Illness Perception, Coping, and Self-Care Adherence Among Adults With Type 2 Diabetes

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Abstract

Understanding the key factors in managing type 2 diabetes over the long term has become necessary. This study aims to explore the association between illness perception, coping, and self-care adherence among adults with type 2 diabetes and find the influence of illness perception and coping on self-care adherence. A cross-sectional survey design was used to collect data from 123 adults with type 2 diabetes aged between 30 and 55 years. The questionnaires included the Brief Illness Perception Questionnaire (BIPQ), Brief COPE, Self-Care Inventory-Revised (SCI-R), and a personal information sheet. A significant correlation was found between illness perception, maladaptive and adaptive coping strategies, and self-care adherence. Adaptive coping, illness perception, and maladaptive coping strategies together explained a 59.9% variance in self-care adherence ($F(3, 119) = 59.29$, $p < .001$). The study highlights the importance of developing a less threatening perception of the illness and enhancing the practice of adaptive coping strategies for achieving better self-care adherence among people with type 2 diabetes. This study signifies the need for a collaborative approach by healthcare professionals, mental health providers, and policymakers to provide accurate diabetes self-management knowledge and develop interventions tailored to individuals' needs.

Keywords

Adaptive coping; illness perception; India; maladaptive coping; self-care adherence; type 2 diabetes

Introduction

The increasing burden of type 2 diabetes (T2D) has become a significant concern across the globe. Considering its high susceptibility among Indians, it has become an enormous health challenge in the country, contributing to a good proportion of this global burden (Pradeepa & Mohan, 2021). According to the International Diabetes Federation (IDF) (2021), India has the second-largest number of adults living with diabetes and is expected to retain this position in 2045. Given the complications of this chronic illness and the complex combination of behavioral, social, and environmental aspects involved in its effective treatment and management, adhering to self-care practices is considered the most promising method to manage T2D (Karimy et al., 2018). However, studies indicate that a high number of people with diabetes do not adhere to recommended care practices (Hla et al., 2018; World Health Organization [WHO], 2003), making this metabolic disorder a rapidly growing health emergency worldwide (IDF, 2021).

Along with medication, recommended self-care behaviors for individuals with T2D include following healthy eating, engaging in physical activity, regularly monitoring blood glucose, foot care, and avoiding tobacco (American Diabetes Association [ADA], 2022). Evidence suggests that adherence to these behaviors has led to reasonable glycemic control and improved quality of life for people with T2D (Aga et al., 2020; Alyami et al., 2020; Babazadeh et al., 2017; Tharek et al., 2018); signifying the essentiality of healthy lifestyle changes in slowing down the pace of this chronic condition. However, studies have shown that such life-long adherence is complicated and involves the interplay of a wide array of psychosocial determinants of health (Achouri et al., 2019; Al-Qerem et al., 2021; Bonger et al., 2018; McCoy & Theeke, 2019). One of these determinants is the individual's perception of the illness and treatment, explained theoretically by the common-sense model of self-regulation (CSM) propounded by Leventhal et al. (1998, 1980, 2016).

CSM elaborates on how a patient develops an understanding of an illness based on their beliefs and expectations and then chooses a course of action to cope with it. This entire process forms the basis of a person's representation of the illness and treatment, the appropriateness of which is constantly appraised, based on which adherence to a particular health behavior is continued or discontinued. The CSM framework explains the role of emotional, perceptual, behavioral, and cognitive processes in shaping an individual's illness representation and guiding their response to the illness, including adherence to self-care behaviors. Hence, this model helps predict health outcomes and adherence behavior among people with chronic illness (Cameron & Leventhal, 2003; Leventhal et al., 2016; Owiredua et al., 2018).

The model has five major components, namely identity (beliefs concerning the illness identity based on its name and symptoms), timeline (beliefs regarding disease duration), consequences (beliefs relating to the influence of the illness on routine functioning), cause (beliefs regarding causal factors of the disease), and control (beliefs concerning illness curability and controllability through treatment). These components enable an individual to make sense of illness and treatment, devise a management strategy, and evaluate the outcomes (Leventhal et al., 1998). Hence, illness perception plays a critical role in illness management. In support of this view, many studies have reported that illness representation is a vital determinant of self-care behaviors influencing glycemic control in people with T2D (Abubakari et al., 2011; Hashimoto et al., 2019; Kugbey et al., 2017; Ngetich et al., 2022; Nie et al., 2018).

Previous research has pointed out the significant relationship between how individuals with chronic illnesses, such as diabetes, perceive their condition and their adherence to various health behaviors (Alyami et al., 2020; Hagger et al., 2017; Harvey & Lawson, 2009; Mosleh & Almalik, 2016). For example, greater perceptions of personal control, treatment control, illness coherence, and timeline have been reported to correlate with better self-care practices, such as adherence to recommended dietary behaviors (Abubakari et al., 2011; Barnes et al., 2004; Hemphill et al., 2013) and physical activity (French et al., 2013; Khunti et al., 2008; Skinner et al., 2006) among the T2D population. Studies have also shown that beliefs of lower illness identity, emotional representations, and fewer consequences played a significant role in diet adherence (Alyami et al., 2020; van Puffelen et al., 2015). An exploratory study conducted in India by Abraham et al. (2015) revealed similar findings, reporting that greater control and coherence perceptions led to better adherence to healthy eating and physical activity. In contrast, the dimensions of identity, consequences, and emotional representation were negatively related to these self-care practices. Research has also demonstrated significant associations between illness perception dimensions: coherence, personal control (Bilondi et al., 2022), timeline and consequence (Aflakseir, 2012), and medication adherence.

According to CSM, an individual adopts coping strategies based on the illness representation. Coping represents the responses (cognitive and behavioral) an individual adopts to manage an illness condition or a stressful situation (Leventhal et al., 1998) and is generally categorized as problem-focused (coping focused on taking action to tackle the disease condition), emotion-focused (coping focused on managing emotional distress caused by the disease), and less useful coping behaviors (Carver et al., 1989; Lazarus & Folkman, 1984). Coping is crucial in determining whether an individual's health outcome will be positive or negative. A few studies (Hapunda, 2022; Knowles et al., 2020) have classified these coping strategies as adaptive or maladaptive based on their positive or negative effects on health outcomes.

Consistent with previous studies, people's perceptions of diabetes influence their coping style (Hagger et al., 2017; Lawson et al., 2013; Searle et al., 2007). A recent Knowles et al. (2020) study reported that higher illness perception is associated with more engagement in maladaptive coping. In contrast, another study showed the dimensions of illness perception, namely illness coherence and personal and treatment control, were associated with coping strategies such as instrumental support, planning, and active coping (Lawson et al., 2013).

As coping strategies significantly contribute to an individual's health outcomes, they are linked with adherence to diabetes self-care (Albai et al., 2017). Previous research conducted among the diabetic population has shown that problem-focused coping styles improved metabolic control (Hart & Grindel, 2010; Hill-Briggs & Gemmell, 2007; Rose et al., 2000) and healthy dietary behaviors (Hill-Briggs & Gemmell, 2007), whereas maladaptive coping behaviors led to poor metabolic control and adherence behavior (Duangdao & Roesch, 2008; Weijman et al., 2005). Further, there is evidence that coping styles can improve adherence to self-care practices for adults with T2D (Albai et al., 2017) and that a significant relationship exists between glycated hemoglobin, self-care practices, and coping styles (Shayeghian et al., 2015). Certain studies have also highlighted that adaptive/problem-focused coping is the frequently used coping style among people with diabetes (Lawson et al., 2013; Tuncay et al., 2008), while others have reported that active task-oriented coping is seldom used by people with T2D (Karlsen & Bru, 2002).

Therefore, to effectively manage T2D, it is essential to comprehend the process of self-care adherence from the perspective of the CSM, which illustrates the pathway of illness perception and the coping process. A comprehensive meta-analysis on CSM conducted by

Hagger et al. (2017) that included T2D reaffirmed the importance of understanding this process for bridging the gap in the research findings. Accordingly, this study explores the relationship between illness perception, coping, and self-care adherence among adults with T2D.

Method

Design, setting, and sample

This study employed a cross-sectional survey design. A purposive sampling method was used to collect data from 123 adults with T2D during August and September 2022 from three private clinics in Kannur district, Kerala, India. The desired sample size was computed using G*power software 3.1 (Faul et al., 2007). Based on the computation, a sample size of 108 required approximately 90% power to determine an effect size of 0.10 with a .05 significant level. Initially, 135 participants were recruited. Of these, 12 were dropped due to the following reasons: under medication for other chronic illnesses (n = 6), item non-response (n = 5), and not returning the questionnaire (n = 1). Hence, the final sample included 123 participants based on the following inclusion criteria: 1) diagnosed with T2D for at least 6 months, 2) aged between 30 and 55 years, and 3) can read and write English. The exclusion criteria were 1) adults with T2D taking medication for any other chronic illnesses, 2) women with gestational diabetes, and 3) participants with physical and mental illnesses.

Procedure

After obtaining ethical approval for the study from the Institutional Ethical Committee (human studies) at Pondicherry University (Approval No. HECPU/2021/18/30-03-2021), data were collected using self-report questionnaires and a personal information sheet. Data collection occurred at the clinic waiting area after obtaining permission from the concerned authority. Participants were briefed individually on the study's purpose, and interested individuals were requested to sign the informed consent form before completing the questionnaires. Participants took approximately 15–20 minutes to provide their responses. Most completed the questionnaires in the clinic waiting area, while a few, due to time constraints, returned the questionnaires the following day.

Measures

Personal information sheet

Personal Information Sheet included sociodemographic and clinical details of the participants.

The Brief Illness Perception Questionnaire

The Brief Illness Perception Questionnaire (BIPQ) measured illness perception and was developed by Broadbent et al. (2006). It assessed the cognitive and emotional representations of an illness. The questionnaire comprises eight items rated on a scale from 0 to 10 and one open-ended item asking respondents about the most important causal factors that have caused their illness. Each item of the BIPQ evaluates one dimension of illness perception. The

eight dimensions were consequences, timeline, personal control, treatment control, identity, illness concern, coherence, and emotional representation. The score range of the items was 0–80, and the total score was calculated using a reversed score of Items 3, 4, and 7 and adding it to Items 1, 2, 5, 6, and 8. Higher scores indicate a more threatening view of the illness. The test-retest reliability of the scale ranged from 0.50 to 0.70 and demonstrated good predictive and discriminant validity. Responses from the final open-ended item for causal factors were grouped into categories, and categorical analysis was performed.

The Brief COPE

Coping strategies were measured using the brief COPE (Carver, 1997), which is an abridged version of the COPE (Coping Orientation to Problems Experienced) developed by Carver et al. (1989). This self-report inventory comprises 28 items with 14 subscales that assess 14 different coping strategies. For rating the items, a 4-point Likert scale was used where 1 = "I haven't been doing this at all," 2 = "I've been doing this a little," 3 = "I've been doing this a medium amount," and 4 = "I've been doing this a lot." Notably, the scale has been categorized differently by researchers for study purposes. The current study employed the categorization method provided in a study by Hapunda (2022), which categorizes coping into two types: maladaptive and adaptive. Maladaptive coping includes seven subscales, namely self-blame, self-distraction, denial, substance use, behavioral disengagement, venting, and humor. Similarly, adaptive coping comprises seven subscales: active coping, emotional use, instrumental use, positive reframing, planning, acceptance, and religion. Each subscale consists of two items, with scores ranging between 2 and 8, with higher scores indicating more significant use of a specific coping strategy. The entire scale had a good Cronbach's alpha of 0.84 and demonstrated adequate concurrent validity.

Self-Care Inventory-Revised (SCI-R)

Self-care adherence was measured using the SCI-R (Weinger et al., 2005), a modified version of the Self-Care Inventory developed by La Greca (1992). The SCI-R, a self-report questionnaire, measures adherence to diabetes self-care among adults with diabetes. It has 15 items, 12 of which can be used exclusively for T2D. Items are rated on a 5-point Likert scale ranging from 1 = "never do it" to 5 = "always do this as recommended, without fail," with a score range of 12–60. Total scores were calculated by summing the responses, with higher scores suggesting higher levels of self-care. The internal consistency of the SCI-R for type 2 diabetes was α = 0.85, demonstrating good validity.

Data analyses

Data were analyzed using IBM SPSS statistics (Version 19). The appropriate analyses were conducted to ensure that the data met normality and equal variances assumptions. In case of assumption violation, the non-parametric test was performed. The demographics, clinical characteristics, and study variables were described with the help of descriptive statistics. Pearson's correlation was utilized to find the correlation among the study variables. The study's bivariate associations were tested using independent samples t-tests, Mann-Whitney U test, and one-way ANOVA. Multiple linear regression was employed to find the predictors of self-care adherence using illness perception, maladaptive coping, and adaptive coping as the predictor variables in the regression model.

Results

Participant characteristics

The sample consisted of 62 men (50.4%) and 61 women (49.6%) with a mean age of 45.1 years (SD = 3.93; range = 35–54). Most participants were married (n = 104, 84.6%), some were divorced (n = 11, 8.9%), and a few were single (n = 8, 6.5%). Most participants possessed the undergraduate level of education (n = 82, 66.7%), some had post-graduate and above qualifications (n = 30, 24.4%), and a few were educated up to school level (n = 11, 8.9%). Most participants reported being upper middle class (n = 99, 80.5%), while few belonged to the upper class (n = 11, 8.9%) and middle class (n = 12, 9.8%). Only one (0.8%) participant was from the lower middle class. Participants' occupations varied, including professionals (teacher/professor, doctor, engineer, lawyer, banker, psychologist/counselor, police, nurse, etc.) (n = 53, 43.1%), business (n = 24, 19.5%), clerical workers (n = 12, 9.8%), homemakers (n = 24, 19.5%) and others (n = 10, 8.1%).

The sample included participants from both urban (n = 66, 53.7%) and rural areas (n = 57, 46.3%), and most had a family history of diabetes (n = 80, 65%). A total of 54 (43.9%) participants had had diabetes for more than 3 years–6 years, 43 (35%) had had diabetes for over 6 years, and 26 (21.1%) had had diabetes for 6 months–3 years. The majority of participants were being treated with only oral medication (n = 105, 85.4%), while 3 (2.4%) participants were only on insulin, and 15 (12.2%) were on oral medication and insulin. Among the participants, 62.6% (n = 77) had no diabetes-related complications, while 33.3% (n = 41) showed at least one complication, and 4.1% (n = 5) had more than two complications. Regarding medication adherence, 113 (91.9%) participants reported adhering to their medication routines, and all had regular medical check-ups. The frequency of doctor visits was regular (every 3–6 months) for 70 (56.9%) participants, but some visited only occasionally (n = 44, 35.8%), and a few visited doctors only if they encountered complications (n = 9, 7.3%). A total of 67 (54.5%) participants followed a recommended diet plan, and 46 (37.4%) followed an exercise plan. Heredity (n = 74, 60.2%) and lifestyle factors (n = 49, 39.8%) were the top-listed causal factors given by participants for their T2D.

Association of the study variables

Table 1 presents the correlation among the study variables. It shows that a positive significant association existed between illness perception and maladaptive coping, $r(121)$ = .58, $p < .01$, d = 1.42, 95% CI [0.45, 0.69] (Cohen, 1988). A significant inverse correlation was determined between illness perception and adaptive coping; $r(121)$ = -.44, $p < .01$, d = -.98, 95% CI [-0.57, -0.29]. Similarly, illness perception was inversely correlated with self-care adherence; $r(121)$ = -.52, $p < .01$, d = -1.22, 95% CI [-0.64, -0.38]. Maladaptive coping was inversely related to adaptive coping; $r(121)$ = -.63, $p < .01$, d = -1.62, 95% CI [-0.73, -0.51], and self-care adherence; $r(121)$ = -.62, $p < .01$, d = -1.58, 95% CI [-0.72, -0.49], and the association was significant. Adaptive coping showed a significant positive relationship with self-care adherence; $r(121)$ = .73, $p < .01$, d = 2.14, 95% CI [0.64, 0.80].

Table 1: Means, Standard Deviations (SD), and Correlations for Illness Perception, Maladaptive Coping, Adaptive Coping, and Self-Care Adherence (*N* = 123)

	M (SD)	1	2	3	4
1. Illness perception	42.48 (9.63)	–			
2. Maladaptive coping	22.48 (5.69)	.58**	–		
3. Adaptive coping	34.08 (6.05)	-.44**	-.63**	–	
4. Self-care adherence	34.59 (8.16)	-.52**	-.62**	.73**	–

Note: *p* < .05

Table 2 demonstrates the gender-based difference among the study variables. It was found that illness perception was significantly higher ($t(121) = 3.59$, $p < .001$, 95% CI [-9.23, -2.66]) in women ($M = 45.48$, $SD = 9.2$) than in men ($M = 39.53$, $SD = 9.2$). The effect size was found to be medium, $d = 0.64$ with 95% CI [-1.01, -0.28], but no significant difference in adaptive coping was observed between men and women, $t(121) = 1.01$, $p = .314$, 95% CI [-1.06, 3.27]. Self-care adherence was significantly higher, $t(121) = 2.18$, $p = .031$, 95% CI [0.29, 6.03] in men ($M = 36.16$, $SD = 8.8$) than in women ($M = 32.99$, $SD = 7.2$) and the analysis showed a medium effect size, $d = 0.39$, 95% CI [0.04, 0.75].

Table 2: Means, SD, and Tests of Difference (*t*-test) of Illness Perception, Adaptive Coping, and Self-Care Adherence Based on gender

	Men		Women		*t*(121)	*p*	*d*
	M	*SD*	*M*	*SD*			
Illness perception	39.53	9.2	45.48	9.2	3.59	.000***	0.64
Adaptive coping	34.63	6.2	33.52	5.9	1.01	.314	-
Self-care adherence	36.16	8.8	32.99	7.2	2.18	.031*	0.39

Note: Men (*n* = 62) and women (*n* = 61); *p* < .05, ***p* < .001

As the assumptions of normality and equal variances of maladaptive coping based on gender group were not met, the Mann-Whitney U test was conducted and presented in Table 3. It was found that men and women showed no difference in the use of maladaptive coping, $U(62, 61) = 1547.00$, $p = .081$.

Table 3: Mean Rank, Test of Difference (U test) of Maladaptive Coping Based on Gender

	Men	Women	U	*z*	*p*
	Mean rank	**Mean rank**			
Maladaptive coping	56.45	67.64	1547.00	-1.745	.081

Note: **p* < .01

Table 4 presents the difference among the study variables based on the duration of diabetes. It was found that the main effect for illness perception was significant; $F(2, 120) = 5.815$, $p = .004$, $\eta^2 = 0.09$, 95% CI [0.01, 0.19], and subsequently, a post-hoc Scheffé test was used to compare pairs of group means. The test revealed that the mean for the more than 3 years–6 years group ($M = 45.03$) was significantly higher than the over 6 years group ($M = 38.68$) at the 5% level of significance, but the 6 months–3 years group ($M = 43.50$) showed no significant difference from the other two groups. The main effect for maladaptive coping was significant; $F(2, 120) = 3.586$, $p = .031$, $\eta2 = 0.06$, but the 95% CI [0, 0.14] was not significant, and the Scheffé test showed that groups did not differ significantly.

For adaptive coping, the main effect was significant: $F(2, 120) = 11.488$, $p < .001$, η2 = 0.16, 95% CI [0,05, 0.27]. The Scheffé test post-hoc suggested that adaptive coping was significantly higher in the over 6 years group ($M = 37.16$) compared to the 6 months–3 years ($M = 30.88$) and the more than 3 years–6 years ($M = 33.17$) groups. In contrast, the difference between the 6 months–3 years and more than 3 years–6 years groups was not statistically significant. Similarly for self-care adherence, the main effect was significant; $F(2, 120) = 5.759$, $p = .004$, η2= 0.09, 95% CI [0.01, 0.18] and the Scheffé test suggested that the mean for the over 6 years group ($M = 37.53$) was significantly higher than the 6 months–3 years group ($M = 31.09$) at the α = .05 significance level, but the more than 3 years–6 years group ($M = 33.94$) did not show significant difference from the other two groups. This indicated that self-care adherence was significantly high in the group of patients having diabetes for over 6 years compared to the 6 months–3 years group, whereas there was no difference in self-care adherence between the 6 months–3 years and the more than 3 years–6 years groups.

Table 4: Mean, SD, and Tests of Difference (ANOVA) for the Duration of Diabetes on Illness Perception, Maladaptive Coping, Adaptive Coping, and Self-care Adherence among People with T2D

Duration of Diabetes	6 months–3 years		More than 3 years–6 years		Over 6 years		*F* (2, 120)	*p*	η²
	N	*M (SD)*	*N*	*M (SD)*	*N*	*M (SD)*			
Illness Perception	26	43.50[a,b] (8.9)	54	45.03[a] (9.3)	43	38.68[b] (9.5)	5.815	.004	0.09
Maladaptive Coping	26	23.79[a] (5.9)	54	23.29[a] (5.8)	43	20.66[a] (5.07)	3.586	.031	0.06
Adaptive Coping	26	30.88[a] (5.8)	54	33.17[a] (4.7)	43	37.16[b] (6.4)	11.488	.000	0.16
Self-Care Adherence	26	31.09[a] (6.6)	54	33.94[a,b] (6.8)	43	37.53[b] (9.7)	5.759	.004	0.09

Note: Means not sharing subscripts differ significantly at a = .01, as indicated by the Scheffé test; [a,b] Means did not differ significantly from the means having either [a] or [b].

Table 5 demonstrates the influence of illness perception and coping on self-care adherence. It was found that self-care adherence was significantly higher; $t(121) = 7.07$, $p < .001$, 95% CI [6.35, 11.28] among participants who had lower illness threat perception ($M = 38.68$, $SD = 7.4$) compared to those who had a higher illness threat perception ($M = 29.86$, $SD = 6.2$) having a large effect size of $d = 1.28$, 95% CI [0.89, 1.67]. Similarly, self-care adherence was significantly higher; $t(121) = 6.89$, $p < .001$, 95% CI [6.65, 12.02] among participants who showed low maladaptive coping ($M = 37.48$, $SD = 7.4$) than those who showed high maladaptive coping ($M = 28.14$, $SD = 5.7$), with a large effect size; $d = 1.34$, 95% CI [0.93, 1.76], that was significantly higher; $t(121) = 9.16$, $p < .001$, 95% CI [-12.72, -8.2], in participants who demonstrated higher use of adaptive coping ($M = 39.27$, $SD = 6.7$) than those who showed a lower use of ($M = 28.81$, $SD = 5.8$). The effect size was large; $d = 1.65$, 95% CI [-2.07, -1.24].

Table 5: Means, SD, and Tests of Difference (*t*-Test) of Illness Perception, Maladaptive Coping, and Adaptive Coping on Self-care Adherence among People with T2D

	Illness perception				*t* (121)	*d*	Maladaptive coping				*t* (121)	*d*	Adaptive coping				*t* (121)	*d*
	Less threatened		More threatened				Low		High				Low		High			
	N	M (SD)	N	M (SD)			N	M (SD)	N	M (SD)			N	M (SD)	N	M (SD)		
Self-care adherence	66	38.68 (7.4)	57	29.86 (6.2)	7.07***	1.28	85	37.48 (7.4)	38	28.14 (5.7)	6.89***	1.34	55	28.81 (5.8)	68	39.27 (6.7)	9.16***	1.65

Note: d = Cohen's d; ***p < .00

The variables fulfilled the main assumptions of linearity and normality and the absence of multicollinearity underpinning multiple regression. Hence, a multiple linear regression was employed (see Table 6) to find the best variables for predicting self-care adherence among participants. The results showed that illness perception, maladaptive coping, and adaptive coping predicted self-care adherence; R^2 = .599, $F(3, 119)$ = 59.29, p < .001. Cohen's f^2 measure for the effect size of this analysis was f^2 = 1.44, 95% CI [0.48, 0.67], indicating that the predictor variables forecasted 59.9% of the variance in self-care adherence among participants. Adaptive coping was the best predictor, β = .54, p < .001 followed by illness perception, β = -.18, p = .013 and maladaptive coping, β = -.17, p = .044.

Table 6: Regression Coefficients of Illness Perception, Maladaptive Coping, and Adaptive Coping on Self-care Adherence among People with T2D

Variable	B	95% CI for B		SE B	B	t	p
		LL	UL				
Constant	21.85	10.64	33.06	5.66		3.86	.000
Illness perception	-.16	-0.28	-0.03	.06	-.18	2.53	.013*
Maladaptive coping	-.25	-0.48	-0.01	.12	-.17	2.04	.044*
Adaptive coping	.73	0.53	0.93	.10	.54	7.13	.000***
R	.77						
R^2	.599						
F	59.29***						
f^2	1.44						

Note: N =123; *p < .05, ***p < .001

Discussion

This study investigated the relationships among illness perception, maladaptive coping, adaptive coping, and self-care adherence in people with T2D. The findings suggest that individuals' perceptions of diabetes, the coping strategies they practice, and their level of self-care adherence are associated with each other. The more threatening an individual's perception of their diabetes is, the more they engage in maladaptive coping strategies, including self-blame, self-distraction, denial, substance use, behavioral disengagement, venting, and humor. The most probable reason for such an association is that, often, the course of the illness is not well defined and varies from person to person, leading to an improper understanding of this metabolic disorder. This lack of proper knowledge, along with fear and anxiety concerning the illness, makes the process of management daunting for individuals. Eventually, they create a sense of helplessness and incapability that makes them view their condition as threatening and tackle it in unhealthy ways. A recent study found similar findings for illness perception and maladaptive coping (Knowles et al., 2020).

On the other hand, this study observed that individuals with a less threatening perception of the illness engage in more adaptive coping strategies, including active coping, emotional and instrumental support, positive reframing, planning, acceptance, and religion. By obtaining accurate information regarding diabetes self-care practices and incorporating it into their daily routines, individuals can develop a less fearful view of the illness, which may create a sense of confidence that they can manage the disorder healthily and efficiently. A study conducted by Lawson et al. (2013) showed a similar association between illness perception and adaptive coping. However, a study by Knowles et al. (2020) did not report a significant relationship between illness perception and adaptive coping.

Individuals who perceive their illness as less threatening have higher self-care adherence. Illness coherence, personal control, and treatment control are essential dimensions that contribute to a lower perception of illness threat. This may be because once individuals acquire a solid understanding of the course of the illness and the essentiality and effectiveness of its management, any apprehension concerning the illness may decline, and they may feel more personal control over the illness. This increase in personal control, along with awareness related to the health benefits of diabetes management, may help them better adhere to self-care activities. Many studies have shown a similar association of illness perception with self-care adherence (Abraham et al., 2015; Nie et al., 2018; Nsereko et al., 2013).

Individuals who engaged more in maladaptive coping strategies demonstrated less engagement in adaptive coping strategies. Specific maladaptive coping strategies, such as denial, behavioral disengagement, self-distraction, etc., may help an individual avoid illness-related distress. However, consistent use of these strategies may not help them develop a problem-focused approach toward the illness and may result in less frequent use of adaptive coping. However, this finding is contrasted by a recent study that reported no significant correlation between maladaptive and adaptive coping (Knowles et al., 2020).

Individuals who used more maladaptive coping showed lower adherence to their self-care activities. Higher use of maladaptive coping strategies among people with T2D may increase their tendency to indulge in behaviors such as denial, venting, self-distraction, behavioral disengagement, etc., that may initially appear to help cope with the illness. However, these strategies may not help them adhere to self-care practices after some time, leading to reduced

self-care adherence. This finding is based on a study that reported a similar association (Hapunda, 2022).

Further, individuals who adopt more adaptive coping strategies will probably demonstrate higher adherence to self-care activities. All in all, T2D is a lifestyle disorder; therefore, its management involves strict lifestyle changes that may pose personal and emotional challenges to individuals suffering from it. However, those who often engage in adaptive coping strategies, such as planning their routine, positively reframing the situation, seeking health care, emotional support, etc., may be able to better cope with these challenges. This may be the reason for their higher self-care adherence, following a study highlighting the association of adaptive coping strategies with better self-care (Hapunda, 2022).

Another study finding is that the women participants perceived their illness as more threatening compared to men. As women engage in multiple roles, they prioritize the needs of others (spouses, children, and family members). They may ignore the initial symptoms of their illness, which may result in appraisal, illness, and utilization delay (Safer et al., 1979). This delay in seeking treatment, along with severe symptoms, health-related difficulties, and poor personal control, may cause them to perceive the illness as a threat. Men, in contrast, may access treatment and health care services faster than women, enabling them to acquire a better understanding of the illness and its complications and perceive it as less threatening and manageable. This finding is consistent with a study that reported perceptions of lower personal control and self-efficacy related to health management among women compared to men (Mead et al., 2010). However, another study reported that women accepted their identity as a person with chronic illnesses more easily compared to men (Dyer et al., 2014).

Further, this study observed that gender did not influence the coping strategies (maladaptive and adaptive) individuals use to manage their illness. Considering the high literacy rate in Kerala, both men and women have equal access to education, information, and employment. With increasing technological advancements and equal work opportunities, women have become as financially independent as men. These factors may have contributed to gender equity in healthcare resources and support and led to equal possibilities of using a particular coping strategy without gender-based differences—however, previous studies conflict with this finding. For instance, one study reported that coping was influenced by gender (Gåfvels & Wändell, 2006), and another by Hara et al. (2014) reported that while women experienced more stress than men, they were more reluctant to cope.

Women showed poorer self-care adherence than men. Women are generally expected to take care of the family's needs; therefore, more domestic responsibilities are given to women than men. Most women struggle to balance family and work and frequently experience difficulty accessing proper self-care, which explains their poor self-care adherence. Women prioritize the care and health of their family over their own, which benefits men by allowing them to receive more support from significant others (family and friends) who can play an essential role in promoting self-care adherence. This is a probable reason men engage in better self-care adherence than women. Supporting this finding, a study by Tavero et al. (2018) highlighted that the caregiving role bestowed on women significantly impacts their health. A recent systematic review by Suresh and Thankappan (2019) found that women faced personal, sociocultural, and psychological barriers to getting diabetes care.

The duration of diabetes influences how individuals perceive their T2D, engage in coping, and adhere to self-care practices is another important finding. People with diabetes for more than 3–6 years had a more negative perception of their illness compared to those with diabetes

for more than 6 years. This may be due to the insidious nature of diabetes, which unfolds its symptoms and complications in a progressive manner that can differ from person to person. After the initial diagnosis, it may take time for individuals to realize the challenges posed by the disease, and their low level of awareness may make them feel anxious and fearful about the condition, due to which they begin perceiving it as a threat. However, this threatening perception may alter depending on their comprehension of the illness, symptoms, complications experienced, and the treatment and social support they receive. It may help them to reconstruct a less threatening perception of the illness. This may be why individuals who have had diabetes for over 6 years have a less threatening perception of their illness. A study by Abraham et al. (2015) reported a similar relationship between a more prolonged duration of diabetes and less threatening illness perception.

However, the illness perception of people with diabetes for 6 months–3 years did not differ from individuals having diabetes for more than 3 years–6 years and more than 6 years. During the initial years of diagnosis, individuals assume their illness to be less harmful or mild, especially when healthcare professionals recommend only lifestyle changes or oral medication due to the disease's asymptomatic nature and the absence of diabetes-related complications. Only when symptoms and complications emerge do they begin to realize the seriousness of the disease. However, this change in perception may be gradual and take too long to materialize, depending on the severity of the symptoms and diabetes-related complications among this population. This could explain why there is no difference in the perception of the illness based on the duration of the disease. A study performed by van Puffelen et al. (2015) highlighted that in the initial years of diabetes, individuals do not consider the illness severe, which supports the current study's findings.

In addition, maladaptive coping did not differ based on the duration of diabetes. Managing diabetes is a highly taxing process involving cognitive, emotional, and behavioral efforts. Hence, individuals may be in denial and fail to accept the illness during the early years after diagnosis, causing them to delay taking responsibility for its management and frequently engage in maladaptive coping strategies. This deferral in accepting responsibility may persist without severe consequences from the chronic condition. It may explain why there is no difference in their use of maladaptive coping strategies based on the diabetes duration. However, as the illness progresses and becomes more severe, individuals may encounter the negative consequences of retaining maladaptive coping. Accordingly, this finding warrants further investigation. Gåfvels et al. (2018) found that there was a decrease in the sense of denial among the diabetic population over time, which contradicts the current study's finding.

The study documents that people having diabetes for more than 6 years will probably use more adaptive coping strategies than those having diabetes for 6 months–3 years and more than 3 years–6 years. Given that diabetes is a slow-progressing disorder, following a healthy lifestyle is the most effective way to manage the condition. However, this understanding may emerge only as the illness progresses, motivating individuals to develop a problem-focused approach to illness management. This quest for healthy solutions to their chronic illness may encourage individuals with T2D to adopt healthy ways to face the unpredictable nature of diabetes and, over time, contribute to the increased use of adaptive coping strategies. A study reported a similar finding, stating that cognitive revaluation increased over time among people with T2D (Gåfvels et al., 2018).

Individuals having diabetes for 6 months–3 years showed no difference in their use of adaptive coping strategies compared to those having diabetes for more than 3 years–6 years.

Engaging in efforts to Seek emotional and practical assistance from others in the initial years of diagnosis and proactively approaching the illness may be difficult for many individuals. Hence, some may not invest sufficient cognitive effort or employ problem-focused strategies to manage the illness in the initial few years of the disease. A healthier shift may happen only with time and an increased understanding of the illness and its complications, which may be the reason for no difference in the use of adaptive coping strategies among individuals with diabetes for 6 months–3 years and those with more than 3 years–6 years. However, contrasting the current finding, another study reported increased cognitive revaluation over 2 years after diagnosis (Gåfvels et al., 2018).

Further, it was found that people with T2D for more than 6 years will probably demonstrate a higher self-care adherence than those having diabetes for 6 months–3 years. Compared to other chronic illnesses, diabetes does not involve severe symptoms and progresses slowly. Due to its asymptomatic and unpredictable nature, it remains challenging to make individuals with T2D aware of the seriousness of their condition in the initial years of diagnosis. Therefore, their level of self-care adherence may not be as high as expected. However, as time progresses, the illness symptoms may increase, and individuals may develop more complications related to diabetes, causing them to seek information and follow their recommended self-care practices. This finding is in accordance with past studies that reported the correlation of longer diabetes duration with self-care (monitoring of blood glucose) adherence (Enikuomehin et al., 2021; Raoufi et al., 2018) but conflicts with that of a study (Mogre et al., 2017) showing no association between diabetes duration and self-care adherence.

Moreover, this finding allows one to comprehend the process of self-care adherence from the stages of change (SOC) model viewpoint (Prochaska & Velicer, 1997). As the illness progresses, individuals may choose to change health behavior due to their personal experiences with the illness or by observing others' experiences. The SOC model may explain how these changes occur over time and could be the reason for increased self-care adherence among individuals having diabetes for more than 6 years compared to those having diabetes for 6 months–3 years. A study conducted by Arafat et al. (2019) reported an association between diabetes duration, SOC, and medication adherence among people with T2D, results that are consistent with the current study findings.

However, individuals having diabetes for more than 3 years–6 years did not differ in their self-care adherence compared to those with diabetes for 6 months–3 years and more than 6 years. In its early stages, diabetes is mainly symptomless and without complications. However, the recommended diabetes self-care practices may be challenging for a newly diagnosed individual. Therefore, without symptoms and complications, the individual may not wholly adhere to recommended practices, and it may take a long time to adapt to the chronic illness. This may be the reason individuals with diabetes for more than 3–6 years do not differ in their self-care adherence from those with diabetes for 6 months–3 years and over 6 years. However, this finding is contrasted by a study (Arafat et al., 2019) that reported a positive correlation between disease duration and self-care adherence.

According to this study, illness perception, maladaptive coping, and adaptive coping influence self-care adherence among people with T2D. People with T2D who perceive their illness as severe and threatening tend to have poor adherence to self-care compared to those who perceive it as less intimidating. This may be because the burden of managing diabetes is both physically and emotionally taxing, and those who perceive the condition as highly threatening may tend to get more distressed and demotivated. This cycle of distress and

demotivation can become self-perpetuating and lead to poor self-care adherence among people with T2D. On the other hand, individuals who acquire accurate information about illness and health care are more prone to develop a positive perception of the illness, making them feel more confident about regulating it through the recommended treatment regimen. This confidence may cause them to adhere more responsibly to their self-care practice, a finding that is consistent with previous studies reporting that diabetes perceptions influence self-care practices (Kugbey et al., 2017) and personal control is associated with self-care practices (Abubakari et al., 2011).

Individuals who used more maladaptive coping tended to demonstrate poor diabetes self-care adherence. Individuals engaging more in maladaptive coping strategies seldom seek correct ways to understand and manage their illness. These strategies may only provide them with temporary relief from illness-induced distress. Thus, they may not help them use healthy ways to manage the disease, reducing their self-care adherence. Hapunda (2020) reported a similar finding among people with T2D.

Individuals who frequently adopt adaptive coping strategies show higher adherence to self-care. Adaptive coping strategies help individuals face challenges head-on, assess their condition realistically, modify unhealthy emotional responses, and take preventive measures to avoid adverse health effects. These proactive and positive approaches toward the illness may help them accurately understand the course of the illness and remain motivated during the ups and downs of the illness, thereby forming a solid foundation for their long-term adherence. A similar association between adaptive coping and self-care adherence was reported in a previous study (Hapunda, 2022).

Finally, a significant finding of this study is that among individuals with T2D, using adaptive coping strategies best predicts self-care adherence. Adaptive coping strategies comprise cognitive, emotional, and behavioral efforts to tackle the illness, such as actively addressing and managing unhealthy emotions related to the condition, seeking emotional help from family and friends and practical assistance from healthcare professionals, and using a problem-focused approach to effectively manage symptoms and complications. These proactive strategies, positive outlook, and acceptance of the illness help individuals with T2D consistently follow recommended treatment and self-care practices. This finding is supported by studies highlighting the association between adaptive coping and better self-care adherence among the T2D population (Hapunda, 2022; Hart & Grindel, 2010).

The current study has certain limitations. First, the generalizability of this study may not be possible as the study sample was restricted to a geographical area. Second, study variables were measured using self-report measures and may have led to desirability and recall bias. This study also has certain delimitations, such as that it did not include older adults, only participants who could comprehend the English language were included, and the sample only comprised people with T2D from Kerala, India.

Implications

This study highlights the significance of understanding the psychological aspects of diabetes management by emphasizing the role of illness perception, maladaptive coping, and adaptive coping in the self-care adherence of people with T2D. Increasing awareness about perceiving illness as less threatening, alleviating the practice of maladaptive coping, and enhancing adaptive coping may be beneficial in effectively managing T2D. There is a need for

interventions focusing on improving adaptive coping skills and self-care adherence among the T2D population, with a particular reference to women. Future research should focus on providing interventions such as psychoeducation for perceiving the illness as less threatening, decreasing the reliance on maladaptive coping strategies, and promoting more engagement in adaptive coping strategies among people with T2D.

Conclusion

In this study, illness perception, coping, and self-care adherence were associated with each other. Women viewed their illnesses as more threatening than men. Men and women showed no significant differences in their use of coping strategies; however, women had lower adherence to self-care than men. A longer duration of diabetes led to a less threatening perception of the illness, while maladaptive coping did not differ based on the duration of diabetes. Longer durations of diabetes were related to higher adaptive coping and increased self-care adherence. Self-care adherence was higher when the illness was perceived as less threatening than when it was perceived as more threatening. Less engagement in maladaptive coping led to better self-care adherence than more engagement in maladaptive coping. In contrast, less engagement in adaptive coping led to poorer self-care adherence compared to more engagement in this coping. Adaptive coping emerged as the best predictor of self-care adherence, followed by illness perception and maladaptive coping.

Acknowledgments

References

Abraham, A. M., Sudhir, P. M., Philip, M., & Bantwal, G. (2015). Illness perceptions and perceived barriers to self-care in patients with type 2 diabetes mellitus: An exploratory study from India. *International Journal of Diabetes in Developing Countries*, 2(35), 137–144. https://doi.org/10.1007/s13410-014-0266-z

Abubakari, A.-R., Jones, M. C., Lauder, W., Kirk, A., Anderson, J., & Devendra, D. (2011). Associations between knowledge, illness perceptions, self-management and metabolic control of type 2 diabetes among African and European-origin patients. *Journal of Nursing and Healthcare of Chronic Illness*, 3(3), 245–256. https://doi.org/10.1111/j.1752-9824.2011.01098.x

Achouri, M. Y., Mammeri, M., Sehanine, Y., Selka, M. A., Ghomari, W. I., Lahmer, A., & Hadj Habib, M. (2019). Facteurs associés à la non-observance thérapeutique chez les diabétiques de type 2: Première enquête algérienne [Factors associated with medication non-adherence in patients with type 2 diabetes mellitus: The first Algerian survey]. *Annales Pharmaceutiques Francaises*, 77(6), 506–515. https://doi.org/10.1016/j.pharma.2019.08.003

Aflakseir, A. (2012). Role of illness and medication perceptions on adherence to medication in a group of Iranian patients with type 2 diabetes. *Journal of Diabetes*, 4(3), 243–247. https://doi.org/10.1111/j.1753-0407.2012.00183.x

Aga, F., Dunbar, S. B., Kebede, T., Higgins, M. K., & Gary, R. (2020). Relationships of diabetes self-care behaviours to glycaemic control in adults with type 2 diabetes and comorbid heart failure. *Nursing Open*, 7(5), 1453–1467. https://doi.org/10.1002/nop2.517

Al-Qerem, W., Jarab, A. S., Badinjki, M., Hyassat, D., & Qarqaz, R. (2021). Exploring variables associated with medication non-adherence in patients with type 2 diabetes mellitus. *PLOS ONE*, *16*(8), Article e0256666. https://doi.org/10.1371/journal.pone.0256666

Albai, A., Sima, A., Papava, I., Roman, D., Andor, B., & Gafencu, M. (2017). Association between coping mechanisms and adherence to diabetes-related self-care activities: A cross-sectional study. *Patient Preference and Adherence*, *2017*(11), 1235–1241. https://doi.org/10.2147/PPA.S140146

Alyami, M., Serlachius, A., Mokhtar, I., & Broadbent, E. (2020). The association of illness perceptions and God locus of health control with self-care behaviours in patients with type 2 diabetes in Saudi Arabia. *Health Psychology and Behavioral Medicine*, *8*(1), 329–348. https://doi.org/10.1080/21642850.2020.1805322

American Diabetes Association (ADA). (2022). Introduction: Standards of medical care in diabetes—2022. *Diabetes Care*, *45*(Supplement_1), S1–S2. https://doi.org/10.2337/dc22-Sint

Arafat, Y., Mohamed Ibrahim, M. I., Awaisu, A., Colagiuri, S., Owusu, Y., Morisky, D. E., AlHafiz, M., & Yousif, A. (2019). Using the transtheoretical model's stages of change to predict medication adherence in patients with type 2 diabetes mellitus in a primary health care setting. *Daru: Journal of Faculty of Pharmacy, Tehran University of Medical Sciences*, *27*(1), 91–99. https://doi.org/10.1007/s40199-019-00246-7

Babazadeh, T., Dianatinasab, M., Daemi, A., Nikbakht, H. A., Moradi, F., & Ghaffari-Fam, S. (2017). Association of self-care behaviors and quality of life among patients with type 2 diabetes mellitus: Chaldoran County, Iran. *Diabetes & Metabolism Journal*, *41*(6), 449–456. https://doi.org/10.4093/dmj.2017.41.6.449

Barnes, L., Moss-Morris, R., & Kaufusi, M. (2004). Illness beliefs and adherence in diabetes mellitus: A comparison between Tongan and European patients. *The New Zealand Medical Journal*, *117*(1188), Article U743. https://pubmed.ncbi.nlm.nih.gov/14999303/

Bilondi, S. S., Noghabi, A. D., & Aalami, H. (2022). The relationship between illness perception and medication adherence in patients with diabetes mellitus type II: Illness perception and medication adherence. *Journal of Preventive Medicine and Hygiene*, *62*(4), E966–E971. https://doi.org/10.15167/2421-4248/jpmh2021.62.4.2277

Bonger, Z., Shiferaw, S., & Tariku, E. Z. (2018). Adherence to diabetic self-care practices and its associated factors among patients with type 2 diabetes in Addis Ababa, Ethiopia. *Patient Preference and Adherence*, *2018*(12), 963–970. https://doi.org/10.2147/PPA.S156043

Broadbent, E., Petrie, K. J., Main, J., & Weinman, J. (2006). The brief illness perception questionnaire. *Journal of Psychosomatic Research*, *60*(6), 631–637. https://doi.org/10.1016/j.jpsychores.2005.10.020

Cameron, L. D., & Leventhal, H. (2003). Self-regulation, health, and illness: An overview. In L. D. Cameron & H. Leventhal (Eds.), *The self-regulation of health and illness behaviour* (pp. 1–13). Routledge.

Carver, C. S. (1997). You want to measure coping but your protocol's too long: Consider the brief COPE. *International Journal of Behavioral Medicine*, *4*(1), 92–100. https://doi.org/10.1207/s15327558ijbm0401_6

Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology*, *56*(2), 267–283. https://doi.org/10.1037//0022-3514.56.2.267

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Routledge Academic.

Duangdao, K. M., & Roesch, S. C. (2008). Coping with diabetes in adulthood: A meta-analysis. *Journal of Behavioral Medicine*, *31*(4), 291–300. https://doi.org/10.1007/s10865-008-9155-6

Dyer, C. (2014). *The meaning of multiple medication use in adults: A qualitative study* [Master's thesis, Brock University]. DSpace. http://hdl.handle.net/10464/5561

Enikuomehin, A. C., Olamoyegun, M. A., Ojo, O. A., Ajani, G. D., Akinlade, T. A., & Ala, O. A. (2021). Pattern of Self-care practices among type 2 diabetes patients in Southwest, Nigeria. *Nigerian Journal of Clinical Practice*, *24*(7), 978–985. https://doi.org/10.4103/njcp.njcp_527_20

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191. https://doi.org/10.3758/bf03193146

French, D. P., Wade, A. N., & Farmer, A. J. (2013). Predicting self-care behaviours of patients with type 2 diabetes: The importance of beliefs about behaviour, not just beliefs about illness. *Journal of Psychosomatic Research*, 74(4), 327–333. https://doi.org/10.1016/j.jpsychores.2012.12.008

Gåfvels, C., Hägerström, M., Rane, K., Wajngot, A., & Wändell, P. E. (2018). Coping strategies among patients newly diagnosed with diabetes or rheumatoid arthritis at baseline and after 24 months. *Journal of Health Psychology*, 23(10), 1273–1286. https://doi.org/10.1177/1359105316648759

Gåfvels, C., & Wändell, P. E. (2006). Coping strategies in men and women with type 2 diabetes in Swedish primary care. *Diabetes Research and Clinical Practice*, 71(3), 280–289. https://doi.org/10.1016/j.diabres.2005.07.001

Hagger, M. S., Koch, S., Chatzisarantis, N. L. D., & Orbell, S. (2017). The common sense model of self-regulation: Meta-analysis and test of a process model. *Psychological Bulletin, 143*(11), 1117–1154. https://doi.org/10.1037/bul0000118

Hapunda, G. (2022). Coping strategies and their association with diabetes specific distress, depression and diabetes self-care among people living with diabetes in Zambia. *BMC Endocrine Disorders*, 22(1), Article 215. https://doi.org/10.1186/s12902-022-01131-2

Hara, Y., Hisatomi, M., Ito, H., Nakao, M., Tsuboi, K., & Ishihara, Y. (2014). Effects of gender, age, family support, and treatment on perceived stress and coping of patients with type 2 diabetes mellitus. *BioPsychoSocial Medicine*, 8(1), Article 16. https://doi.org/10.1186/1751-0759-8-16

Hart, P. L., & Grindel, C. G. (2010). Illness representations, emotional distress, coping strategies, and coping efficacy as predictors of patient outcomes in type 2 diabetes. *Journal of Nursing and Healthcare of Chronic Illness*, 2(3), 225–240. https://doi.org/10.1111/j.1752-9824.2010.01062.x

Harvey, J. N., & Lawson, V. L. (2009). The importance of health belief models in determining self-care behaviour in diabetes. *Diabetic medicine: A journal of the British Diabetic Association*, 26(1), 5–13. https://doi.org/10.1111/j.1464-5491.2008.02628.x

Hashimoto, K., Urata, K., Yoshida, A., Horiuchi, R., Yamaaki, N., Yagi, K., & Arai, K. (2019). The relationship between patients' perception of type 2 diabetes and medication adherence: A cross-sectional study in Japan. *Journal of Pharmaceutical Health Care and Sciences*, 5(1), Article 2. https://doi.org/10.1186/s40780-019-0132-8

Hemphill, R. C., Stephens, M. A., Rook, K. S., Franks, M. M., & Salem, J. K. (2013). Older adults' beliefs about the timeline of type 2 diabetes and adherence to dietary regimens. *Psychology & Health*, 28(2), 139–153. https://doi.org/10.1080/08870446.2012.685740

Hill-Briggs, F., & Gemmell, L. (2007). Problem solving in diabetes self-management and control: A systematic review of the literature. *The Diabetes Educator*, 33(6), 1032–1052. https://doi.org/10.1177/0145721707308412

Hla, L. S. P., Pongthavornkamol, K., Wattanakitkrileart, D., & Orathai, P. (2018). Factors influencing adherence to therapeutic regimens among people with type 2 diabetes mellitus in Yangon, Myanmar. *Journal of Population and Social Studies*, 26(4), 262–280. https://doi.org/10.25133/JPSSv26n4.019

International Diabetes Federation (IDF). (2021). *IDF Diabetes Atlas* (10th ed.). https://diabetesatlas.org/atlas/tenth-edition/

Karimy, M., Koohestani, H. R., & Araban, M. (2018). The association between attitude, self-efficacy, and social support and adherence to diabetes self-care behavior. *Diabetology & Metabolic Syndrome*, 10(1), Article 86. https://doi.org/10.1186/s13098-018-0386-6

Karlsen, B., & Bru, E. (2002). Coping styles among adults with Type 1 and Type 2 diabetes. *Psychology, Health & Medicine*, 7(3), 245–259. https://doi.org/10.1080/13548500220139403

Khunti, K., Skinner, T. C., Heller, S., Carey, M. E., Dallosso, H. M., Davies, M. J., & DESMOND Collaborative (2008). Biomedical, lifestyle and psychosocial characteristics of people newly diagnosed with Type 2 diabetes: Baseline data from the DESMOND randomized controlled trial. *Diabetic Medicine: A Journal of the British Diabetic Association*, 25(12), 1454–1461. https://doi.org/10.1111/j.1464-5491.2008.02620.x

Knowles, S. R., Apputhurai, P., O'Brien, C. L., Ski, C. F., Thompson, D. R., & Castle, D. J. (2020). Exploring the relationships between illness perceptions, self-efficacy, coping strategies, psychological distress and quality of life in a cohort of adults with diabetes mellitus. *Psychology, Health & Medicine*, 25(2), 214–228. https://doi.org/10.1080/13548506.2019.1695865

Kugbey, N., Oppong Asante, K., & Adulai, K. (2017). Illness perception, diabetes knowledge and self-care practices among type-2 diabetes patients: A cross-sectional study. *BMC Research Notes*, *10*. Article 381. https://doi.org/10.1186/s13104-017-2707-5

La Greca, A. M. (1992). *Brief Manual for the Self-Care Inventory*. https://people.miami.edu/_assets-profiles/acad-as/pdf/psychology/annette-lagreca-pdfs/sci-manual-2004.pdf

Lawson, V. L., Bundy, C., Belcher, J., & Harvey, J. N. (2013). Changes in coping behavior and the relationship to personality, health threat communication and illness perceptions from the diagnosis of diabetes: A 2-year prospective longitudinal study. *Health Psychology Research*, *1*(2), Article e20. https://doi.org/10.4081/hpr.2013.e20

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer Publishing Company.

Leventhal, H., Leventhal, E. A., & Contrada, R. J. (1998). Self-regulation, health, and behavior: A perceptual-cognitive approach. *Psychology & Health*, *13*(4), 717–733. https://doi.org/10.1080/08870449808407425

Leventhal, H., Meyer, D. and Nerenz, D. (1980). The common sense representation of illness danger. In S. Rachman (Ed.), *Contributions to medical psychology* (Vol. II, pp. 7–30). Pergamon Press.

Leventhal, H., Phillips, L. A., & Burns, E. (2016). The Common-Sense Model of Self-Regulation (CSM): A dynamic framework for understanding illness self-management. *Journal of Behavioral Medicine*, *39*(6), 935–946. https://doi.org/10.1007/s10865-016-9782-2

McCoy, M. A., & Theeke, L. A. (2019). A systematic review of the relationships among psychosocial factors and coping in adults with type 2 diabetes mellitus. *International Journal of Nursing Sciences*, *6*(4), 468–477. https://doi.org/10.1016/j.ijnss.2019.09.003

Mead, H., Andres, E., Katch, H., Siegel, B., & Regenstein, M. (2010). Gender differences in psychosocial issues affecting low-income, underserved patients' ability to manage cardiovascular disease. *Women's Health Issues: Official Publication of the Jacobs Institute of Women's Health*, *20*(5), 308–315. https://doi.org/10.1016/j.whi.2010.05.006

Mogre, V., Abanga, Z. O., Tzelepis, F., Johnson, N. A., & Paul, C. (2017). Adherence to and factors associated with self-care behaviours in type 2 diabetes patients in Ghana. *BMC Endocrine Disorders*, *17*(1), Article 20. https://doi.org/10.1186/s12902-017-0169-3

Mosleh, S. M., & Almalik, M. M. (2016). Illness perception and adherence to healthy behaviour in Jordanian coronary heart disease patients. *European Journal of Cardiovascular Nursing*, *15*(4), 223–230. https://doi.org/10.1177/1474515114563885

Ngetich, E., Pateekhum, C., Hashmi, A., Nadal, I. P., Pinyopornpanish, K., English, M., Quansri, O., Wichit, N., Kinra, S., & Angkurawaranon, C.. (2022). Illness perceptions, self-care practices, and glycemic control among type 2 diabetes patients in Chiang Mai, Thailand. *Archives of Public Health*, *80*, Article 134. https://doi.org/10.1186/s13690-022-00888-1

Nie, R., Han, Y., Xu, J., Huang, Q., & Mao, J. (2018). Illness perception, risk perception and health promotion self-care behaviors among Chinese patient with type 2 diabetes: A cross-sectional survey. *Applied Nursing Research: ANR*, *39*, 89–96. https://doi.org/10.1016/j.apnr.2017.11.010

Nsereko, E., Bavuma, C., Tuyizere, M., Ufashingabire, C., Rwakageyo, J. M. V., & Yamuragiye, A. (2013). Illness perceptions and depression in relation to self-care behaviour among type 2 diabetes patients in a referral hospital in Kigali-Rwanda. *Rwanda Journal of Health Sciences*, *2*(1), 1–9. https://www.ajol.info/index.php/rjhs/article/view/85422

Owiredua, C., Quarshie, E. N. B., & Atorkey, P. (2018). Living with diabetes: An exploratory study of illness representation and medication adherence in Ghana. *Cogent Medicine*, *5*(1), Article 1463599. https://doi.org/10.1080/2331205X.2018.1463599

Pradeepa, R., & Mohan, V. (2021). Epidemiology of type 2 diabetes in India. *Indian Journal of Ophthalmology*, *69*(11), 2932–2938. https://doi.org/10.4103/ijo.IJO_1627_21

Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion: AJHP*, *12*(1), 38–48. https://doi.org/10.4278/0890-1171-12.1.38

Raoufi, A. M., Tang, X., Jing, Z., Zhang, X., Xu, Q., & Zhou, C. (2018). Blood glucose monitoring and its determinants in diabetic patients: A cross-sectional study in Shandong, China. *Diabetes Therapy*, *9*(5), 2055–2066. https://doi.org/10.1007/s13300-018-0499-9

Rose, M., Fliege, H., Hildebrandt, M., Schirop, T., & Klapp, B. F. (2002). The network of psychological variables in patients with diabetes and their importance for quality of life and metabolic control. *Diabetes Care*, *25*(1), 35–42. https://doi.org/10.2337/diacare.25.1.35

Safer, M. A., Tharps, Q. J., Jackson, T. C., & Leventhal, H. (1979). Determinants of three stages of delay in seeking care at a medical clinic. *Medical Care*, *17*(1), 11–29. https://doi.org/10.1097/00005650-197901000-00002

Searle, A., Norman, P., Thompson, R., & Vedhara, K. (2007). A prospective examination of illness beliefs and coping in patients with type 2 diabetes. *British Journal of Health Psychology*, *12*(Pt 4), 621–638. https://doi.org/10.1348/135910706X164935

Shayeghian, Z., Aguilar-Vafaie, M. E., Besharat, M. A., Amiri, P., Parvin, M., Gillani, K. R., & Hassanabadi, H. (2015). Self-care activities and glycated haemoglobin in Iranian patients with type 2 diabetes: Can coping styles and social support have a buffering role? *Psychology & Health*, *30*(2), 153–164. https://doi.org/10.1080/08870446.2014.951651

Skinner, T. C., Carey, M. E., Cradock, S., Daly, H., Davies, M. J., Doherty, Y., Heller, S., Khunti, K., & Oliver, L. (2006). Diabetes education and self-management for ongoing and newly diagnosed (DESMOND): Process modelling of pilot study. *Patient Education and Counseling*, *64*(1), 369–377. https://doi.org/10.1016/j.pec.2006.04.007

Suresh, N., & Thankappan, K. R. (2019). Gender differences and barriers women face in relation to accessing type 2 diabetes care: A systematic review. *Indian Journal of Public Health*, *63*(1), 65–72. https://doi.org/10.4103/ijph.IJPH_26_18

Tavero, I. L., García, E. G., Seda, J. M., Serrano, R. R., Cabrera, I. M. C., & Rodríguez, A. A. (2018). The gender perspective in the opinions and discourse of women about caregiving. *Revista da Escola de Enfermagem da U S P*, *52*, Article e03370. https://doi.org/10.1590/s1980-220x2017009403370

Tharek, Z., Ramli, A. S., Whitford, D. L., Ismail, Z., Mohd Zulkifli, M., Ahmad Sharoni, S. K., Shafie, A. A., & Jayaraman, T. (2018). Relationship between self-efficacy, self-care behaviour and glycaemic control among patients with type 2 diabetes mellitus in the Malaysian primary care setting. *BMC Family Practice*, *19*(1), Article 39. https://doi.org/10.1186/s12875-018-0725-6

Tuncay, T., Musabak, I., Gok, D., & Kutlu, M. (2008). The relationship between anxiety, coping strategies and characteristics of patients with diabetes. *Health and Quality of Life Outcomes*, *6*(1), Article 79. https://doi.org/10.1186/1477-7525-6-79

van Puffelen, A. L., Heijmans, M. J., Rijken, M., Rutten, G. E., Nijpels, G., Schellevis, F. G., & Diacourse study group (2015). Illness perceptions and self-care behaviours in the first years of living with type 2 diabetes; Does the presence of complications matter? *Psychology & Health*, *30*(11), 1274–1287. https://doi.org/10.1080/08870446.2015.1045511

Weijman, I., Ros, W. J., Rutten, G. E., Schaufeli, W. B., Schabracq, M. J., & Winnubst, J. A. (2005). The role of work-related and personal factors in diabetes self-management. *Patient Education and Counseling*, *59*(1), 87–96. https://doi.org/10.1016/j.pec.2004.10.004

Weinger, K., Butler, H. A., Welch, G. W., & Greca, A. M. L. (2005). Measuring diabetes self-care: A psychometric analysis of the Self-Care Inventory-revised with adults. *Diabetes Care*, *28*(6), 1346–1352. https://doi.org/10.2337/diacare.28.6.1346

World Health Organization (WHO). (2003). *Adherence to long-term therapies: Evidence for action*. https://apps.who.int/iris/handle/10665/42682