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**Belief-based Self-regulation Model to Improve Self-care in Type 2 Diabetes**

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**Abstract**

Background: Poor self-care among individuals with type 2 diabetes mellitus (T2DM) is often linked to inadequate self-regulation, leading to uncontrolled blood glucose and increased risk of complications. Significance: Addressing the psychological and behavioral dimensions of self-regulation is essential to improving outcomes in chronic disease management. Objectives: The specific objectives are to: 1) examine the effects of individual, social, and health-service factors on problem interpretation and emotional responses; 2) determine the mediating roles of health beliefs and coping strategies in the self-regulation process; 3) assess the overall impact of the belief-based self-regulation model on self-care behavior in patients with T2DM. Methods: A cross-sectional explanatory study was conducted on 150 T2DM patients with blood glucose levels >210 mg/dL, selected using multistage random sampling from health centers in South Sulawesi, Indonesia. Data were collected using structured and validated questionnaires. The structural relationships between variables were analyzed using Structural Equation Modeling–Partial Least Squares (SEM–PLS). Limitations: The cross-sectional design limits the ability to infer causal relationships. Furthermore, the self-reported nature of the data may introduce response bias. Findings: Individual characteristics, social support, and health service factors significantly influenced both the interpretation of illness and emotional responses. These, in turn, affected belief formation, coping mechanisms, and ultimately self-care behaviors. Coping was found to be the strongest direct predictor of self-care. Implications: The study highlights the importance of integrating belief systems and emotional regulation into self-care interventions. The proposed model provides a comprehensive framework for health professionals to enhance self-care behaviors among T2DM patients through psychological, social, and health-system support.

**Keywords:** self-regulation; belief; coping; self-care; type 2 diabetes mellitus

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**1.0 Introduction**

Self-care plays a critical role in managing type 2 diabetes mellitus (T2DM), as it supports blood glucose control and helps prevent both acute and long-term complications (Goins et al., 2020; Rahmatulloh et al., 2024). Despite its importance, self-care practices among

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individuals with T2DM remain insufficient across many populations (Ahmad & Joshi, 2023; Mohamad et al., 2025). Poor adherence to treatment regimens, including medication intake, dietary adjustments, physical activity, and foot care, often results in uncontrolled glycemia, which subsequently increases the risk, incidence, and severity of diabetes-related complications such as neuropathy, cardiovascular disease, and nephropathy (Hidayat et al., 2022; Fadli et al., 2024).

Evidence consistently shows that implementing effective self-care strategies is associated with improved metabolic outcomes, better quality of life, and lower hospitalization rates among patients with T2DM (Abebe et al., 2022; Park & Park, 2024). Therefore, empowering patients to engage in continuous, effective self-care behaviors is essential for preventing further deficits that may impair daily functioning and overall well-being (Karami et al., 2021). However, many patients still struggle to sustain adequate self-care routines due to psychological, social, environmental, and health system-related barriers (Kıcaj et al., 2025).

One of the major factors contributing to inadequate self-care is limited self-regulation capacity. Self-regulation influences how patients interpret symptoms, manage emotional responses, and make decisions related to diabetes care (Chuman & Hatamochi, 2021). Studies indicate that disruptions in self-regulation, such as low self-efficacy, negative beliefs about illness, maladaptive coping strategies, and limited family or social support, can hinder patients' ability to manage their condition effectively (Bauer et al., 2025; Zupa et al., 2022). Given its central role in behavioral change, strengthening self-regulation has been recognized as a promising approach to improving self-care behaviors in T2DM.

## 2.0 Literature Review

The global prevalence of diabetes mellitus continues to escalate, particularly in low- and middle-income countries. Evidence shows that many individuals with T2DM exhibit low self-regulation, especially in recognizing disease identity and understanding its causes (Castonguay et al., 2018). This lack of insight hinders their ability to adopt effective coping strategies. A study conducted in China found that self-care adherence among diabetes patients was predominantly moderate (50.4%) or low (33.6%) (Qi et al., 2021). Similarly, in a study conducted in Makassar, Indonesia, 72.8% of T2DM patients demonstrated low self-care ability, while 52.8% reported a poor quality of life (Irwansyah & Kasim, 2021).

Several determinants influence self-care ability, including knowledge, education level, self-esteem, social support, self-efficacy, and perception of illness (Bretschneider et al., 2022; Yan et al., 2024). Among these, social support plays a vital role in shaping health behavior (Momenabadi et al., 2020). In the context of self-regulation, social support and access to health services serve as essential external enablers. Self-regulation itself is influenced by belief systems, which impact how patients manage their care routines (Hariyono & Romli, 2020).

## 3.0 Methodology

This study adopted a cross-sectional design and was conducted at several public health centers in South Sulawesi between August and September 2024. A cross-sectional approach was selected because the primary aim of this research was to test the hypothesized relationships within a belief-based self-regulation model and to examine associations among key variables at a single point in time. Although longitudinal designs provide stronger evidence of causality and temporal ordering, such an approach would require extended follow-up, higher costs, and increased participant burden, which were not feasible in this preliminary model-testing phase. Therefore, the cross-sectional design is appropriate for identifying initial structural relationships that can inform future longitudinal investigations.

The study evaluated the influence of belief-based self-regulation on self-care behaviors among patients with type 2 diabetes mellitus (T2DM). The study population consisted of 150 individuals with T2DM, each with a fasting blood glucose level above 210 mg/dL. Participants were recruited through a multistage random sampling technique, with inclusion criteria specifying adults aged 35 years or older, with adequate independence, and not receiving inpatient care at the time of the study. Ethical approval was granted by the Health Research Ethics Committee of the Faculty of Health, University of Mega Buana Palopo, and all participants provided written informed consent after being informed of the study's objectives, procedures, and benefits.

The study analyzed both exogenous and endogenous variables. Endogenous variables included coping mechanisms and self-care behaviors, while exogenous variables encompassed individual characteristics, illness perception, environmental factors, family-related factors, emotional responses, problem interpretation, and the self-management process. Data were collected using validated and reliable questionnaires. The constructs and indicators were adapted from previous research: individual characteristics; illness representation; environmental factors; family factors; emotional responses (using a modified DASS-42); disease interpretation; and the self-management process. Coping strategies were assessed using an adapted COPE Inventory, while self-care practices were measured using a modified Summary of Diabetes Self-Care Activities (SDSCA) questionnaire covering diet, exercise, medication adherence, blood glucose monitoring, and foot care. Blood glucose levels were measured using a digital glucometer. Data were analyzed using Structural Equation Modeling with Partial Least Squares (SEM-PLS), which included assessments of the outer and inner models and indicator weights to evaluate the effects of the study variables.

## 4.0 Results

Table 1 presents the sociodemographic and clinical characteristics of the 150 respondents involved in the study. The majority of participants were male (55.3%), while females accounted for 44.7%. This gender distribution indicates a slight predominance of male patients among individuals with type 2 diabetes mellitus (T2DM) in the study sample.

Table 1. Distribution Characteristics of Respondents (n=150)

Variable	Mean±SD	n (%)
Gender, n (%)		
Male	-	83 (55.3)
Female	-	67 (44.7)
Disease Complications, n (%)		
No complications	-	70 (46.7)
There are complications	-	80 (53.3)
Ages, Years (±Up to)	52.6 ± 6.48	-
Long suffering from DM, years (±Up to)	4.8 ± 1.43	-
Blood sugar while, mg/dL (±Up to)	264.8 ± 56.47	-

Regarding the presence of complications, 53.3% of respondents reported having diabetes-related complications, whereas 46.7% had no complications. This suggests that more than half of the participants were already experiencing health issues secondary to diabetes, emphasizing the urgency of effective self-care practices and disease management.

The mean age of respondents was 52.6 years (SD ±6.48), which reflects the common age range of individuals with chronic T2DM. The average duration of diabetes among participants was 4.8 years (SD ±1.43), indicating that most had been living with the condition for a moderate period of time, potentially long enough to face challenges in long-term disease management.

Furthermore, the mean random blood glucose level was recorded at 264.8 mg/dL (SD ±56.47), which is considerably above the normal range. This finding indicates poor glycemic control among the majority of participants, which may be linked to inadequate self-care behavior and lack of effective self-regulation strategies.

Overall, the data highlight a population of T2DM patients who are predominantly middle-aged, have suboptimal blood sugar control, and face a significant burden of complications underlining the need for targeted interventions focused on self-care improvement through belief-based self-regulation models.

Table 2. Results of Hypothesis Testing (Test Results of Significance of Structural Models)

Correlation of Variable	Coefficient	T-Statistic	p-Value
Characteristic Factor → Problem Interpretation	0.621	2.722	0.018
Characteristic Factor → Emotional Reaction	0.134	2.873	0.026
Social Support Factor → Problem Interpretation	0.216	2.714	0.022
Social Support Factor → Emotional Reaction	0.270	2.051	0.048
Health Service Factor → Problem Interpretation	0.406	2.271	0.026
Health Service Factor → Emotional Reactions	0.109	2.112	0.008
Problem Interpretation → Emotional Reaction	0.148	1.924	0.037
Problem Interpretation → Belief	0.141	2.739	0.016
Belief → Emotional Reaction	0.416	1.952	0.009
Belief → Coping	0.882	30.757	<0.001
Coping → Self-Care	0.746	13.674	<0.001

Table 2 outlines the structural relationships among the variables in the belief-based self-regulation model for self-care in patients with type 2 diabetes mellitus. All hypothesized paths were found to be statistically significant ( $p < 0.05$ ), indicating that each variable contributes meaningfully to the overall model.

The characteristic factor significantly influenced both problem interpretation ( $\beta = 0.621$ ;  $p = 0.018$ ) and emotional reactions ( $\beta = 0.134$ ;  $p = 0.026$ ), suggesting that demographic or personal characteristics such as age, gender, or duration of illness shape how patients perceive their illness and respond emotionally.

Social support was also shown to have a significant positive effect on problem interpretation ( $\beta = 0.216$ ;  $p = 0.022$ ) and emotional response ( $\beta = 0.270$ ;  $p = 0.048$ ). This implies that interpersonal and environmental support systems help patients better understand their illness and manage emotional stress.

Likewise, the health service factor was significantly associated with problem interpretation ( $\beta = 0.406$ ;  $p = 0.026$ ) and emotional responses ( $\beta = 0.109$ ;  $p = 0.008$ ). These results suggest that the quality and accessibility of healthcare services play a crucial role in how patients cognitively and emotionally process their condition.

The problem interpretation variable had significant effects on both emotional reactions ( $\beta = 0.148$ ;  $p = 0.037$ ) and belief ( $\beta = 0.141$ ;  $p = 0.016$ ), indicating that the way patients interpret symptoms and causes of their illness influences both their emotional states and belief systems.

Further, belief significantly influenced emotional response ( $\beta = 0.416$ ;  $p = 0.009$ ) and had a strong effect on coping strategies ( $\beta = 0.882$ ;  $p < 0.001$ ), showing that belief systems are central to emotional regulation and adaptive behavior in managing chronic disease.

Finally, coping had a substantial and highly significant impact on self-care behavior ( $\beta = 0.746$ ;  $p < 0.001$ ), confirming its mediating role and reinforcing the model's validity. These findings demonstrate that belief-based coping mechanisms are key determinants of effective diabetes self-care.

## 5.0 Discussion

The self-regulation model represents a dynamic process through which individuals address both health-related and broader life challenges. It is composed of three key stages: interpreting the problem, implementing coping strategies, and evaluating the effectiveness of those strategies. Effective self-regulation requires individuals to manage their emotions, cognition, and behaviors in a coordinated way. When self-regulatory capacity is inadequate, it often results in difficulty adopting or sustaining behavior change (Papachristoforou et al., 2020; Bassi et al., 2022). In the context of type 2 diabetes mellitus (T2DM), self-regulation plays a crucial role in controlling blood glucose, maintaining dietary discipline, and sustaining healthy lifestyle choices (Castonguay et al., 2018; Suleiman et al., 2022; Fadli et al., 2023).

The findings of this study suggest that the interpretation of illness, as an integral component of the self-regulation framework, is influenced by individual characteristics, perceived social support, and the availability and quality of health services. Moreover, in addition to the cognitive appraisal of illness, the study also identified emotional reactions as a significant aspect of the self-regulatory process. Emotional regulation is inherently intertwined with self-regulation; individuals attempting to modify their behaviors often encounter internal emotional challenges. The results indicate that emotional responses, including fear, anxiety, and depressive symptoms, affect how individuals perceive and manage their illness. Together, the interpretation of the disease and the emotional responses directly shape the confidence of T2DM patients in handling their health problems, thereby enhancing their coping mechanisms and, ultimately, their self-care practices.

Another major insight from the study is the pivotal role of belief systems in shaping the self-regulatory behaviors of T2DM patients. Beliefs significantly contribute to an individual's readiness and motivation to change behaviors. However, this research revealed that patients' awareness of the importance of blood glucose control and treatment adherence remains suboptimal. Therefore, reinforcing positive health beliefs is essential to encourage consistent medication use and commitment to healthy lifestyles. Strong personal convictions around disease management are associated with better blood sugar regulation, increased patient satisfaction, and improved overall quality of life. Enhanced confidence in self-care abilities correlates with higher adherence to medication and better dietary management among individuals with T2DM.

While previous studies have primarily focused on how self-regulation affects self-care (Vohs & Baumeister, 2011; Castonguay et al., 2018; Chuman & Hatamochi, 2021), this research provides a more comprehensive perspective. It emphasizes that successful self-regulatory behavior not only stems from internal motivation but also depends on a broader set of influences, including knowledge, self-efficacy, and access to supportive social resources. Moreover, it highlights how individual and family values and beliefs play a role in both preventing illness and managing complex chronic conditions. This study extends the application of self-regulation by incorporating individual and family dimensions and acknowledging collaboration with healthcare professionals. It also integrates key elements from behavioral change theories, self-regulation theory, social support frameworks, and chronic disease self-management research.

## 6.0 Conclusion

This study confirms that self-regulation plays a critical role in improving self-care among patients with type 2 diabetes mellitus. The self-regulation process is shaped by multiple interrelated factors, including individual characteristics, social support, health service quality, emotional responses, and belief systems. Belief-based self-regulation is particularly influential, as it fosters coping mechanisms that directly impact the patients' ability to engage in effective self-care behaviors.

The results indicate that enhancing patients' understanding of their illness, managing emotional responses, and reinforcing health beliefs are essential strategies for promoting behavioral change. Furthermore, the integration of family and social support, as well as the active involvement of healthcare professionals, strengthens the self-regulation process and supports better management of chronic conditions. In conclusion, developing belief-oriented self-regulation models offers a promising approach to empower individuals in managing their health, improving treatment adherence, and ultimately enhancing their quality of life.

## Acknowledgements

This study has several limitations. First, the cross-sectional design does not allow causal or temporal inferences among the variables in the self-regulation model. Second, all data were obtained through self-reported questionnaires, which may introduce recall or social desirability bias. Third, the study was conducted in selected health centers in South Sulawesi, which may limit the generalizability of the findings to broader populations.

Future studies could employ longitudinal or experimental designs to better capture temporal relationships and confirm causal pathways. Methodological improvements, such as incorporating objective behavioral measures or mixed-method approaches, may also strengthen the understanding of self-regulation processes in T2DM management. Expanding the sample to multiple regions or diverse healthcare settings would further enhance generalizability.

## Paper Contribution to Related Field of Study

This article contributes to the growing body of knowledge in chronic disease management by developing and validating a belief-based self-regulation model specifically designed for individuals with type 2 diabetes mellitus. Unlike previous studies that primarily focused on isolated behavioral aspects, this research integrates emotional, cognitive, social, and service-related factors into a comprehensive model, thereby offering a holistic framework for understanding and improving self-care behavior.

The findings enhance theoretical development by linking self-regulation theory with practical elements such as social support, belief systems, and coping strategies. In doing so, it provides actionable insights for healthcare practitioners, especially nurses and community health workers, to design patient-centered interventions that strengthen belief, emotional resilience, and behavioral commitment. Furthermore, the model can be adapted for managing other chronic illnesses, broadening its relevance across interdisciplinary health sciences and behavioral medicine.

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