A Salutogenic Perspektive: How Khowledge and Attitudes Foster Sence of Coherence and Empowerment in Diabeties Self Care

Nita Syamsiah✉[1)], Astrid Berlian Utami[1)], Erlena[1)], Uun Nurjanah[1)]
[1] Department of Nursing, Faculty of Health Sciences, Horizon University, Karawang, West Java, Indonesia 41316
✉Email: nita.syamsiah.krw@horizon.ac.id

ABSTRACT

***Background**: Diabetes mellitus (DM) remains a growing global health burden with serious consequences for morbidity and mortality. Despite this, adherence to diabetes self-care is still suboptimal, particularly in primary healthcare settings. A salutogenic approach, which emphasizes factors that create health rather than only preventing disease, provides a useful lens to understand how knowledge and attitudes can empower patients by strengthening their Sense of Coherence (SOC). **Objective**: This study aims to examine how knowledge and attitudes strengthen SOC and health empowerment, which in turn influence self-care behaviors in patients with Type 2 Diabetes Mellitus (T2DM), using a Salutogenic Framework at the Patokbeusi Health Center, Subang Regency. A cross-sectional design was used with 86 respondents selected through purposive sampling. Data were collected using validated questionnaires on knowledge, attitudes (HBM constructs), and self-care (SDSCA). Chi-square and Odds Ratio (OR) were used to assess associations. **Results**: It is found that 60.5% of respondents had low knowledge, 55.8% had poor attitudes, and 58.1% demonstrated low self-care. Knowledge was significantly associated with self-care (p = 0.000; OR = 8.000), as were attitudes (p = 0.004; OR = 4.128). The lowest adherence occurred in physical activity (40.0%) and diet regulation (45.7%). Knowledge contributed to the comprehensibility and manageability dimensions of SOC, while positive attitudes supported empowerment through improved self-efficacy and meaningful engagement. **Conclusion**: Knowledge and attitudes are key predictors of self-care through their roles in strengthening SOC and empowerment. These findings emphasize the need for structured salutogenic-based programs that build patient resources and empowerment to improve diabetes self-care at the primary care level.*

***Keywords**: Diabetes Mellitus, Health Empowerment, Salutogenic Framework, Self-Care Behavior, Sense of Coherence*

INTRODUCTION

Diabetes mellitus (DM) is one of the global health problems that continues to increase the number of sufferers from year to year. This condition not only has an impact on individual health, but also poses a considerable social and economic burden. Based on a report *by the International Diabetes Federation (IDF),* Indonesia occupies the fifth position in the world with the highest number of DM sufferers, which is around 10.6% in the age group of 20–79 years (West *et al.*, 2009). Data projections show a significant increase, from 18.69 million cases in 2020 to about 40.7 million cases in 2045, or an increase of about 75% in 25 years (Wahidin *et al.*, 2024). The number of deaths due to DM is also estimated to have doubled in the same period.

In addition to affecting the quality of life of sufferers, DM also contributes greatly to the increasing incidence of other diseases such as stroke, ischemic heart disease, and chronic kidney disease. Data shows that these complications have increased sharply in the last two decades (Wahidin *et al.*, 2024). This condition emphasizes the importance of strengthening DM prevention and control programs in primary health services.

Effective diabetes management is highly dependent on the patient's ability to self-care. These activities include dietary regulation, regular exercise, monitoring blood glucose levels, adherence to medication, and foot care (‘1. Improving care and promoting health in populations:

Received: 10-11-2025, Accepted: 08-12-2025, Published Online: 09-01-2026

Standards of Care in Diabetes—2025', 2025). Various studies show that good self-care behavior can help keep blood sugar levels under control as well as lower the risk of complications (Toh, Lee and Sündermann, 2023). However, in reality, patient compliance rates with these recommendations are still low in many developing countries, including Indonesia (Pamungkas *et al.*, 2019); (Diani *et al.*, 2025).

In Aceh, for example, about 75% of DM patients are known to have not achieved good glycemic control, and most still experience symptoms of complications (Sofyan *et al.*, 2023). A similar condition was found in Ethiopia, where most patients had sufficient knowledge of diabetes, but were not followed by adequate *self-care* behaviors (Niguse *et al.*, 2019). This phenomenon shows that there is a gap between patient knowledge and the application of healthy behaviors in daily life.

The low level of self-care practices among diabetes patients in Indonesia is influenced by various factors. Among them are limited knowledge about the disease and its complications, the existence of a mistaken cultural view of diabetes, low family support, and the lack of structured educational programs from health workers (Diani *et al.*, 2025). Some qualitative studies have even highlighted that beliefs and cultural values also shape the way patients understand and deal with their illnesses.

In terms of service systems, the challenges also remain significant. Evaluation results from thousands of health centers in Indonesia indicate that the capacity of health workers in diabetes management still needs improvement (Lin *et al.*, 2020). Although programs such as Posbindu and Prolanis are in place, field challenges remain, particularly related to resources, education, and consistency of follow-up (Sofyan *et al.*, 2023).

Patients' knowledge and attitudes toward diabetes are crucial factors in shaping self-care behaviors. Previous research shows that patients with strong knowledge tend to have better glycemic control (Alaofè *et al.*, 2021). However, knowledge alone is not sufficient. A positive attitude and strong self-efficacy are also needed to ensure that patients are truly willing and able to adopt healthy behaviors in their daily lives (Darvishi *et al.*, 2025); (Toh, Lee and Sündermann, 2023).

Most research on self-care among diabetes patients in Indonesia remains largely descriptive and has not sufficiently examined complex psychosocial factors. Theoretical approaches such as the Health Belief Model (HBM) have strong potential to explain patient behavior but have not been widely utilized in studies at the primary care level.

The HBM has been shown to predict self-care behaviors in various countries, particularly through constructs such as perceived susceptibility and self-efficacy, which positively influence patient behavior (Dehghani-Tafti *et al.*, 2015); (Melkamu, Berhe and Handebo, 2021). Conversely, perceived barriers often hinder the adoption of healthy behaviors. Several international studies suggest that integrating the HBM into educational programs can enhance the effectiveness of diabetes control interventions.

Building upon the HBM framework, the salutogenic approach developed by Aaron (Antonovsky, 1987) offers a complementary perspective by shifting the focus from disease prevention to health creation and resource mobilization (Antonovsky, 1996). At its core is the concept of Sense of Coherence (SOC), defined as an individual's capacity to perceive life as comprehensible (understanding situations), manageable (having adequate resources), and meaningful (seeing value in taking action) (Antonovsky, 1987); (Eriksson and Lindström, 2006).

Research in chronic disease management increasingly demonstrates that a strong SOC is associated with better health outcomes, improved self-management behaviors, and enhanced quality of life (Eriksson and Lindström, 2008); (Beckman *et al.*, 2021). Among diabetes patients, SOC functions as a resource that helps individuals navigate the complexities of their condition and maintain consistent self-care practices despite challenges (Meier Magistretti, 2022). Studies have shown that patients with higher SOC levels tend to have better glycemic control, greater treatment adherence, and lower psychological distress (Silarova *et al.*, 2014); (Wiesmann and Hannich, 2013).

Closely related to SOC is the concept of health empowerment—the process

Received: 10-11-2025, Accepted: 08-12-2025, Published Online: 09-01-2026

through which individuals gain greater control over decisions and actions affecting their health (Anderson and Funnell, 2010); (Funnell and Anderson, 2004). Health empowerment encompasses self-efficacy, autonomy, and active participation in health management. In diabetes care, empowered patients exhibit higher levels of self-management, stronger problem-solving skills, and better clinical outcomes (Barrett *et al.*, 2017); (Tuomikoski *et al.*, 2020). Importantly, empowerment extends beyond information provision; it involves supporting patients in building the capacity to make informed decisions and take meaningful action toward their health goals (Tengland, 2016); (Zhang *et al.*, 2020).

The salutogenic framework posits that knowledge and attitudes serve as generalized resistance resources (GRRs) that strengthen both SOC and empowerment (Antonovsky, 1996). Knowledge enhances comprehensibility by enabling patients to understand their condition and treatment options. Positive attitudes contribute to manageability by fostering confidence in their ability to carry out self-care behaviors. Together, these factors contribute to meaningfulness when patients perceive their health actions as valuable and aligned with personal goals (Lindström and Eriksson, 2010); (Vaandrager *et al.*, 2022).

While the HBM explains health behaviors through perceived threats and benefits, the salutogenic approach adds depth by emphasizing internal resources and coping capacities required for sustained behavior change (Eriksson and Lindström, 2006). Integrating both frameworks helps clarify not only what motivates patients to initiate self-care (HBM constructs) but also what internal strengths support the continuation of these behaviors over time (SOC and empowerment) (Wiesmann and Hannich, 2013); (Super *et al.*, 2016).

Unfortunately, research examining the relationships between knowledge, HBM-based attitudes, and self-care behaviors simultaneously in Indonesia remains very limited. Most studies have been conducted in urban areas or large hospitals, while primary health centers—where the majority of community-level care occurs—have not been extensively investigated. Therefore, research in the Subang region, particularly at the Patokbeusi Health Center, is valuable because it reflects real community-level conditions.

The novelty of this study lies in its comprehensive application of the HBM to understand the interaction between knowledge, attitudes, and self-care behaviors among diabetes patients. The findings are expected to serve as a foundation for developing more targeted, theory-based educational programs and to support efforts to strengthen the quality of diabetes management at the primary care level.

METHODS

Research Design

This study employed a cross-sectional design with a quantitative correlational approach to examine the relationship between knowledge levels, Health Belief Model (HBM)–based attitudes, and self-care behavior among patients with type 2 diabetes mellitus (T2DM). This design was chosen as it enables researchers to describe the relationships between variables at a single point in time without implementing any intervention. This approach is efficient and well-suited for research on health-related behaviors (Wang and Ji, 2020).

Research Location and Time

The research was conducted at the Patokbeusi Health Center in Subang Regency, West Java. This location was purposively selected because it has a relatively high number of diabetes patients and has demonstrated good implementation of the Prolanis (Chronic Disease Management Program). As a primary healthcare facility, the Puskesmas plays a crucial role in preventing diabetes complications through promotive and preventive services. Data collection was carried out from September to November 2025.

Population and Sample

The study population consisted of all type 2 diabetes mellitus (T2DM) patients who were registered and made regular visits to the Patokbeusi Health Center during the study period. Inclusion criteria were patients with a medically confirmed diagnosis of T2DM, aged ≥18 years, having lived with the condition for at least six months, able to communicate in

Received: 10-11-2025, Accepted: 08-12-2025, Published Online: 09-01-2026

Indonesian, and willing to participate by signing informed consent. Exclusion criteria included patients with severe complications requiring hospital care, severe cognitive or psychiatric impairment, terminal illness, gestational diabetes, or those absent after two follow-up visits.

Sample Size Determination

Sample size determination used the Lemeshow formula for cross-sectional studies with correlation tests (Sharma *et al.*, 2020). The calculation applied a 95% confidence level, an estimated proportion of good self-care behavior of 0.255 based on (Niguse *et al.*, 2019), and an 8% margin of error. The results indicated a minimum requirement of 114 respondents. Considering a potential drop-out rate of approximately 10%, the final target sample was set at 126 respondents. This number is sufficient to meet the requirements for multiple regression analysis, which typically requires a minimum of 10–15 subjects per variable (Nishioka *et al.*, 2022).

Sampling Techniques

The consecutive sampling technique was used in this study, involving the enrollment of all T2DM patients who met the inclusion criteria until the required sample size was reached. This technique is considered appropriate for primary healthcare settings and helps minimize the potential for selection bias (Nishioka *et al.*, 2022).

Research Variables

Independent variables included the level of knowledge and the attitude constructs based on the Health Belief Model (HBM), which consist of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action. The dependent variable was the self-care behavior of type 2 DM patients. Several covariate variables were also analyzed, including age, gender, education, occupation, duration of diabetes, HbA1c levels, comorbidities, and family support.

In addition to the HBM constructs, this study also examined variables aligned with the salutogenic framework. Sense of Coherence was assessed to understand patients' overall capacity to comprehend, manage, and find meaning in their diabetes management. Health empowerment was measured to evaluate patients' perceived control and confidence in managing their health. These salutogenic variables complement the HBM framework by providing insight into the internal resources that support sustained self-care behavior.

Research Instruments

The research instrument consisted of four parts. The first section included demographic and clinical data of respondents (age, gender, education, occupation, duration of diabetes, blood glucose levels, HbA1c, and complications). The second section was a diabetes knowledge questionnaire adapted from the Diabetes Knowledge Questionnaire (DKQ) (Eigenmann, Skinner and Colagiuri, 2011); (Feleke *et al.*, 2013), consisting of 15 multiple-choice items. Each correct answer was scored 1 and each incorrect answer 0, with knowledge categorized as good (≥11), sufficient (8–10), and poor (<8). The third section used the Health Belief Model for Diabetes questionnaire adapted from (Dehghani-Tafti *et al.*, 2015), Kartal & Ozsoy (2007), and (Darvishi *et al.*, 2025). This questionnaire contained 42 statements rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The fourth section employed the revised Summary of Diabetes Self-Care Activities (SDSCA) (Toobert, Hampson and Glasgow, 2000) to assess the frequency of self-care behaviors over the past seven days, including diet, physical activity, blood glucose monitoring, foot care, and medication adherence.

To assess salutogenic dimensions, the Sense of Coherence Scale-13 (SOC-13) (Antonovsky, 1993); (Eriksson and Lindström, 2006) was used, measuring comprehensibility (5 items), manageability (4 items), and meaningfulness (4 items) on a 7-point Likert scale. Health empowerment was assessed using the Diabetes Empowerment Scale–Short Form (DES-SF) (Anderson *et al.*, 2003), an 8-item instrument evaluating diabetes-related psychosocial self-efficacy on a 5-point Likert scale. Both instruments have been validated internationally and demonstrate good reliability (Cronbach's $\alpha > 0.70$) across diverse populations.

At the end of Knowledge Questionnaire description:

Received: 10-11-2025, Accepted: 08-12-2025, Published Online: 09-01-2026

The knowledge and attitude levels were categorized based on the percentage of the respondents' total score relative to the maximum possible score. Knowledge was assessed with a maximum score of 15, and respondents scoring ≥75% (≥12) were categorized as having high knowledge, whereas those scoring <75% (<12) were classified as having low knowledge.

At the end of HBM Attitude Questionnaire description:

Attitudes were assessed using a Likert-scale instrument with a maximum score of 210. Respondents with ≥75% of the total score (≥158) were classified as having a good attitude, while scores <75% (<158) were categorized as poor. The 75% cut-off is commonly applied in behavioral health research to indicate adequate competency and positive behavioral orientation

Validity and Reliability Tests

The content validity test was carried out through an expert panel consisting of internal medicine specialists, nurses, diabetes educators, and public health experts. The minimum Content Validity Index (CVI) value received is 0.80. The reliability test was carried out by calculating Cronbach's alpha value, where a value of ≥0.70 was considered reliable. In addition, *a test-retest test* was conducted on 30 respondents at an interval of two weeks to assess the consistency of the answers.

Data Collection Procedure

Before the research began, ethical approval was obtained from the Health Research Ethics Committee, along with a research permit from the Subang Regency Health Office. The enumerators involved were trained nurses who received instruction on the study objectives, interview techniques, and research ethics. Respondents were identified using the list of DM patients at the Patokbeusi Health Center. After receiving an explanation of the study, those who agreed to participate were asked to sign an informed consent form.

Questionnaires were administered through structured interviews lasting 30–40 minutes in a designated room to ensure privacy. Clinical data, such as HbA1c levels, were obtained from medical records or re-tested if the previous results were more than three months old. Data quality control was conducted through completeness checks and double data entry performed by two different officers.

Data Analysis

The data collected were processed using SPSS version 26.0 and AMOS. Descriptive analysis was conducted to describe respondent characteristics and the distribution of research variables. Normality was tested using the Shapiro-Wilk test, while linearity, multicollinearity, and homoscedasticity were assessed prior to inferential analysis. Relationships between variables were examined using Pearson or Spearman correlation tests based on data distribution. Variables with a p-value < 0.25 in the bivariate analysis were included in the multiple linear regression model to identify the factors most strongly influencing self-care behavior. The results were reported in terms of ß, t, p-values, and adjusted R^2, with a significance level of 0.05.

In addition, path analysis was performed to assess the direct and indirect relationships between variables, using model fit criteria of CFI > 0.90, RMSEA < 0.08, and GFI > 0.90.

Ethical Considerations

This research obtained ethical approval from the Health Research Ethics Committee (No. DP.04.03/F.XXVI.20/KEPK/517/2025 dated May 24, 2025). All respondents received a clear explanation of the study objectives and were informed of their right to refuse participation or withdraw at any time without any impact on the health services they received. Personal data were stored anonymously and used solely for scientific purposes. After completing the questionnaire, respondents were provided with brief education regarding the importance of self-care behavior in diabetes management. Throughout the research process, the principles of autonomy, confidentiality, justice, and beneficence were upheld.

Received: 10-11-2025, Accepted: 08-12-2025, Published Online: 09-01-2026

RESULTS AND DISCUSSIONS

This research was conducted at the Patokbeusi Health Center, Subang Regency, West Java, from April to June 2025. Of the 126 patients with type 2 diabetes mellitus (DM) targeted as the sample, 110 patients were successfully recruited and met the inclusion criteria. After data cleaning and verification of completeness, 24 questionnaires were found to be incomplete, resulting in a final analyzed sample of 86 respondents, with a response rate of 78.2%.

Data collection was carried out through structured interviews using standardized questionnaires that had been previously tested for validity and reliability. Each interview lasted approximately 35 minutes. All participants provided informed consent prior to data collection. Additional information, such as duration of diabetes and family history, was obtained from medical records and confirmed directly with respondents.

Data analysis was conducted in four stages: (1) descriptive analysis to present respondent characteristics and variable distribution; (2) assumption testing to ensure parametric requirements were met; (3) bivariate analysis using chi-square tests to examine relationships between variables; and (4) multivariate analysis using binary logistic regression to identify independent predictors of self-care behavior.

Descriptive Analysis

Demographic & Clinical Characteristics of Respondents

The demographic & Clinical characteristics of the study respondents are presented in Table 1 below:

Table 1. Distribution of Respondent Demographic & Clinical Characteristics (n=86)

Characteristics	Category	Frequency (n)	Percentage (%)
Age	40-50 years	25	29,1
	51-60 years old	61	70,9
Gender	Man	33	38,4
	Woman	53	61,6
Education	No school	2	2,3
	SD	36	41,9
	SMP	22	25,6
	SMA	23	26,7
	Diploma (D3)	1	1,2
	Bachelor (S1)	2	2,3
Work	Housewives (IRT)	22	25,6
	Trader	18	20,9
	Freelance Workers	15	17,4
	Factory Workers	10	11,6
	Domestic Assistant (ART)	7	8,1
	Farmer/Farm Worker	12	14,0
	Civil Servant/Teacher	2	2,3
Revenue/month	< IDR 1,000,000	30	34,9
	IDR 1,000,000 - 2,000,000	21	24,4
	> IDR 3,000,000	35	40,7
Clinical Characteristic			
Duration of Suffering from DM	3 years	9	10,5
	4 years	23	26,7
	5 years	25	29,1
	6 years	14	16,3
	7 years	9	10,5

Received: 10-11-2025, Accepted: 08-12-2025, Published Online: 09-01-2026

Characteristics	Category	Frequency (n)	Percentage (%)
	8 years	3	3,5
	9 years	2	2,3
	10 years	1	1,2
DM Family History	Yes	26	30,2
	No	60	69,8

Most respondents were between 51 and 60 years old, with an average age of approximately 54 years, and the majority were women. Education levels were generally low, with many having completed only basic schooling, and only a small proportion having attained higher education. Most respondents worked in informal sectors such as housewives, traders, or freelance workers, with widely varying income levels.

Clinically, respondents had lived with diabetes for an average of five years, with more than half having been diagnosed for 4–5 years. Interestingly, most did not report a family history of diabetes, indicating that lifestyle-related factors may play a substantial role in the development of the condition within this population.

Level of Knowledge and Attitudes about Self-Care of Diabetes Mellitus

The distribution of respondents' knowledge and attitudes levels about self-care DM is presented in Table 2.

Table 2. Distribution of Knowledge & Attitudes related Self-Care DM (n=86)

Categories	Frequency (n)	Percentage (%)	Note
Knowledge			Knowledge Score: Mean SD ± = 9.8 ± 3.1 (out of a maximum score of 15)
High (≥75% correct score)	34	39,5	
Low (<75% correct score)	52	60,5	
Total	86	100,0	
Attitudes			Attitude Score: Mean ± SD = 142.5 ± 28.3 (out of a maximum score of 210)
Good (≥75% score)	38	44,2	
Poor (<75% score)	48	55,8	
Total	86	100,0	

The analysis showed that most respondents (60.5%) had low knowledge about diabetes self-care, with an average score of 9.8 out of 15. Although they generally understood the basic concept of diabetes and the importance of diet, their knowledge of HbA1c targets, hypoglycemia symptoms, and proper foot care remained limited. In terms of attitudes, more than half of the participants (55.8%) held less positive views toward self-care, while only 44.2% demonstrated a good attitude. With an average attitude score of approximately 68% positive, the findings indicate that although many patients recognize the importance of self-care, various psychological and behavioral barriers still prevent them from fully applying this knowledge in their daily lives.

Construct Distribution Health Belief Model (HBM) and Salutogenic Variables

In order to provide a more comprehensive picture of attitudes based on the HBM framework, an analysis of each construct was conducted. Table 3 presents the category distribution for each HBM construct, while Table 4 presents distribution of Salutogenic Variables (n = 86).

Table 3. Construct Distribution of Health Belief Model (n = 86)

HBM Construct	Category	Frequency (n)	Percentage (%)	Mean ± SD
Perceived Susceptibility	High	41	47,7	23,8 ± 5,2
(Perceived Vulnerability)	Moderate	28	32,6	
	Low	17	19,8	

Received: 10-11-2025, Accepted: 08-12-2025, Published Online: 09-01-2026

Perceived Severity (Perceived Seriousness)	High	52	60,5	26,1 ± 4,8
	Moderate	22	25,6	
	Low	12	14,0	
Perceived Benefits (Perceived Benefits)	High	45	52,3	24,9 ± 5,5
	Moderate	26	30,2	
	Low	15	17,4	
Perceived Barriers (Perceived Obstacles)	High	38	44,2	24,2 ± 6,1
	Moderate	31	36,0	
	Low	17	19,8	
Self-Efficacy (Self-Efficacy)	High	36	41,9	22,5 ± 6,3
	Moderate	29	33,7	
	Low	21	24,4	
Cues to Action (Signal to Action)	High	48	55,8	25,3 ± 5,1
	Moderate	24	27,9	
	Low	14	16,3	

Note: The score for each construct ranges from 7-35 (out of 7 items on a Likert scale of 1-5). Categorization: High (≥27), Medium (18-26), Low (<18).

Table 4. Distribution of Salutogenic Variables (n = 86)

Variable	Category	Frequency (n)	Percentage (%)	Mean ± SD
Sense of Coherence (Total)	High (≥65)	37	43.0	58.4 ± 12.6
	Medium (52-64)	31	36.0	
	Low (<52)	18	21.0	
SOC: Comprehensibility	High	39	45.3	21.2 ± 5.8
	Medium	29	33.7	
	Low	18	21.0	
SOC: Manageability	High	35	40.7	18.6 ± 5.2
	Medium	32	37.2	
	Low	19	22.1	
SOC: Meaningfulness	High	41	47.7	18.6 ± 4.9
	Medium	28	32.6	
	Low	17	19.8	
Health Empowerment	High (≥32)	36	41.9	29.8 ± 7.4
	Medium (24-31)	33	38.4	
	Low (<24)	17	19.8	

Note: SOC scores range from 13-91; Empowerment scores range from 8-40. Categorization based on tertiles and validated cut-off points.

Based on the HBM constructs, most respondents showed a high perceived seriousness of DM complications (60.5%) and recognized the benefits of self-care (52.3%). However, perceived barriers were also relatively high (44.2%), particularly relating to financial constraints, limited time, and challenges in adjusting dietary habits. Only 41.9% of respondents reported high self-efficacy, indicating lingering doubts about their ability to manage diabetes independently.

In addition, high cues to action were reported by 55.8% of respondents, with the primary sources being health workers, the experiences of others, and mass media

Received: 10-11-2025, Accepted: 08-12-2025, Published Online: 09-01-2026

information. These findings suggest that external support remains an important motivating factor for engaging in self-care.

Analysis of the salutogenic variables (Table 4) shows that 43.0% of respondents demonstrated a high Sense of Coherence (SOC), with the highest scores found in the meaningfulness dimension (47.7%). However, nearly one-fifth (21.0%) had low SOC, reflecting difficulties in viewing diabetes management as comprehensible, manageable, and meaningful. Regarding health empowerment, 41.9% of respondents reported high levels, indicating a reasonable degree of confidence in making diabetes-related decisions and actions. Nonetheless, 19.8% showed low empowerment, highlighting the need for interventions that enhance patient autonomy and self-efficacy.

Correlation analyses between knowledge, attitudes, and salutogenic variables revealed significant positive relationships. Knowledge showed strong correlations with the comprehensibility ($r = 0.564$, $p < 0.001$) and manageability ($r = 0.487$, $p < 0.001$) dimensions of SOC. Positive attitudes were strongly associated with meaningfulness ($r = 0.512$, $p < 0.001$) and health empowerment ($r = 0.603$, $p < 0.001$). These findings indicate that knowledge and attitudes function as important internal resources that strengthen patients' SOC and empowerment.

Self-Care Behavior of Diabetes Mellitus

The distribution of respondents' self-care behaviors is presented in Table 5 to provide a more detailed overview. Furthermore, Table 6 presents the distribution of self-care behaviors by individual SDSCA domains.

Table 5. Distribution of DM Self-Care Behavior Levels (n = 86)

Categories of Self-Care Behaviors	Frequency (n)	Percentage (%)
High (≥5 days/week)	36	41,9
Low (<5 days/week)	50	58,1
Total	86	100,0

SDSCA score: Mean SD ± = 4.1 ± 1.8 days per week (out of 7 days)

Table 6. Distribution of Self-Care Behaviors by SDSCA Domain (n = 86)

Domain Self-Care	Mean ± SD	Median	Interpretation of Compliance
General Diet	4,5 ± 2,1	4,0	Medium (64.3%)
Specific Diet	3.2 ± 1.9	3,0	Low (45.7%)
Physical Activity	2.8 ± 2.0	2,0	Rendah (40,0%)
Monitoring Glucose Darah	5,1 ± 2,3	5,0	Medium (72.9%)
Foot Care	3,9 ± 2,2	4,0	Medium (55.7%)
Medication Compliance	6,2 ± 1,4	7,0	Tinggi (88,6%)
SDSCA Total Score	**4,1 ± 1,8**	**4,0**	**Moderate (58.6%)**

Note: The score ranges from 0-7 days per week. Interpretation: High (≥5 days), Medium (3-4 days), Low (<3 days).

Most respondents (58.1%) had low levels of *self-care* behavior, with an average score of 4.1 ± 1.8 days per week based on SDSCA instruments. The domain with the highest adherence was medication adherence (88.6%), followed by blood glucose monitoring (72.9%). In contrast, adherence to physical activity (40%) and specific dietary arrangements (45.7%) were relatively low. These findings suggest that patients tend to be more adherent to routine and simple activities, rather than those that require long-term behavioral changes.

Bivariate Analysis

Analysis of the Relationship between Knowledge and Attitudes and Self-Care Behaviors

An analysis of the relationship between knowledge and attitudes about self-care and self-care behavior in DM patients is presented in Table 7.

Table 7. Relationship between Knowledge and Attitudes with Self-Care Behaviors in DM Patients (n=86)

Variables	Self-Care Behaviors	Total	OR (95% CI)	p-value	Note
	Low	Tall			

Received: 10-11-2025, Accepted: 08-12-2025, Published Online: 09-01-2026

	n	%	n	%	n	%	
Knowledge							Chi-Square Test Strength of Relationship: Strong (Phi = 0.484; p < 0.001)
Low	40	46,5	12	14,0	52	100,0	
Tall	10	11,6	24	27,9	34	100,0	
Total	**50**	**58,1**	**36**	**41,9**	**86**	**100,0**	
Attitudes							Chi-Square Relationship Strength Test: Moderate (Phi = 0.348; p = 0.004)
Bad	35	40,7	13	15,2	48	100,0	
Good	15	17,4	23	26,7	38	100,0	
Total	**50**	**58,1**	**36**	**41,9**	**86**	**100,0**	

The bivariate analysis showed a clear and significant relationship between knowledge and self-care behavior ($p < 0.001$). Patients with low knowledge were eight times more likely to exhibit poor self-care compared to those with higher knowledge. Attitude was also influential—patients with negative attitudes were approximately four times more likely to have inadequate self-care ($p = 0.004$). Overall, these findings indicate that knowledge exerts a stronger influence than attitude in shaping how well patients manage their diabetes.

Mediating Role of SOC and Health Empowerment

To examine the mediating role of SOC and health empowerment in the relationship between knowledge/attitudes and self-care behavior, a series of regression analyses were conducted (Baron and Kenny, 1986). Results showed that knowledge significantly predicted SOC ($\beta = 0.542$, $p < 0.001$) and health empowerment ($\beta = 0.489$, $p < 0.001$). Similarly, attitudes significantly predicted SOC ($\beta = 0.496$, $p < 0.001$) and empowerment ($\beta = 0.587$, $p < 0.001$). When SOC and empowerment were added to the model predicting self-care behavior, both remained significant predictors (SOC: $\beta = 0.324$, $p = 0.002$; Empowerment: $\beta = 0.397$, $p < 0.001$), while the direct effects of knowledge and attitudes were reduced, suggesting partial mediation. This indicates that knowledge and attitudes influence self-care behavior both directly and indirectly through their effects on SOC and health empowerment.

Visualization of Variable Relationships

To clarify the relationship between independent and dependent variables, the following graph is presented:

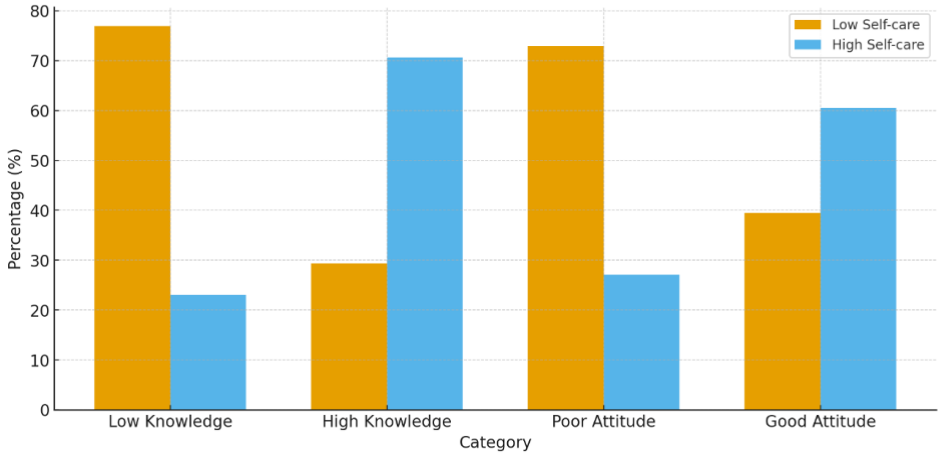

Figure 1. Comparison of the Proportion of Self-Care Behaviors Based on Knowledge and Attitude

Figure 1 shows a pattern of positive relationship between knowledge and attitudes and self-care behavior. In the group with good knowledge or attitude, the proportion of respondents with high self-care behavior was much larger than in the group with poor knowledge or attitude. This striking difference in proportion underscores the importance of interventions that target increased

Received: 10-11-2025, Accepted: 08-12-2025, Published Online: 09-01-2026

knowledge and the formation of positive attitudes to improve the self-care behaviour of DM patients.

Advanced Analysis: Exploration of Covariate Variable Relationships

Although the main focus of this study was the relationship between knowledge, attitudes, and self-care behaviors, an exploratory analysis of several covariate variables was also conducted to provide a more comprehensive understanding.

Table 8. Analysis of the Relationship of Covariate Variables with Self-Care Behavior (n=86)

Variable Covariate	Category	Self-Care Behavior Low (%)	Height (%)	p-value	Interpretasi
Age	40-50 years	52,0	48,0	0,342	Insignificant
	51-60 years old	60,7	39,3		
Gender	Man	54,5	45,5	0,631	Not

Additional analysis of covariate variables, such as age and sex, showed that there was no significant relationship between the two variables and self-care behavior ($p > 0.05$). Thus, self-care behavior is more influenced by internal factors in the form of knowledge and attitudes than demographic factors.

DISCUSSION

The results showed that patients' knowledge and attitudes toward diabetes mellitus had a significant relationship with self-care behavior. These findings align with research by (Toh, Lee and Sündermann, 2023) and (Darvishi *et al.*, 2025), which confirm that a strong understanding of diabetes contributes to better adherence to dietary management, physical activity, and long-term glycemic control. However, knowledge alone is insufficient to sustain behavior change. Psychosocial factors—such as self-efficacy and risk perception—play a critical role in bridging the gap between knowledge and self-care practices (Dehghani-Tafti *et al.*, 2015); (Melkamu, Berhe and Handebo, 2021).

From a salutogenic perspective, our findings illuminate the pathways through which knowledge and attitudes function as generalized resistance resources (GRRs) that strengthen patients' capacity for health management (Antonovsky, 1996); (Vaandrager *et al.*, 2022). The moderate-to-strong correlations between knowledge and the comprehensibility and manageability dimensions of SOC indicate that patient education does more than transfer information—it helps patients make sense of their condition and view it as manageable. This aligns with salutogenic theory, which emphasizes that meaningful understanding and perceived manageability are prerequisites for sustained health behavior (Eriksson and Lindström, 2006); (Eriksson and Lindström, 2008).

Likewise, the strong association between positive attitudes and both meaningfulness and health empowerment suggests that attitudinal interventions should focus not only on modifying beliefs about disease threats but also on fostering a sense of purpose and control in health management. When patients perceive their self-care activities as meaningful and feel empowered to make decisions, they are more likely to maintain these behaviors despite obstacles (Funnell and Anderson, 2004); (Tuomikoski *et al.*, 2020). This perspective shifts health promotion from a disease-centered approach to a resource-oriented approach that builds patient capacity (Wiesmann and Hannich, 2013); (Super *et al.*, 2016).

These findings reinforce the usefulness of the Health Belief Model (HBM) in understanding patient behavior within chronic disease management. In this study, the dimensions of perceived susceptibility and perceived severity emerged as key drivers of behavior change by increasing patients' awareness of the long-term consequences of poor glycemic control. In contrast, perceived barriers such as limited time, financial constraints, and a lack of social support served as significant obstacles to achieving optimal self-care practices (Alaofè *et al.*, 2021); (Niguse *et al.*, 2019).

In the context of primary health services, integrating salutogenic principles into health promotion represents a paradigm shift from problem-focused to

Received: 10-11-2025, Accepted: 08-12-2025, Published Online: 09-01-2026

resource-oriented care (Vaandrager *et al.*, 2022). Rather than focusing solely on disease complications and risk factors, salutogenic health promotion encourages patients to identify and mobilize their existing strengths, coping resources, and support systems (Antonovsky, 1996). This approach aligns well with contemporary models of patient-centered care and chronic disease self-management (Barrett *et al.*, 2017); (Tengland, 2016).

Practical applications include (1) SOC-focused education, which helps patients view diabetes management as comprehensible through clear, personalized information; manageable through identification of available resources and development of practical skills; and meaningful through exploration of personal goals and values; (2) Empowerment-based counseling, which supports autonomous decision-making rather than prescriptive instruction, using techniques such as guided reflection, problem-solving assistance, and collaborative goal-setting (Funnell and Anderson, 2004); (3) Peer support programs, which strengthen both SOC and empowerment by leveraging shared experiences and mutual learning (Rahmah et al., 2022).

Furthermore, digital health platforms can enhance salutogenic approaches by providing accessible resources that support comprehensibility (educational materials), manageability (tracking tools and reminders), and meaningfulness (personalized feedback and goal-progress visualization) (Toh, Lee and Sündermann, 2023). When integrated with face-to-face services at health centers, such digital tools can extend the reach and effectiveness of salutogenic interventions (Super *et al.*, 2016).

CONCLUSION

This study demonstrates that knowledge and attitudes significantly predict self-care behavior in patients with type 2 diabetes mellitus, and that this relationship operates partly through the mediating roles of Sense of Coherence and health empowerment. From a salutogenic perspective, these findings highlight that effective diabetes management depends not only on what patients know and believe, but critically on their capacity to comprehend, manage, and find meaning in their health journey.

These findings have important implications for health promotion at primary care level. Healthcare providers should shift from purely disease-focused education to salutogenic approaches that: (1) enhance comprehensibility by helping patients understand diabetes in personally meaningful ways; (2) build manageability by identifying and mobilizing patients' coping resources; (3) foster meaningfulness by connecting self-care activities to patients' life goals and values; and (4) strengthen empowerment through collaborative, patient-centered interactions that support autonomous decision-making.

SUGGESTION

Future research should examine the effectiveness of salutogenic intervention programs in enhancing SOC, empowerment, and sustained self-care behaviors among diabetes patients in Indonesian primary care settings. Longitudinal studies that evaluate the dynamic relationships between these variables over time would offer valuable insights for designing more effective, resource-oriented health promotion strategies.

REFERENCE

‘1. Improving care and promoting health in populations: Standards of Care in Diabetes—2025’ (2025) *Diabetes Care*, 48(Supplement_1), pp. S14–S26.

Alaofè, H. *et al.* (2021) ‘Knowledge, attitude, practice and associated factors among patients with type 2 diabetes in Cotonou, Southern Benin’, *BMC Public Health*, 21(1), p. 339.

Anderson, R. M. *et al.* (2003) ‘The Diabetes Empowerment Scale-Short Form (DES-SF).’

Anderson, R. M. and Funnell, M. M. (2010) ‘Patient empowerment: myths and misconceptions’, *Patient education and counseling*, 79(3), pp. 277–282.

Antonovsky, A. (1987) *Unraveling the mystery of health: How people manage stress and stay well.*, *Unraveling the mystery of health: How people manage stress and stay well*. San Francisco, CA, US: Jossey-Bass (The Jossey-Bass social and behavioral science series and the Jossey-Bass health series.).

Antonovsky, A. (1993) ‘The structure and properties of the sense of coherence scale’, *Social science & medicine*, 36(6),

Received: 10-11-2025, Accepted: 08-12-2025, Published Online: 09-01-2026

pp. 725–733.
Antonovsky, A. (1996) 'The salutogenic model as a theory to guide health promotion', *Health Promotion International*, 11(1), pp. 11–18. doi: 10.1093/heapro/11.1.11.
Barrett, N. J. *et al.* (2017) 'Engaging African Americans in research: the recruiter's perspective', *Ethnicity & disease*, 27(4), p. 453.
Beckman, M. *et al.* (2021) 'Ongoing supervision as a method to implement motivational interviewing: Results of a randomized controlled trial', *Patient Education and Counseling*, 104(8), pp. 2037–2044.
Darvishi, A. *et al.* (2025) 'Predicting preventive self-care behaviours among type 2 diabetes based on the health belief model in Bandar Abbas city: a cross-sectional study', *BMJ open*, 15(1), p. e091420.
Dehghani-Tafti, A. *et al.* (2015) 'Determinants of self-care in diabetic patients based on health belief model', *Global journal of health science*, 7(5), p. 33.
Diani, N. *et al.* (2025) 'Self-Care Management of Diabetes Patients in the Community Health Center Area', *Dunia Keperawatan: Jurnal Keperawatan dan Kesehatan*, 13(1), pp. 51–59.
Eigenmann, C. A., Skinner, T. and Colagiuri, R. (2011) 'Development and validation of a diabetes knowledge questionnaire', *Practical Diabetes International*, 28(4), pp. 166-170d.
Eriksson, M. and Lindström, B. (2006) 'Antonovsky's sense of coherence scale and the relation with health: a systematic review', *Journal of Epidemiology and Community Health*, 60(5), pp. 376–381. doi: 10.1136/jech.2005.041616.
Eriksson, M. and Lindström, B. (2008) 'A salutogenic interpretation of the Ottawa Charter', *Health promotion international*, 23(2), pp. 190–199.
Feleke, S. A. *et al.* (2013) 'Assessment of the level and associated factors with knowledge and practice of diabetes mellitus among diabetic patients attending at FelegeHiwot hospital, Northwest Ethiopia', *Clin Med Res*, 2(6), p. 110.
Funnell, M. M. and Anderson, R. M. (2004) 'Empowerment and self-management of diabetes', *Clinical diabetes*, 22(3), pp. 123–128.
Lin, S. *et al.* (2020) 'Traditional Chinese medicine injections for heart failure: a protocol for systematic review and network meta-analysis of randomised controlled trials', *BMJ open*, 10(9), p. e037331.
Lindström, B. and Eriksson, M. (2010) *The hitchhiker's guide to salutogenesis: Salutogenic pathways to health promotion*. Folkhälsan research center, Health promotion research.
Meier Magistretti, C. (2022) 'The sense of coherence in the life course', *The handbook of salutogenesis*, pp. 117–121.
Melkamu, L., Berhe, R. and Handebo, S. (2021) 'Does patients' perception affect self-care practices? The perspective of health belief model', *Diabetes, Metabolic Syndrome and Obesity*, pp. 2145–2154.
Niguse, H. *et al.* (2019) 'Self-care related knowledge, attitude, practice and associated factors among patients with diabetes in Ayder Comprehensive Specialized Hospital, North Ethiopia', *BMC research notes*, 12(1), p. 34.
Nishioka, Y. *et al.* (2022) 'Appropriate definition of diabetes using an administrative database: a cross-sectional cohort validation study', *Journal of Diabetes Investigation*, 13(2), pp. 249–255.
Pamungkas, R. A. *et al.* (2019) 'Barriers to effective diabetes mellitus self-management (DMSM) practice for glycemic uncontrolled type 2 diabetes mellitus (T2DM): A socio cultural context of Indonesian communities in West Sulawesi', *European Journal of Investigation in Health, Psychology and Education*, 10(1), pp. 250–261.
Sharma, S. K. *et al.* (2020) 'How to calculate sample size for observational and experimental nursing research studies', *National Journal of Physiology, Pharmacy and Pharmacology*, 10(1), pp. 1–8.
Silarova, B. *et al.* (2014) 'Sense of coherence as a predictor of health-related behaviours among patients with coronary heart disease', *European journal of cardiovascular nursing*, 13(4), pp. 345–356.
Sofyan, H. *et al.* (2023) 'The state of diabetes care and obstacles to better care in Aceh, Indonesia: a mixed-methods study', *BMC Health Services Research*, 23(1), p. 271.
Super, S. *et al.* (2016) 'Strengthening sense of coherence: opportunities for theory building in health promotion', *Health promotion international*, 31(4), pp. 869–878.
Tengland, P.-A. (2016) 'Behavior change or empowerment: on the ethics of health-

Received: 10-11-2025, Accepted: 08-12-2025, Published Online: 09-01-2026

promotion goals', *Health Care Analysis*, 24(1), pp. 24–46.
Toh, S. H. Y., Lee, S. C. and Sündermann, O. (2023) 'Mobile behavioral health coaching as a preventive intervention for occupational public health: Retrospective longitudinal study', *JMIR Formative Research*, 7(1), p. e45678.
Toobert, D. J., Hampson, S. E. and Glasgow, R. E. (2000) 'The summary of diabetes self-care activities measure: results from 7 studies and a revised scale.', *Diabetes care*, 23(7), pp. 943–950.
Tuomikoski, A. *et al*. (2020) 'How mentoring education affects nurse mentors' competence in mentoring students during clinical practice–A quasi-experimental study'', *Scandinavian Journal of Caring Sciences*, 34(1), pp. 230–238.
Vaandrager, L. *et al*. (2022) 'Salutogenesis Post-Graduate Education: Experience From the European Perspective on the ETC-PHHP Health Promotion Summer Schools (1991–2020)', *The handbook of salutogenesis*, pp. 51–56.
Wahidin, M. *et al*. (2024) 'Projection of diabetes morbidity and mortality till 2045 in Indonesia based on risk factors and NCD prevention and control programs', *Scientific reports*, 14(1), p. 5424.
Wang, X. and Ji, X. (2020) 'Sample size estimation in clinical research: from randomized controlled trials to observational studies', *Chest*, 158(1), pp. S12–S20.
West, E. *et al*. (2009) 'Nursing resources and patient outcomes in intensive care: a systematic review of the literature', *International journal of nursing studies*, 46(7), pp. 993–1011.
Wiesmann, U. and Hannich, H.-J. (2013) 'The contribution of resistance resources and sense of coherence to life satisfaction in older age', *Journal of Happiness Studies*, 14(3), pp. 911–928.
Zhang, K. M. *et al*. (2020) 'What motivates nurses to exercise? Determinants of physical activity among Canadian nurses using self-determination theory', *Annals of Behavioral Medicine*, 54(6), pp. 381–390.

Received: 10-11-2025, Accepted: 08-12-2025, Published Online: 09-01-2026