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Contribution of Disease-Specific Distress, Social Support, and Self-Efficacy to Diabetes Self-Management Behaviors in Saudi Adults: A Path Analysis

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Purpose: Disease-specific distress, social support, and self-efficacy have noticeable impacts on diabetes self-management. Although these three concepts are connected, their interplay and subsequent influence on diabetes self-management warrants further research.

Patients and Methods: A total of 154 individuals with type 2 diabetes mellitus were recruited to complete a survey, which included questions related to social support, diabetes self-efficacy, diabetes self-management behaviors, and disease-specific stress. The variables were examined with path analysis using Analysis of Moment Structures (AMOS) software.

Results: In the final model, diabetes self-efficacy was a significant predictor of increased diabetes self-management behaviors. Lower levels of disease-specific distress were associated with higher levels of self-efficacy. Path analysis indicated that the direct effect of social support on diabetes self-management behaviors was significant, and social support indirectly affected diabetes self-management behaviors through the mediating effect of diabetes self-efficacy. Overall, the study findings indicate that social support can exert an impact on diabetes self-management behaviors through the mediating effect of diabetes self-efficacy.

Conclusion: The study's findings support the use of Individual and Family Self-Management Theory to improve diabetes self-management. Further research is needed to better understand how factors related to the family support system influence diabetes self-management behaviors.

Keywords: type 2 diabetes mellitus, social environment, health-related behaviors, public health, comorbidities, Saudi Arabia

Introduction

Diabetes mellitus (DM) is a chronic metabolic disease characterized by an increased blood glucose.[1] Increased blood glucose, medically termed hyperglycemia, is a common effect of uncontrolled DM and can lead to serious damage to body systems, especially to the blood vessels and nerves.[1] Type 2 DM (T2DM) is a major public health concern that affects how the body uses glucose for energy. If not treated, it hinders the body from using insulin properly, leading to hyperglycemia.[2] Globally, more than 95% of people, or 415 million adults, with DM have T2DM, which is projected to increase to 643 million by 2030 and 783 million by 2045 if measures to address the disease are not implemented promptly.[1]

Adequate diabetes self-management plays an integral role in alleviating the symptomatic burden and maintaining the quality of life of people living with T2DM.[3,4] However, individuals with uncontrolled diabetes may encounter physical and cognitive challenges that hinder their capacity to independently manage their conditions. Consequently, social support, broadly defined as the process by which expert individuals with perceived authority contribute to one's engagement (in particular, with health-related behaviors), is considered a key factor in ensuring successful diabetes self-management.[3,5] Social support is also an important indicator of high levels of self-efficacy and adequate diabetic control.[6]

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Social support plays an integral role in successful disease self-management because people are often influenced by their social environments and the behaviors and attitudes of those around them.[6] There are several mechanisms by which social support can affect self-management. For example, social norms and expectations regarding health-related behaviors can shape a patient's self-management practices. Individuals who perceive that their social group values and practices healthy behaviors, such as regular physical activity, healthy eating, and medication adherence, are more likely to adopt and maintain these behaviors. In contrast, if unhealthy behaviors are normalized within a social circle, they can have a negative impact on self-management.[7]

In the context of diabetes, social support from health care providers can significantly influence disease self-management.[7,8] For instance, emotional support, practical assistance, and encouragement from healthcare providers can enhance motivation, self-efficacy, and adherence to treatment plans. Accordingly, healthcare providers can provide a form of emotional support by addressing the challenges of adopting necessary diabetes self-management skills. This support can help patients build coping mechanisms and reduce psychological distress levels. Additionally, an individual's family and peers can provide other forms of social support, such as reminders about taking medications, accompanying the patient to medical appointments, and engaging in exercise sessions together.[7,8] In Saudi Arabia, older people are treated with the highest respect. Family social support is considered the main and preferred source of support for Saudi older adults.[9] Social support, whether provided by family members or healthcare professionals, has consistently shown a positive impact on Saudi individuals' self-management and disease control.[10]

A condition-specific factor that influences a person's engagement in the process of self-management is disease-specific distress. Individuals living with chronic conditions can experience significant emotional and psychological burdens, such as anxiety and depression, related to the demands and challenges of disease self-management. Disease-specific distress negatively influences a patient's adherence to treatment recommendations.[6,11,12] In the context of diabetes, disease-specific distress can affect an individual's medication adherence, blood sugar monitoring, and lifestyle modifications. When individuals experience high levels of distress, they may feel overwhelmed by the demands of diabetic management, leading to difficulties with consistently following prescribed treatment regimens.[6,11,12]

Social facilitation refers to the mechanism by which a person's engagement in healthy behaviors and self-management is influenced by the presence of others and includes the concept of social support.[13] Persons living with diabetes who receive sufficient social support experience improved quality of life and clinical outcomes.[14,15] Moreover, they have a greater tendency to engage in recommended self-management tasks (eg, medication adherence and glucose monitoring),[16–18] and lower rates of disease-specific distress and better health than those with inadequate social support.[18]

The patient-provider partnership, a form of social support, also has a positive influence on self-management behaviors by improving self-efficacy, which is a person's capacity to organize and execute a needed action to perform a particular task.[19] The patient-provider partnership and self-efficacy have a remarkable impact on the health of people living with diabetes.[19,20] Although there is a theoretical linkage between condition-specific factors and social facilitation, little is known about the associations between disease-specific distress, patient-provider partnerships, and self-efficacy. Additionally, the behavioral benefits of the interplay between condition-specific factors, social facilitation, and self-efficacy beliefs have not been thoroughly studied in the context of the Saudi population.

The Individual and Family Self-Management Theory (IFSMT) provides healthcare providers a theoretical framework to assess and evaluate factors influencing successful chronic disease self-management. This theory focuses on empowering individuals and families to actively participate in the management of their own health and well-being.[13] In the context of diabetes, IFSMT can be used to enable individuals with T2DM to successfully manage their condition. Based on IFSMT, self-management is a dynamic process, which involves three key components: The context, the process, and the outcomes.[13] The contextual dimension of the IFSMT addresses condition-specific factors (ie, disease severity or psychological distress), the physical and social environment (ie, care accessibility and cultural diversity), and individual and family characteristics (ie, sociodemographic factors, literacy, and cognitive ability). The process dimension includes main constructs such as knowledge and beliefs, self-regulation skills, and social facilitation factors. The outcome dimension of this theory involves proximal and distal outcomes. For example, proximal outcomes are related with the adoption of required self-management behaviors for a particular health illness.[13]

This study used the IFSMT as an orienting framework to gain perspective on self-management behaviors (Figure 1). Accordingly, a conceptual framework was developed to address the indirect and direct impacts of condition-specific

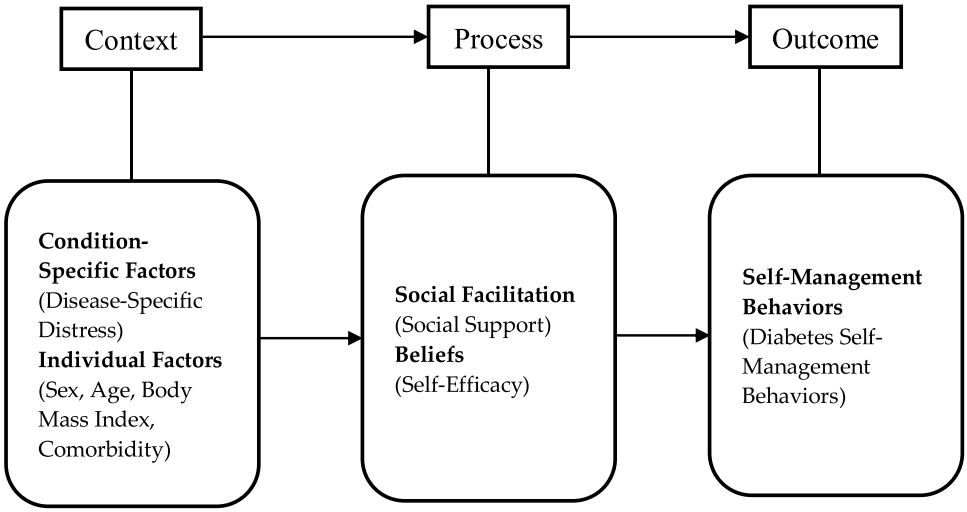

Figure 1 Hypothesized model of diabetes self-management based on the individual and family self-management theory.

factors (ie, disease-specific distress), social facilitation (ie, social support), and beliefs (ie, self-efficacy) on self-management behaviors (ie, diabetes self-management behaviors) while controlling for demographic characteristics (age, sex, body mass index [BMI], and comorbidities). In addition, the use of this theory can help researchers to examine how various concepts interrelate within the context of self-management behaviors. Therefore, this study aimed to validate the components of the IFSMT in Saudi adults with T2DM.

Materials and Methods

Design and Settings

This cross-sectional study was conducted from April 2022 to February 2023 at primary healthcare centers in urban and rural areas within the Riyadh region of Saudi Arabia. These primary care centers provide healthcare services to patients with chronic diseases at various locations across Riyadh.

Sample

The sample size was determined using a statistical power analysis. The significance criterion (α), population effect size, statistical power, number of variables, and type of statistical analysis were addressed while determining the sample size. An effect size of 0.15 in the F-test for multiple regression was used. According to the guidelines for power analysis, the recommended sample size was estimated to be 92.

A total of 154 participants were enrolled in this study. Individuals were considered eligible if they were aged 18–85 years, had been diagnosed with T2DM for at least 3 months, and volunteered to participate in the study. Exclusion criteria were pregnant participants and those who had cancer or mental disorders and cognitive disabilities. Eligible participants with no missing data on any of the study variables were included in the hypothesized model.

Measures

Contextual Factors

Data on individual and condition-specific factors (ie, age, sex, marital status, employment status, educational level, income, total medications, BMI, comorbidities, and disease duration) were collected using a self-reported questionnaire. BMI values were classified into four levels based on guidelines for the prevention and control of overweight and obesity in Saudi adults, with underweight being <18.5 kg/m^2, normal weight being 18.5–24.9 kg/m^2, overweight being 25.0–29.9 kg/m^2, and obese being ≥30 kg/m^2.[21] The Health Distress Scale (HDS) was used to measure the level of distress caused by the illness.[22] HDS is a self-administered Likert scale containing four items, with responses ranging from 0 (none of the time) to 5 (all the time). Higher and lower scores indicate higher versus lower levels of distress about health caused

by the illness, respectively.[23] Categorical contextual variables (ie, marital status, employment status, educational level, income, and comorbidities) were recorded as binary variables.

Self-Management Processes

Patient-provider partnerships were measured using a questionnaire about communication with healthcare providers. This scale includes three items, each answered on a 5-point Likert scale ranging from 0 (never) to 5 (always).[22] This questionnaire assesses the extent to which respondents have good communication with their healthcare providers, using items such as, "Asks questions about the things you want to know and things you don't understand about your treatment". Higher scores indicate better communication and partnerships with healthcare professionals.[22] The total score was then summed (range: 0–15), with higher scores reflecting higher states of perceived social support. The Cronbach's alpha from the original study was 0.85, whereas it was 0.73 in this study.

The Arabic version of the Diabetes self-efficacy (A-DSES) was used to assess individuals' self-efficacy levels.[23] The A-DSES comprises 8 items and assesses several areas (ie, diet, physical activity, blood glucose monitoring, follow-up visits, and self-control).[24] These 8 items are scored on an 8-point Likert scale (0 [not confident] to 8 [totally confident]). A higher score indicates better diabetes self-efficacy. The A-DSES demonstrated appropriate reliability and validity in Saudis with T2DM, with a Cronbach's α of 0.86.

Self-Management Outcome

Diabetes self-management behaviors were assessed using the Diabetes Self-Management Questionnaire (DSMQ).[25] This 16-item questionnaire evaluated a patient's self-management skills related to their diabetes control during the 8 weeks preceding the study. In a previous study, this questionnaire demonstrated adequate reliability and validity in German individuals with diabetes, with a Cronbach's α of 0.84. The 16-item DSMQ measures the following four constructs: Glucose management, dietary control, physical activity, and follow-up appointments.[25] Participants responded to the 16 items on a 4-point Likert scale (0 [does not apply] to 3 [applies to me very much]). The responses were then calculated to a range from 0 to 100, with higher scores indicating adequate self-management of diabetes. The Arabic version of the DSMQ was used in this study.[26]

Data Collection

Participants were identified from patients visiting primary care centers. The participants were provided with information related to the study (eg, aims, data collection procedures, and confidentiality). After providing informed consent, the participants were asked to complete the questionnaires. Baseline demographic data, including sex, age, marital status, type of employment, educational level, income, disease duration, total number of medications, and BMI, were collected. Data regarding health distress, communication with healthcare providers, the DSES, and the DSMQ were obtained.

Data Analysis

The Statistical Package for Social Sciences (SPSS; version 29, IBM Corp., Armonk, NY, USA) and Analysis of Moment Structures (AMOS; version 29, IBM Corp., Armonk, NY, USA) were used for statistical analysis. The data were analyzed in three phases. In the first phase, a frequency analysis of all variables was conducted, and reports with missing values for study variables were deleted in a list-wise manner. In the second phase, the statistical assumptions of the linear and multiple regression models were evaluated, and all assumptions were met. In the third phase, a path analysis was conducted using AMOS, and paths were based on the connections between the three dimensions (Figure 1). A covariance matrix and full maximum likelihood estimation were used to assess the study model. The model fit was assessed by systematically removing paths until the most parsimonious model was achieved. In addition, paths were removed in order, starting from the path with the highest P-value and progressing to the lowest. The modification indices of the study model were evaluated based on the Hu and Bentler criteria to indicate strong model fit: A Tucker–Lewis index (TLI) of $\geq$ 0.95, comparative fit index (CFI) of $\geq$ 0.95, and root mean square error of approximation (RMSEA) of $\leq$ 0.06 (90% confidence interval [CI] upper bound $\leq$ 0.08).[27,28]

Results

Sample Characteristics

Demographic characteristics of the participants are presented in Table 1. The mean age of participants was 53 years. More than half of the participants had been diagnosed with T2DM more than five years prior (n = 87, 56.5%). On average, participants had inadequate diabetes self-management behaviors (5.91 ±1.28) and low self-efficacy (5.88 ±1.42).

Path Analysis of the Hypothesized Model

Results of the initial hypothesized path model are listed in Table 2. There were several original paths in the initial model. However, this model poorly fitted the data (TLI = 0.58, CFI = 0.84, RMSEA = 0.12; P < 0.05). Due to poor initial model fit, sequential modifications were applied to improve the overall model validity and parsimony. For repeated retesting of

Table 1 Individuals' Characteristics (N = 154)

Variables	Mean (SD)/ n (%)
Age (years)	53 (12.5)
Gender	
Male	80 (51.9%)
Female	74 (48.1%)
Income	
≤$3666	93 (60.3)
>$3666	61 (39.7)
Education	
≤High School	112 (72.7)
>High School	42 (27.3)
BMI	
Normal	53 (34.4)
Overweight	74 (48.1)
Obese	27 (17.5)
Disease Duration	
≤5 Years	67 (43.5)
>5 Years	87 (56.5)
Comorbidity	
Living with diabetes	69 (44.8)
Living with diabetes and other CDs	85 (55.2)
DSMQ sum scale	5.91 (1.28)
DSES	5.88 (1.42)
HD scale	4.20 (2.07)
Communication with healthcare providers questionnaire	5.73 (1.96)

Abbreviations: SD, standard deviation; CDs, Chronic diseases; DSMQ, Diabetes Self-Management Questionnaire; DSES, Diabetes Self-Efficacy Scale; HD, Health distress.

Table 2 Path Analysis Steps with Fit Indices

Path Model Changes	X^2	*df*	*P*	TLI	CFI	RMSEA
Hypothesized Model	2.31	7	0.04	0.58	0.84	0.12
Removed path between comorbidity and self-efficacy	2.40	8	0.09	0.63	0.87	0.10
Removed path between sex and social support	2.46	8	0.11	0.64	0.88	0.10
Removed path between age and social support	3.32	9	0.19	0.77	0.90	0.09
Removed path between sex and self-efficacy	6.75	10	0.80	0.70	0.91	0.09
Removed path between comorbidity and social support	8.28	11	0.80	0.74	0.92	0.09
Removed path between disease distress and social support	9.97	12	0.12	0.81	0.93	0.08
Removed path between BMI and self-efficacy	10.13	13	0.18	0.85	0.93	0.07
Removed path between age and self-efficacy	10.13	12	0.25	0.89	0.94	0.06
Removed path between BMI and social support	10.14	10	0.33	0.94	0.95	0.04
Removed path between disease distress and diabetes self-management behaviors	9.94	9	0.45	0.97	0.98	0.02

Abbreviations: CFI, comparative fit index; TLI, Tucker–Lewis index; RMSEA, root mean square error of approximation.

model fitness, 10 non-significant paths were removed and eliminated one contextual variable (disease duration). Figure 2 displays the acceptable model fit indices for the modified model. Four contextual variables (sex, age, BMI, and comorbidities) were significantly associated with diabetes self-management behaviors. Social facilitation and self-efficacy were positively associated with diabetes self-management behaviors.

Impact of Contextual Factors on Self-Management Processes

Disease-specific distress was directly associated with diabetes self-efficacy. Having less health distress ($\beta = -0.19$, $P < 0.05$) was associated with better diabetes self-efficacy. Other contextual factors (age, sex, comorbidities, BMI) were not associated with self-management processes (social facilitation and self-efficacy).

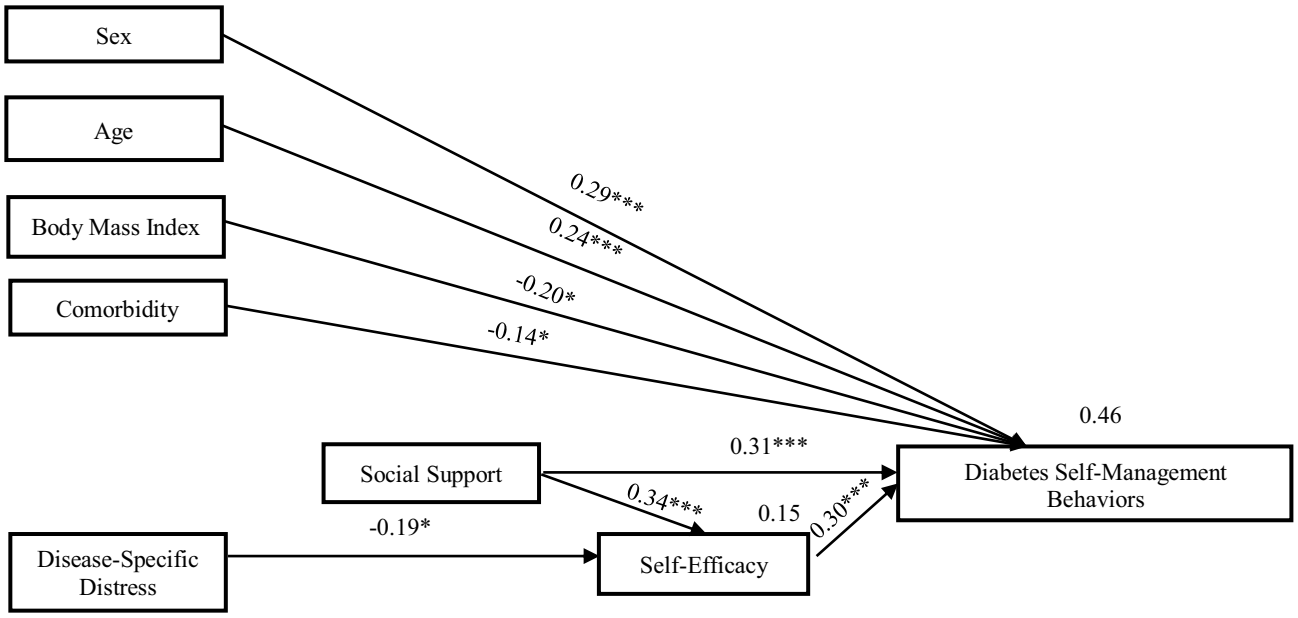

Figure 2 Final path model showing significant relationships among social support, self-efficacy, and diabetes self-management behaviors. The numbers show above the paths are standardized regression coefficients, and the explained amount of variance is displayed above each box. Model fit indices: $X^2 = 9.941$ (*df* = 10, P= 0.45), Tucker-Lewis index = 0.97, comparative fit index = 0.98, root mean square error of approximation =0.02.
Notes: *p ≤ 0.05; ***p ≤ 0.001.

Table 3 Indirect Effects of Social Support and Self-Efficacy on Diabetes Self-Management Behaviors

Path	Standardized Estimate	Standardized Error	P-value
Social support → self-efficacy → self-management behavior	0.10	0.03	0.01

Impact of Contextual Factors and Self-Management Processes on Self-Management Behaviors

Contextual variables (sex, age, BMI, and comorbidities) were directly associated with diabetes self-management behaviors. None of the contextual factors had indirect associations with diabetes self-management behaviors through the process variables of social facilitation and self-efficacy. Patient-provider partnerships ($\beta = 0.31$, $P < 0.001$) and diabetes self-efficacy ($\beta = 0.30$, $P < 0.001$) had direct associations with diabetes self-management behaviors. The patient-provider partnership was also an indirect predictor of diabetes self-management behaviors, which was indicative of diabetes self-efficacy being a mediator between patient-provider partnerships and diabetes self-management behaviors (see Table 3 for indirect effects).

Discussion

This cross-sectional study employed IFSMT to explore indirect and direct associations between disease-specific distress, social facilitation, belief processes, and diabetes self-management behaviors while accounting for demographic factors. Based on our final well-fitting model, IFSMT can be used as a conceptual framework to assess the factors influencing diabetes self-management. Sex, age, BMI, and comorbidities were directly associated with diabetes self-management behaviors. Patient-provider partnerships were indirectly associated with diabetes self-management behaviors through self-management processes (self-efficacy).

Aligned with our initial hypothesized model, the relationship between patient-provider partnerships and self-efficacy is consistent with previous studies that have highlighted the association between low levels of communication between patients and healthcare professionals and inadequate self-efficacy.[29,30] Healthy patient-provider partnerships stress the importance of active communication, shared decision-making, and mutual respect between patients and healthcare professionals. It also emphasizes the importance of recognizing patients as active participants in disease self-management, valuing their beliefs and preferences, and involving them in the treatment process.[31]

Additionally, self-efficacy in disease self-management refers to an individual's belief in their ability to manage chronic illnesses.[32] Self-efficacy is a key concept for understanding and promoting effective self-management of chronic diseases, including diabetes. Thus, an effective patient-provider partnership is associated with higher levels of self-efficacy, which positively influences diabetes self-management behaviors.[29,30] Similarly, several studies have indicated that individuals with diabetes gain better self-confidence when they have a healthcare provider who creates collaboration and trust to achieve optimal health outcomes.[29,33] Evidence supporting the contribution of patient-provider partnerships to diabetes self-management is emerging.[34]

Patient-provider partnerships were found to have an indirect effect on diabetes self-management behaviors through self-efficacy. Our findings suggest that the potential connections that people with diabetes have with their healthcare providers in the relational aspects of healthcare can contribute to their engagement in self-management behaviors. Patient-provider partnerships can also be influenced by structural factors within healthcare systems. Thus, it is necessary to determine whether some healthcare providers provide a different type, amount, or quality of diabetes self-management support compared to those with limited patient-provider interactions, access to healthcare resources, or self-management support. In addition, it is imperative to assess how individuals with diabetes respond to effective and ineffective patient-provider partnerships. Consequently, interventions can be developed to implement supportive policies that enhance the sustainability of effective partnerships.

Our analysis focused on patient-provider partnerships as an assessment of social support in order to identify the potential contribution of these partnerships to diabetes self-management. In support of the importance of patient-provider partnerships, studies have demonstrated that patients report that their providers encouraged regular follow-ups, provided ongoing support, and offered opportunities to seek clarification or discuss concerns between follow-up visits.[2,33,35] In the context of diabetes

self-management, continuous engagement can foster a sense of partnership and help individuals become active participants. For example, individuals with higher levels of social support tend to receive positive reinforcement for healthy behavior adoption and coping strategies in stressful situations, which improves their self-efficacy in successfully managing their illness.[2] The results regarding the influence of self-efficacy and social support on diabetes self-management are in line with previous findings,[36,37] yet the significant influence of self-efficacy in Saudi adults suggests potential cultural differences in how social support is perceived and utilized. Thus, healthcare providers should understand unique social dynamics within Saudi Arabia, such as family-centric decision-making, which may play a distinct role in diabetes self-management. This assertion requires further investigation in the context of the Saudi population.

Besides patient-provider partnerships, this study indicated a significant direct association between disease-specific distress and self-efficacy, consistent with previous findings in individuals with diabetes.[38,39] Contrary to our initial hypothesized model, the path coefficient from disease-specific distress to patient-provider partnerships was not significant. This may be related to the limited number of items in the disease-specific distress questionnaire and the use of an instrument that measures only social support from clinicians. One study found that psychological distress was negatively associated with social support.[36] In that study, researchers used the Perceived Social Support Scale (PSSS) developed by Zimet et al in 1988. This scale comprises three domains (perceived social support from family, friends, and others) with 12 items.[40] This provides insight into the premise that family and friends have an integral part in lowering psychological distress levels among patients with chronic diseases.[10] Thus, this assertion requires additional research in the context of the Saudi population. Accordingly, disease-specific distress did not have a direct impact on diabetes self-management behaviors. One possible explanation for this is the participants' lower scores for disease-specific distress. In this study, among the factors influencing diabetes self-management behaviors, disease-specific distress had the lowest mean (4.20). Since the majority of participants experienced lower levels of disease-specific distress, it could not be perceived as a barrier in the management of diabetes.

Other influential variables may not have been statistically significant in our sample and were not included in the final model. For instance, sex was not a significant predictor of diabetes self-management processes, including self-efficacy and patient-provider partnerships. Nevertheless, men and women report different types of social influences and support, and the influence of patient-provider partnerships on health outcomes may differ between men and women with diabetes. Based on our findings, age, BMI, and comorbidities directly affected diabetes self-management behaviors, which is consistent with existing literature supporting the effect of contextual factors (ie, age, BMI, and comorbidity) on diabetes self-management.[17,33]

Study Implications

The study's conceptual model aligns with the theoretical perspective of the IFSMT, which supports the application of a mid-range self-management theory to individuals with T2DM. This study also provides theoretical references aimed at improving individuals' DM self-management. In clinical settings, social support plays a primary role in maintaining diabetes self-management behaviors and overcoming barriers. Thus, healthcare providers should pay close attention to the influence of social support and self-efficacy, as they are important internal factors in the self-management behaviors of patients with diabetes. In the context of primary care, researchers can devise targeted international measures so that individuals with diabetes can improve their self-management behaviors by enhancing their sense of self-efficacy and patient-provider partnerships.

Study Strengths and Limitations

This study had several strengths and weaknesses. One of the major strengths of this study is that it accounted for the context and process factors that affect the self-management behaviors of patients with T2DM. In addition, our study is the first to validate the role of diabetes self-efficacy in the association between social support and diabetes self-management behaviors. Nevertheless, this study also had several limitations. First, it employed a cross-sectional design, which precluded us from assessing the causal effects among contextual factors, processes, and self-management behaviors. Thus, longitudinal studies should be conducted to further understand these

associations over time and to establish potential causal relationships and provide more generalizable results. Second, the data were self-reported. Thus, there is potential for recall bias or social desirability bias, particularly in responses regarding social support, diabetes self-efficacy, and diabetes self-management behaviors.

Conclusion

This study evaluated the contributions of disease stress, social facilitation, and beliefs about diabetes self-management. Our study results addressed the importance of self-efficacy as a mechanism by which patient-provider partnerships can influence diabetes self-management behaviors. Use of the IFSMT can be beneficial to scientists who are involved in assessing factors contributing to successful chronic disease self-management. In the context of diabetes, further descriptive, correlational studies are needed to look at other components of the IFSMT that may be correlated with increased diabetes self-management, such as family social support, patient activation, and accessibility to healthcare services.

Data Sharing Statement

Data are not shared due to privacy and ethical restrictions.

Ethics Approval and Informed Consent

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of King Fahad Medical City (Ref #: H-01-R-012, dated February 24, 2022). Informed consent was obtained from all participants, who were provided with detailed information about the study. Additionally, participation was voluntary, and participants were free to participate or withdraw from the study at any time.

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Disclosure

The author reports no conflicts of interest in this work.

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