, experienced moderate levels of social support. It is important to recognize that perceived social support can significantly influence an individual's mental and emotional health. The moderate level of perceived social support observed in this study may suggest a need for interventions or programs designed to strengthen social support networks among participants (34-37).

When perceived social support was analyzed by its components, family support emerged as the most influential source. This highlights the critical role of family as a primary support network for individuals. Conversely, support from friends received the lowest score, suggesting participants may feel less supported by friends compared to family members. Understanding the reasons behind this disparity could be crucial for developing targeted interventions to strengthen friend-based support systems (38). When analyzing perceived social support by its components, family support emerged as the most significant source (39). This underscores the importance of family as a primary source of support for individuals. Conversely, support from friends received the lowest score, suggesting that participants may feel less supported by their friends compared to their family members. Understanding the reasons behind this disparity could be crucial for developing targeted interventions to strengthen friend-based support systems (40, 41).

The mean score for perceived stress indicates that participants experienced moderate levels of perceived stress. Stress management interventions could be beneficial for this population, given the potential negative effects of chronic stress on physical and mental health. Similarly, the mean score for self-care suggests that participants engage in moderate levels of self-care practices. Improving self-care behaviors could be an essential aspect of promoting overall well-being and reducing stress levels among participants (42, 43).

The concept of social support is multifaceted and encompasses various aspects, including emotional, instrumental, informational, and appraisal support. It can be categorized into objective and subjective support, with the latter being closely related to an individual's subjective feelings (37). Social support plays a crucial role in enhancing mental resilience, helping individuals cope with and recover from challenging situations, and promoting a positive mental state. Research has found that perceived social support is positively correlated with positive emotions and negatively associated with symptoms of anxiety and depression (38, 44). This indicates that higher levels of perceived social support are linked to greater positive emotions and fewer symptoms of anxiety and depression. These findings highlight social support as a vital resource for mental well-being (35).

Additionally, social support has been found to moderate both genetic and environmental vulnerabilities, fostering resilience to stress, potentially through its impact on the hypothalamic-pituitary-adrenal (HPA) axis (34). The perception of social support has also been associated with levels of social interaction in older adults and with instrumental support in younger adults. The type of social support appears to play an important role in building resilience to stress (36, 45).

A comparative study by Tabatabaeichehr et al. examined received and perceived social support among elderly individuals. The results of this research align with the present study, revealing a direct linear correlation between received and perceived social support. Significant differences were observed in the mean scores across the dimensions of perceived social support, with family support having the highest mean score compared to other types of support. These findings highlight a strong relationship between received and perceived social support among the elderly. Furthermore, family was identified as the most influential source of social support from the perspective of the elderly (46).

A study conducted by Karimy et al. explored the relationship between attitude, self-efficacy, social support, and adherence to self-care behaviors in diabetes patients. The findings demonstrated a significant relationship between self-efficacy, attitude toward self-care, social support, and adherence to diabetes self-care behaviors. Patients with higher self-care scores exhibited better self-efficacy, social support, and attitudes toward self-care. The combined variables of self-efficacy, social support, and attitude toward self-care accounted for 39.5% of the total variance in self-care behavior. Additionally, social support, self-efficacy, and attitude toward self-care were identified as the most important predictors of self-care behaviors. While the results of this study align with the findings of the present research, it is important to acknowledge several limitations and potential biases (47).

A study conducted in Saudi Arabia aimed to examine the role of healthcare professionals and social support as factors influencing self-care among adults with type 2 diabetes in Riyadh. The findings indicated that poor adherence to diabetes self-care practices could contribute to a higher incidence of uncontrolled type 2 diabetes among patients in Saudi Arabia. Additionally, factors such as culture, religion, gender, stigma, social support, and the healthcare environment played a role in influencing diabetic adults' adherence to self-care activities. Consistent with the results of the present study, this research also emphasized that effective management of type 2 diabetes relies on support from family, spouses, friends, and

healthcare professionals (48).

Our results showed that gender differences play a significant role in patients' awareness and coping with stress. Men, in particular, are highly dependent on the support of their wives. Age also affects patients' awareness and ability to cope with stress. For men, age influences perceived stress and coping strategies, whereas women may experience a greater "psychological impact of diabetes" as they age. The support of family members, especially spouses, is vital for the well-being of patients. Patients who receive family support, particularly nutritional support, demonstrate better glycemic control.

The type of treatment—such as diet, exercise, oral hypoglycemic drugs, or insulin therapy—also affects patients' perceived stress and coping. Proper self-management is essential for maintaining blood sugar control and overall well-being. These findings highlight the importance of tailoring patient education and support to individual needs based on gender, age, and level of family support. By addressing these factors, healthcare professionals can empower patients and improve their quality of life (49).

A study by Sadeghi al. in Kashan, Iran, examined the relationship between self-efficacy and perceived stress in spouses of PTSD sufferers. The findings revealed a statistically significant correlation between self-efficacy and perceived stress, indicating that as self-efficacy increased, perceived stress decreased in the spouses of veterans. This suggests that increased self-efficacy helps spouses cope with the stress associated with living with a person with PTSD. Higher levels of self-efficacy can lead to lower levels of perceived stress and greater adjustment in spouses of veterans. While caregiving can have negative consequences, teaching stress management skills can help control behavior and reduce stressful situations. By teaching coping methods, self-efficacy and adaptability can be enhanced in spouses of veterans, reducing marital conflicts (50).

A study by Tol et al. investigated the relationship between perceived social support from family and diabetes control in patients with type 1 and type 2 diabetes. This cross-sectional study involved 430 diabetic patients, who were assessed for perceived social support using a standardized scale. The results indicated that perceived social support from family was associated with better diabetes control. Additionally, male gender and metabolic control were significantly correlated with perceived social support (18). These findings align with those of the present study, suggesting that perceived family support plays a crucial role in blood sugar control for type 2 diabetes patients.

However, the cross-sectional design of the study limits the ability to establish causality between variables. Additionally, the reliance on self-reported data may introduce biases, and focusing on a single geographic region restricts the generalizability of the findings. The researchers did not account for factors such as disease duration, severity of complications, or comorbidities, which could further influence self-care behaviors. Future longitudinal studies with more comprehensive assessments and diverse samples are needed to enhance the evidence and provide a deeper understanding of the complex relationship between social support, stress, and self-care in managing type 2 diabetes.

5.1. Conclusions

The findings of this study highlight the critical role of perceived social support and self-care in managing type 2 diabetes in Rasht, Iran. The positive relationship between perceived social support from family, friends, and significant others and self-care behaviors suggests that social support is integral to diabetes management. Conversely, the negative correlation between perceived stress and self-care indicates that stress can negatively impact diabetes control. These results emphasize the importance of incorporating psychosocial factors into diabetes self-care education programs.

By tailoring these programs to address the psychosocial and cultural needs of adults with type 2 diabetes in Rasht, healthcare providers can enhance diabetes management and improve patient outcomes. Further research is warranted to explore the long-term effects of social support and perceived stress on diabetes management and to develop effective interventions aimed at improving diabetes care in Iran.

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