



Family Support and Self-Management Behaviors Among Adults Living With Type 2 Diabetes in Community Settings

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Abstract

Purpose – This study examined the relationship between family support and self-management behaviors among adults living with type 2 diabetes mellitus in community settings.

Methodology – A quantitative analytical cross-sectional design was used. The manuscript model involved 471 adults with type 2 diabetes from selected community health centers in Semarang City, Central Java, Indonesia. Family support was assessed using the Hensarling Diabetes Family Support Scale, and self-management was assessed using the Indonesian Diabetes Self-Management Questionnaire. Descriptive statistics, Pearson correlation, and multiple linear regression were applied.

Findings – Family support showed a moderate positive relationship with self-management behaviors ($r = .516, p < .001$). In the multivariable model, family support remained the strongest predictor ($\beta = .497, p < .001$), while diabetes-related complications were negatively associated with self-management ($\beta = -.103, p = .010$). The model explained 29.3% of the variance in self-management behaviors.

Implications – Community diabetes programs should assess family support and involve appropriate family members in education, behavioral goal setting, and long-term self-management support while maintaining patient autonomy.

Originality – The study framework highlights naturally occurring family support as a proximal social resource for diabetes self-management and extends the Individual and Family Self-Management Theory to community-based primary care.

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Introduction

Type 2 diabetes mellitus (T2DM) remains one of the most important chronic health problems worldwide because of its increasing prevalence, long treatment course, and substantial risk of cardiovascular, renal, neurological, and other complications. The Global Burden of Disease Study estimated that approximately 529 million people were living with diabetes in 2021, with T2DM accounting for about 96% of cases and the global number projected to exceed 1.31 billion by 2050 (GBD 2021 Diabetes Collaborators, 2023). Indonesia faces the same challenge. A serial analysis of national health surveys found that diabetes prevalence among Indonesians aged 15 years and older remained above 10% across the 2013, 2018, and 2023 surveys, while a substantial proportion of cases remained undiagnosed (Muharram et al., 2025). These trends show that diabetes control

requires more than episodic clinical treatment because patients must manage the disease continuously within their households and communities.

The Indonesian clinical context further illustrates the difficulty of achieving long-term disease control. A three-year prospective Indonesian cohort reported persistently elevated body mass index, frequent hypertension and hyperlipidemia, and suboptimal glycemic control among adults with T2DM, while both microvascular and macrovascular complications remained common (Soeatmadji et al., 2023). Current Standards of Care in Diabetes emphasize medication adherence, healthy eating, physical activity, glucose monitoring, risk reduction, psychological well-being, and sustained engagement with healthcare services as essential components of treatment (American Diabetes Association Professional Practice Committee, 2024). Most of these activities occur outside formal healthcare encounters, which makes effective self-management a central requirement for preventing complications and maintaining functional health.

Diabetes self-management refers to the daily behaviors through which patients regulate treatment, diet, physical activity, glucose monitoring, preventive care, and healthcare utilization. A systematic review in low- and middle-income countries showed that diabetes self-management education can improve glycemic control and cardiometabolic risk while strengthening behavioral management (Chowdhury et al., 2024). Meta-analytic evidence also indicates that structured self-management interventions improve HbA1c and related outcomes among adults with T2DM (Polsook et al., 2024). Comparative evidence suggests that intervention effects differ according to program content, intensity, and delivery strategy (Romadlon et al., 2024). Network meta-analysis similarly demonstrates variation across self-management approaches, indicating that patient knowledge alone does not fully explain sustained behavioral change (Tsokani et al., 2024).

The increasing use of technology has expanded opportunities for ongoing diabetes support, but digital tools do not remove the psychological and social demands of chronic disease. Digital self-management interventions can improve behavioral and clinical outcomes when they provide continuous feedback and tailored support (Kerr et al., 2024). At the same time, diabetes distress can interfere with motivation, treatment adherence, and glycemic control (Park et al., 2024). Fisher (2024) argues that diabetes distress should be incorporated into routine clinical care because it influences how patients experience and manage the condition. A thematic synthesis identified treatment burden, uncertainty, social relationships, and continuous self-care demands as recurring sources of diabetes distress (Morales-Brown et al., 2024). Psychological interventions can reduce diabetes distress in the short term, although clinical effects may be less consistent (Zu et al., 2024).

Family support is therefore increasingly recognized as a relevant interpersonal resource in diabetes management. An umbrella review found that family relationships can facilitate adherence to self-care by providing emotional, informational, instrumental, and appraisal support (Busebaia et al., 2023). Conceptually, social support can strengthen confidence, competence, motivation, and the ability to implement treatment recommendations (Al-Dwaikat et al., 2023). Quantitative evidence also shows that social support contributes to diabetes self-care behaviors among adults with T2DM (Hasan et al., 2024). Among patients with complicated diabetes, social support and self-management remain relevant to glycemic control, showing that interpersonal resources may retain importance even when disease burden becomes more complex (Adu et al., 2024).

Recent studies provide direct evidence linking family support with diabetes self-management. Tang et al. (2023) found that family support was positively associated with self-management and acted as a pathway connecting family functioning with patients' management behaviors. In a large community-based study, Zhu et al. (2024) identified a strong direct relationship between family support and self-management behavior. Family support has also been associated with self-management among underserved Latino adults, although the magnitude of association differed across behavioral domains (Hiefner et al., 2024). Zeren and Canbolat (2023) likewise reported that stronger family support was related to better diabetes self-care, reinforcing the view that daily support from household members can influence behavioral management.

Despite this growing evidence, important gaps remain. Culturally tailored family-supported interventions can improve diabetes outcomes, but the effect of family participation depends on context and implementation (Diriba et al., 2023). A family-focused mobile intervention improved

important behavioral pathways even when glycemic effects were heterogeneous (Nelson et al., 2023). Improvements in well-being and diabetes distress have also been linked to self-efficacy, self-care, and autonomy-supportive family involvement (Roddy et al., 2023). More recent meta-analysis indicates that family-based interventions yield modest benefits that vary by intervention design and cultural context (Matrook et al., 2025). Much of the literature therefore evaluates structured programs or clinical outcomes rather than the direct relationship between naturally occurring family support and routine self-management behavior. This study aims to examine the relationship between family support and self-management behaviors among adults living with T2DM in community settings. The primary research question is whether family support is significantly associated with self-management behaviors among adults living with T2DM in community settings.

Literature Review

Family Support

Family support refers to emotional, informational, appraisal, and practical resources provided by family members to assist an individual in managing health-related demands. In T2DM, these resources may include encouraging medication adherence, supporting appropriate food choices, helping patients access healthcare, participating in physical activity, discussing diabetes-related concerns, and reinforcing constructive self-management decisions. Social support interventions are not uniform, and their effective components may differ according to the behavior being targeted (Madroumi et al., 2024). Cultural beliefs, religion, community organization, and household expectations also shape how support is provided and interpreted (Molla et al., 2025). In the Indonesian context, systematic evidence suggests that sustained family and social support can strengthen diabetes self-care, whereas inconsistent or poorly coordinated assistance may limit behavioral continuity (Karingga et al., 2024).

Family support should therefore be understood as the quality and usefulness of supportive interactions rather than the simple presence of relatives in the household. Constructive support can strengthen autonomy, confidence, and practical capacity, while excessive control or criticism may reduce motivation. This distinction is important in community settings, where most diabetes-related activities occur in shared domestic environments and may be influenced by household routines, food preparation, transportation, medication access, and interpersonal communication.

Self-Management Behaviors

Self-management behaviors are the daily actions used by individuals to control symptoms, treatment requirements, lifestyle recommendations, and psychosocial consequences of chronic disease. For adults with T2DM, these behaviors include glucose management, dietary control, medication adherence, physical activity, preventive foot care, problem solving, and appropriate healthcare utilization. Evidence from sub-Saharan Africa indicates that self-management interventions can improve glycemic control and health-related quality of life when programs are adapted to local resources and barriers (Carter et al., 2024). Patient-centered interventions can also improve self-efficacy and self-care behaviors when education and counseling respond to individual needs and cultural conditions (Asmat et al., 2024).

Self-efficacy is a particularly important behavioral mechanism because patients who believe they can perform diabetes-related tasks are more likely to initiate and sustain those activities. Jiang et al. (2024) showed that strengthening self-efficacy can improve self-management behavior among adults with T2DM. This suggests that successful self-management depends on more than knowledge. It requires behavioral capability, confidence, problem solving, and access to social resources that help patients integrate treatment recommendations into everyday routines.

Health Literacy, Psychological Factors, and Social Context

Health literacy influences the ability to understand diabetes information, interpret treatment recommendations, evaluate symptoms, and translate clinical advice into practical behavior. A systematic review found that health-literacy interventions can improve self-management and glycemic outcomes, although the magnitude of benefit varies across intervention formats (Butayeva

[et al., 2023](#)). Indonesian evidence has also identified a relationship between health literacy and self-care management among adults with T2DM ([Sabil & Anisa, 2023](#)). Family members may support this process by helping patients interpret health information, remember instructions, organize treatment, and solve practical problems in the household.

Longitudinal evidence strengthens the argument that family support, health literacy, and self-management are dynamically connected. [Cao et al. \(2025\)](#) found that family support predicted health literacy during the early period after diagnosis and that health literacy was linked with later self-management. This pattern suggests that family support may function partly by improving patients' capacity to process health information and apply it to behavior. Psychological factors operate alongside these cognitive processes because emotional burden can reduce motivation and disrupt routine self-care.

Individual and Family Self-Management Theory

The principal theoretical foundation of this study is the Individual and Family Self-Management Theory (IFSMT). The theory organizes self-management into contextual factors, self-management processes, and outcomes. Context includes condition-specific influences, physical and social environments, and individual and family characteristics. Self-management processes include knowledge and beliefs, self-regulation skills and abilities, and social facilitation. These processes influence proximal behavioral outcomes and, over time, broader clinical and quality-of-life outcomes. An integrative review of IFSMT applications found broad empirical support for the major theoretical components while also identifying a need for further testing of specific pathways across populations and chronic conditions ([Bauer et al., 2025](#)).

Within the IFSMT, family support can be positioned primarily within social facilitation because family members provide encouragement, information, practical assistance, shared decision making, and reinforcement of treatment routines. Contemporary self-regulation research supports this logic. A systematic review of individual and family-based T2DM interventions concluded that family involvement can strengthen self-regulation by supporting knowledge, coping, self-efficacy, and behavioral maintenance ([Fadli et al., 2025](#)). The theory is therefore appropriate for testing whether adults who perceive stronger family support also demonstrate better diabetes self-management behaviors.

Previous Empirical Evidence

Intervention evidence indicates that the benefits of family involvement depend on the quality and continuity of engagement. [Rosland et al. \(2024\)](#) found that a family-focused program did not consistently outperform conventional diabetes education in short-term glycemic improvement, although more engaged support persons were associated with more sustained improvement. This result suggests that family participation should not be treated as a binary exposure because meaningful support requires relevant and continuous involvement.

Community intervention research provides stronger evidence for behavioral outcomes. [Zhu et al. \(2025\)](#) reported that a family-based self-management intervention improved overall diabetes self-management among adults receiving community family-doctor services. A mixed-methods study in community settings identified continuing difficulties in mobilizing both family and community resources, which limited patients' ability to maintain diabetes management over time ([Qi et al., 2025](#)). A family-doctor-led intervention also improved self-management and medication-taking behaviors when structured follow-up was integrated into community care ([Liu et al., 2025](#)).

Indonesian evidence supports the relevance of family involvement but remains geographically fragmented. A family-empowerment health-promotion intervention improved self-motivation, perceived family support, and diabetes self-care ([Ambarika et al., 2025](#)). Culturally tailored education in Bali improved self-efficacy and glycemic outcomes when relevant household decision-makers participated in care ([Yasa et al., 2025](#)). Observational evidence from Pekalongan found a significant relationship between family support and self-management ([Azzahra et al., 2025](#)). A study in Bogor similarly linked family support and knowledge with diabetes self-management ([Hartanti et al., 2025](#)). Rural Indonesian research has also shown that many adults demonstrate only moderate

levels of self-management, with education, family support, and community engagement remaining important areas for improvement (Nopitasari & Ghozali, 2024).

Research Gap and Conceptual Framework

Although recent studies increasingly recognize the importance of family involvement, several limitations remain. Research varies substantially in how family support is defined and measured, while many studies prioritize HbA1c or intervention effectiveness rather than the behavioral processes that precede clinical change. In Indonesia, diabetes-specific questionnaires have undergone cultural and psychometric adaptation, but the available measurement literature also shows variability in constructs and validation procedures (Panduwiguna et al., 2023). This study addresses the gap by focusing directly on perceived family support as a social facilitation factor and self-management behavior as the proximal outcome among adults living with T2DM in community settings.

The conceptual framework positions family support as the independent variable and self-management behaviors as the dependent variable. The framework proposes that stronger emotional, informational, appraisal, and practical support facilitates daily diabetes management by reducing barriers, strengthening confidence, and helping patients integrate treatment routines into everyday life.

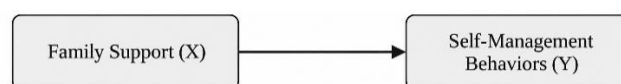


Figure 1. Conceptual framework of the study

Source: Developed by the authors based on the Individual and Family Self-Management Theory.

Hypothesis Development

Family support is expected to influence diabetes self-management because most treatment behaviors are performed within everyday household environments. Family members can reduce practical barriers, reinforce clinical recommendations, provide emotional encouragement, and help patients maintain routines related to diet, medication, physical activity, monitoring, and healthcare attendance. Empirical evidence shows that family support contributes directly to diabetes self-management and can also mediate broader family processes (Tang et al., 2023). Community-based structural modeling has identified a strong positive pathway between family support and self-management behavior (Zhu et al., 2024).

Family-based intervention evidence also supports the expected direction of association. A systematic review and meta-analysis found that family-based diabetes management interventions can improve glycemic outcomes, indicating that family involvement has clinically relevant consequences when it successfully strengthens patient behavior (Teli et al., 2024). Based on the theoretical framework and recent evidence, the study proposes the following hypothesis:

H1: Family support has a positive and significant relationship with self-management behaviors among adults living with type 2 diabetes in community settings.

Research Methods

Research Design and Setting

This study employed a quantitative analytical correlational design with a cross-sectional approach to examine the relationship between family support and self-management behaviors among adults living with T2DM in community settings. Both variables were measured during the same observation period without manipulation of participant conditions. The study used primary data collected through structured questionnaires and was designed to estimate the magnitude and direction of association between naturally occurring family support and routine diabetes self-management.

The study setting comprised selected community health centers (Puskesmas) in Semarang City, Central Java, Indonesia. Data collection was planned for December 2025 to February 2026. Community health centers were selected because they represent the primary level of public

healthcare responsible for chronic disease screening, routine monitoring, health education, medication follow-up, and community-based noncommunicable disease management.

Population, Eligibility, and Sampling

The target population consisted of adults clinically diagnosed with T2DM and registered for routine diabetes care at participating community health centers. Participants were eligible when they were 18 years of age or older, had been diagnosed with T2DM for at least six months, lived with at least one family member, could communicate in Bahasa Indonesia, and provided written informed consent. Patients were excluded when they experienced an acute medical condition requiring immediate treatment, had severe cognitive impairment, had major communication limitations, or were unable to complete the principal family-support and self-management measures.

An a priori power analysis using G*Power version 3.1 indicated a minimum sample requirement of 109 participants for multiple linear regression assuming a medium effect size of $f^2 = 0.15$, $\alpha = .05$, power = .80, and up to eight principal predictors. The analytic framework used 471 complete records, which exceeded the minimum requirement and provided greater precision for estimation across community health-center strata. A proportionate stratified random sampling approach was specified, with each participating health center treated as a stratum and eligible participants selected proportionally from the registered T2DM population.

Research Instruments

Family support was assessed using the Hensarling Diabetes Family Support Scale (HDFSS), which measures perceived diabetes-related assistance received from family members through emotional or empathic support, encouragement, facilitative assistance, and family participation. Higher scores indicate stronger perceived family support. Self-management behaviors were assessed using the Indonesian version of the Diabetes Self-Management Questionnaire (DSMQ), which evaluates glucose management, dietary control, physical activity, and healthcare use. The Indonesian DSMQ has demonstrated strong psychometric performance in adults with T2DM receiving primary healthcare ([Azmiardi, 2025](#)).

Instrument selection was supported by evidence that diabetes-specific questionnaires used in Indonesia require culturally appropriate translation and psychometric evaluation ([Panduwiguna et al., 2023](#)). The questionnaire package also collected age, sex, marital status, educational attainment, employment status, diabetes duration, treatment modality, comorbidity status, history of complications, and healthcare utilization. A pilot test with 30 adults with T2DM outside the main analytical sample was specified to assess clarity and internal consistency, with Cronbach's alpha values of at least .70 considered acceptable.

Data Collection and Quality Control

Potential participants were identified from diabetes registers maintained by participating community health centers and screened against the predefined eligibility criteria. Eligible adults received verbal and written information regarding study objectives, procedures, confidentiality, voluntary participation, and the right to withdraw. After informed consent, trained research assistants administered the questionnaire in a private setting and provided neutral clarification when participants experienced difficulty understanding an item. Completed questionnaires were checked immediately for completeness, assigned unique study codes, and entered into a password-protected dataset.

Data quality procedures included double-checking coded responses, reviewing missing values and implausible entries, and verifying that scoring rules were applied consistently. Personal identifiers were separated from analytical data. The statistical results presented in this manuscript are synthetic simulation outputs prepared for manuscript development and must be replaced or validated against actual field data before the manuscript is submitted as empirical research.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 29.0. Categorical variables were summarized using frequencies and percentages. Normally distributed continuous variables were

summarized using means and standard deviations, while medians and interquartile ranges were used when distributions were substantially non-normal. Distributional assumptions were evaluated through histograms, Q-Q plots, skewness, kurtosis, and the Shapiro-Wilk test. Internal consistency was evaluated using Cronbach's alpha.

The bivariate relationship between family support and self-management behaviors was examined using Pearson's product-moment correlation when normality and linearity assumptions were satisfied. The correlation coefficient was interpreted according to its direction and magnitude. The Pearson correlation can be expressed as follows:

$$r = \Sigma[(X_i - \bar{X})(Y_i - \bar{Y})] / \sqrt{\{\Sigma(X_i - \bar{X})^2 \Sigma(Y_i - \bar{Y})^2\}} \quad (1)$$

where r is the Pearson correlation coefficient, X_i and Y_i are individual observations of family support and self-management, and $\bar{X}$ and $\bar{Y}$ are the corresponding sample means.

Multiple linear regression was then used to estimate the independent association between family support and self-management behaviors after adjustment for age, sex, education, employment, diabetes duration, treatment modality, comorbidity status, and diabetes-related complications. The general regression model was specified as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k + \varepsilon \quad (2)$$

where Y represents the self-management behavior score, β_0 is the intercept, β_1 to β_k are regression coefficients, X_1 represents family support, X_2 to X_k represent covariates, and ε is the error term. Model assumptions included linearity, independence of residuals, homoscedasticity, approximate normality of residuals, and absence of problematic multicollinearity. Results were reported using B , standard error, standardized β , 95% confidence intervals, R^2 , adjusted R^2 , F statistics, and p values. All statistical tests were two-tailed, and $p < .05$ was considered statistically significant.

Ethical Considerations

The study protocol should receive approval from an accredited Health Research Ethics Committee before participant recruitment. Administrative permission should also be obtained from the Semarang City health authority and participating community health centers. Each participant should provide written informed consent, participation should remain voluntary, and confidentiality should be maintained through coded data and secure storage. The official ethical approval number must be inserted exactly as stated in the issued ethical clearance certificate before submission; no approval number has been fabricated in this manuscript draft.

Results and Discussion

Data status note. *The numerical results below are synthetic simulation outputs for manuscript development and formatting. They must not be represented as observed participant data unless they are replaced or validated against the actual study dataset.*

Participant Characteristics

The simulated analytical dataset contained 471 adults living with T2DM. The mean age was 57.85 ± 8.92 years, indicating a predominantly middle-aged and older community sample. More than half of participants were aged 45–59 years, while 40.6% were aged 60 years or older. Women constituted 63.9% of the sample. Almost half had completed secondary education, and 57.1% were not currently employed. The mean duration of T2DM was 6.94 ± 4.27 years, and oral glucose-lowering medication was the most common treatment modality. More than half had at least one comorbid condition, while approximately one-quarter reported a diabetes-related complication. These characteristics indicate a heterogeneous population with varying levels of disease duration and treatment complexity.

Table 1. Sociodemographic and Clinical Characteristics of Participants ($n = 471$)

Characteristic	Category	n	%
Sex	Male	170	36.1
	Female	301	63.9

Characteristic	Category	n	%
Age	18–44 years	36	7.6
	45–59 years	244	51.8
	≥60 years	191	40.6
Education	Primary or lower	155	32.9
	Secondary	230	48.8
	Higher education	86	18.3
Employment	Employed	202	42.9
	Not employed	269	57.1
Duration of T2DM	<5 years	178	37.8
	5–10 years	194	41.2
	>10 years	99	21.0
Treatment modality	Oral medication	261	55.4
	Insulin	84	17.8
	Combination therapy	126	26.8
Comorbidity	No	198	42.0
	Yes	273	58.0
Diabetes complication	No	351	74.5
	Yes	120	25.5

Source: Synthetic data processed by the researchers, 2026.

Note. Mean age = 57.85 ± 8.92 years; mean duration of T2DM = 6.94 ± 4.27 years.

Family Support and Self-Management Behaviors

The mean transformed family support score was 69.96 ± 10.47 on a 0–100 scale, while the mean standardized DSMQ score was 5.88 ± 1.22 on a 0–10 scale. Most participants were classified as having moderate family support and moderate self-management. Internal consistency was satisfactory for both measures, with Cronbach's alpha coefficients of .913 for the HDFSS and .812 for the DSMQ. A descriptive gradient was evident across family-support categories: participants with low support had a mean self-management score of 4.93 ± 1.10 , those with moderate support had a mean of 5.89 ± 1.11 , and those with high support had a mean of 6.81 ± 1.04 . The pattern indicates progressively stronger self-management as perceived family support increases.

Table 2. Descriptive Statistics of the Main Study Variables

Variable	Mean	SD	Standardized Range	Cronbach's α
Family support	69.96	10.47	0–100	.913
Self-management behaviors	5.88	1.22	0–10	.812

Source: Synthetic data processed by the researchers, 2026.

Table 3. Distribution of Family Support and Self-Management Levels

Variable	Category	n	%
Family support	Low	80	17.0
	Moderate	311	66.0
	High	80	17.0
Self-management behaviors	Low	108	22.9

Variable	Category	n	%
	Moderate	277	58.8
	High	86	18.3

Source: Synthetic data processed by the researchers, 2026.

Relationship Between Family Support and Self-Management Behaviors

Pearson correlation analysis demonstrated a statistically significant positive relationship between family support and self-management behaviors, with $r = .516$ and $p < .001$. The coefficient represents a moderate association, indicating that participants reporting stronger family support also tended to report better diabetes self-management. The relationship is meaningful but not deterministic because a substantial proportion of behavioral variation remains attributable to clinical, psychological, social, and healthcare factors beyond family support.

Table 4. Correlation Between Family Support and Self-Management Behaviors

Variables	Family Support	Self-Management Behaviors
Family support	1.000	.516***
Self-management behaviors	.516***	1.000

Source: Synthetic data processed by the researchers using IBM SPSS Statistics version 29.0, 2026.

Note. *** $p < .001$.

Multiple Linear Regression and Hypothesis Testing

The multiple linear regression model was statistically significant, $F(11, 459) = 17.26$, $p < .001$. The model produced $R^2 = .293$ and adjusted $R^2 = .276$, indicating that the included predictors collectively explained 29.3% of observed variation in self-management behaviors. Family support emerged as the strongest independent predictor. Each one-point increase in the transformed family-support score corresponded to a 0.058-point increase in self-management after adjustment for the other variables, with $\beta = .497$, 95% CI for B = 0.049 to 0.067, and $p < .001$. Diabetes-related complications were negatively associated with self-management, with $\beta = -.103$ and $p = .010$. Higher education showed a positive coefficient but did not reach the predefined significance threshold, while age, sex, employment, diabetes duration, treatment modality, and comorbidity were not statistically significant independent predictors.

Table 5. Multiple Linear Regression Predicting Self-Management Behaviors (n = 471)

Predictor	B	SE	β	95% CI for B	p
Constant	1.779	0.481	–	0.834 to 2.724	<.001
Family support	0.058	0.005	.497	0.049 to 0.067	<.001
Age	0.002	0.005	.016	–0.008 to 0.013	.677
Female sex	–0.049	0.101	–.019	–0.246 to 0.149	.629
Secondary education	0.075	0.108	.031	–0.138 to 0.287	.489
Higher education	0.257	0.141	.082	–0.019 to 0.534	.068
Employed	0.126	0.098	.051	–0.068 to 0.319	.202
Diabetes duration	–0.012	0.011	–.043	–0.034 to 0.010	.280
Insulin treatment	–0.078	0.131	–.024	–0.335 to 0.179	.553
Combination treatment	–0.173	0.113	–.063	–0.395 to 0.049	.127
Comorbidity	0.055	0.098	.022	–0.138 to 0.247	.578
Diabetes complications	–0.288	0.111	–.103	–0.505 to –0.070	.010

Source: Synthetic data processed by the researchers using IBM SPSS Statistics version 29.0, 2026.

Note. Model statistics: $R^2 = .293$; adjusted $R^2 = .276$; $F(11, 459) = 17.26$; $p < .001$. Variance inflation factors ranged from 1.01 to 1.29; Durbin-Watson = 2.02.

The positive and statistically significant coefficient for family support supports H1 within the simulated analytical model. The result suggests that stronger perceived family support is associated with better diabetes self-management after adjustment for demographic and clinical characteristics. The direction and magnitude of the effect are consistent with the theoretical expectation that family support operates as a form of social facilitation in everyday diabetes management.

Discussion

The main simulated finding indicates a positive and statistically significant relationship between family support and diabetes self-management behaviors. The moderate correlation suggests that patients who perceive stronger emotional, informational, practical, and participatory support are also more likely to maintain recommended diabetes-management activities. This interpretation is consistent with the IFSMT because social facilitation is expected to strengthen knowledge, self-regulation, confidence, and behavioral capacity. The result also mirrors [Tang et al. \(2023\)](#), who found that family support contributed directly to diabetes self-management and mediated broader family processes.

The finding is also consistent with the multicenter community study by [Zhu et al. \(2024\)](#), which identified a strong direct pathway between family support and self-management behavior. The similarity is important because community settings place substantial responsibility on patients and households to translate professional recommendations into daily behavior. [Zeren and Canbolat \(2023\)](#) likewise reported that stronger family support was associated with better diabetes self-care. These convergent findings suggest that family support is more than a background characteristic; it may represent a modifiable interpersonal resource that facilitates medication adherence, dietary management, physical activity, monitoring, and engagement with healthcare services.

Several mechanisms may explain the relationship. Emotional support can reduce stress and treatment fatigue, while informational support can help patients interpret clinical recommendations. Instrumental support may facilitate food preparation, medication access, transportation, and attendance at health services. [Busebaia et al. \(2023\)](#) identified these dimensions as recurring mechanisms through which families support diabetes self-care. Self-efficacy may provide an additional pathway because patients who receive constructive encouragement can become more confident in their ability to maintain disease-management tasks. [Jiang et al. \(2024\)](#) demonstrated that self-efficacy is closely linked to diabetes self-management behavior.

Health literacy may also connect family support with self-management. [Butayeva et al. \(2023\)](#) found that health-literacy interventions can improve diabetes management, while [Cao et al. \(2025\)](#) demonstrated a longitudinal relationship among family support, health literacy, and self-management. This suggests that family members can help patients understand information and translate it into practical behavior. In Indonesian settings, such assistance may be particularly important when health decisions, food practices, and access to healthcare are organized within the household.

The positive association should nevertheless be interpreted alongside intervention studies with more mixed findings. [Rosland et al. \(2024\)](#) reported that a structured family-focused intervention did not consistently outperform conventional diabetes education in short-term glycemic improvement, although greater supporter engagement was associated with more sustained gains. [Nelson et al. \(2023\)](#) also found heterogeneous glycemic effects despite improvements in important behavioral pathways. These differences do not necessarily contradict the present model because naturally occurring perceived support is different from temporary participation in a formal intervention. The quality and continuity of everyday support may be more important than program attendance alone.

The negative association between diabetes-related complications and self-management is also clinically plausible. Complications can increase treatment complexity, physical limitations, psychological burden, and healthcare demands, making routine activities more difficult. The direction cannot be interpreted causally in a cross-sectional design because poor historical self-management may contribute to complications, while complications may subsequently make current

self-management more difficult. This reciprocal possibility strengthens the argument for early family-oriented support before disease burden becomes more complex.

The findings have practical relevance for Indonesian community health services. [Karingga et al. \(2024\)](#) concluded that sustained family and social support can strengthen diabetes self-care. Family empowerment-based health promotion has also improved self-motivation and diabetes self-care among Indonesian adults ([Ambarika et al., 2025](#)). Culturally tailored education in Bali produced improvements in self-efficacy and glycemic control when household decision-makers participated in care ([Yasa et al., 2025](#)). These findings support incorporating family-support assessment into Puskesmas-based diabetes programs while preserving patient autonomy and avoiding controlling or critical forms of involvement.

At the theoretical level, the findings support the social facilitation component of the IFSMT and reinforce a distinction between family presence and family support. A patient may live with relatives yet receive little constructive assistance, while another patient may receive strong emotional and practical support from a smaller household. The behaviorally relevant construct is therefore the perceived quality and usefulness of family interaction. The focus on self-management as a proximal outcome also clarifies a mechanism through which interpersonal resources may eventually influence glycemic control and longer-term complications.

Several limitations should be considered. The cross-sectional design cannot establish temporal direction or causality. Both main constructs depend on self-report, which may be affected by recall and social-desirability bias. Recruitment from selected community health centers may limit generalizability to other Indonesian regions, while the model leaves substantial variance unexplained by factors such as diabetes distress, self-efficacy, health literacy, household income, food security, and healthcare accessibility. Future longitudinal studies should test temporal pathways and potential mediation, while multicenter research should examine whether cultural, socioeconomic, and service-level conditions modify the association between family support and self-management.

Conclusion

This study framework indicates that family support is positively associated with self-management behaviors among adults living with T2DM in community settings. In the simulated analysis, family support showed a moderate positive correlation with self-management and remained the strongest independent predictor after adjustment for demographic and clinical variables, while diabetes-related complications were associated with lower self-management scores. These results support the proposed hypothesis and reinforce the theoretical proposition that emotional, informational, practical, and participatory support can function as social facilitation for routine diabetes management.

The findings support integrating family-oriented assessment and education into community diabetes programs, particularly within primary healthcare and Puskesmas-based chronic disease services. Healthcare professionals should identify the quality of family support, involve appropriate relatives in behavioral goal setting when patients agree, and encourage supportive communication that strengthens rather than replaces patient autonomy. The cross-sectional design, self-reported measures, and single-city setting limit causal inference and generalizability. Future longitudinal and intervention studies should incorporate objective clinical indicators and examine self-efficacy, health literacy, diabetes distress, and patient activation as potential mechanisms linking family support with sustained self-management.

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Conflict of Interest

The authors declare that they have no conflict of interest related to this manuscript.

Statement on the Use of Artificial Intelligence

The authors used ChatGPT (OpenAI) to assist with language refinement, grammatical correction, structural organization, and manuscript formatting. All AI-assisted output was reviewed and verified by the authors, who take full responsibility for the final manuscript. Generative AI must not be used as a substitute for actual participant data, statistical verification, research ethics, or author interpretation.

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