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Factors associated with diabetes self-care activities in patients with type 2 diabetes mellitus

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ABSTRACT

The chronic nature of Type 2 diabetes mellitus (T2DM) necessitates management strategies beyond pharmacotherapy, specifically consistent self-care and family support. While self-care is critical for glycemic control, the influence of urban sociocultural and family dynamics remains underexplored. This study aimed to evaluate diabetes self-care levels and their associations with demographics, disease knowledge, and family support among adults. A STROBE-compliant cross-sectional study was conducted with 89 purposively sampled adults at a public health center. Instruments included the Diabetes Knowledge Questionnaire (DKQ-24), Family Support Scale (HDFSS), and Summary of Diabetes Self-Care Activities (SDSCA). Reliability was established (Cronbach's α = 0.73–0.96). Data were analyzed using the Mann-Whitney U test and Spearman's rho test. The mean SDSCA score was 71.4 (SD=13.7). Self-care behaviors were significantly associated with university education (p=0.048), disease duration ≥5 years (p=0.002), and older age (r=0.73, p<0.001). Diabetes knowledge (r=0.285, p=0.007) and family support (r=0.219, p=0.039) showed weaker, yet significant, positive correlations. No significant gender differences were observed (p=0.527). Age emerged as the strongest predictor of self-care. These findings highlight the need for age-stratified interventions that integrate family support to optimize T2DM management.

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INTRODUCTION

Diabetes Mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both (Jadon et al., 2024). According to the American Diabetes Association (ADA, 2025), DM is classified into several types, including Type 1, Type 2, gestational diabetes, and specific types due to other conditions. Among these, Type 2 DM represents a significant global health burden and is characterized as an incurable condition requiring lifelong management (Khunti et al., 2023). Consequently, effective clinical management extends beyond pharmacotherapy; it necessitates consistent diabetes self-care and robust psychosocial support (Puzhakkal et al., 2025). While medication controls physiological parameters, the long-term prevention of complications relies heavily on the patient's ability to adhere to complex behavioral regimens (Socea et al., 2023). Therefore, understanding the determinants of successful self-care is critical for improving health outcomes in this population (Olukotun et al., 2022).

Diabetes self-care activities are defined as the daily actions patients undertake to maintain optimal glycemic control and prevent complications (Ahmad & Joshi, 2023). These behaviors include adhering to a proper diet, engaging in regular physical exercise, taking prescribed

medications, monitoring blood glucose levels, smoking cessation, and performing routine foot care (Paudel et al., 2025). Previous literature suggests that the performance of these activities is influenced by various demographic and clinical factors, including age, gender, educational attainment, perception of the disease, and duration of diagnosis (Hisni et al., 2023; Sukarno et al., 2024). However, individual capacity alone is often insufficient to sustain these behaviors over time. The chronic nature of the disease requires a supportive environment that reinforces positive health behaviors and mitigates the risk of burnout or non-adherence (Jiakponna et al., 2024).

Family support serves as a primary environmental resource, directly contributing to the care of members during both health and illness (Tang et al., 2023). Within the context of chronic disease management, the family unit is instrumental in secondary prevention by mitigating risky behaviors and in tertiary prevention by facilitating the restoration of healthy habits (Diriba et al., 2023). Support may be manifested through emotional encouragement, instrumental assistance, and mutual acceptance, all of which strengthen the patient's resolve to prevent complications (Busebaia et al., 2023). Evidence indicates that family support is significantly associated with improved diabetes self-care activities (Zeren & Canbolat, 2023). Nevertheless, previous studies on the association between family dynamics and self-care success remain inconsistent, particularly in urban settings, where diverse social lives may influence how families engage in patient care (Surya & Alfita, 2025).

Theoretically, the interplay between individual and environmental factors can be understood through Social Cognitive Theory (SCT) (Obirikorang et al., 2022). SCT posits that health behaviors are driven by the reciprocal, dynamic interaction of environmental factors (such as family support), personal factors (such as knowledge and self-efficacy), and behavior itself (Yari et al., 2023). In this framework, diabetes knowledge boosts self-efficacy and outcome expectations, while family support strengthens motivation, fostering consistent self-care (Ibrahim et al., 2025). Despite the utility of this framework, existing research predominantly examines Western populations, limiting generalizability to Indonesia's unique sociocultural context. In Indonesia, particularly in Jakarta, family structures and collectivist values fundamentally shape health behaviors, yet the specific interplay between knowledge, support, and demographics remains underexplored (Kurnia et al., 2025).

Despite the high prevalence of diabetes in Jakarta, data regarding the combined effects of these determinants in this specific urban context are scarce. Most existing studies examine demographic, knowledge, and support variables in isolation rather than assessing their synergistic impact on self-care capacity (Sukarno et al., 2024). This gap is critical given Jakarta's rapid urbanization and diverse socioeconomic composition, which may differentially impact a patient's ability to manage their condition (Pasambo et al., 2025). Therefore, this study aims to identify the prevalence and factors associated with diabetes self-care activities among patients with Type 2 DM in Jakarta. By addressing these gaps, this research seeks to inform the development of culturally appropriate, resource-efficient interventions that account for Indonesia's family-centric healthcare dynamics.

METHOD

Type of Research

This was a cross-sectional study conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. It is presented in Figure 1. A CONSORT-style flow diagram showing the total number screened (n=493), those

excluded with specific reasons (hearing impairment, physical disability, incomplete data) (n=100), and the final analyzed sample of 89 participants.

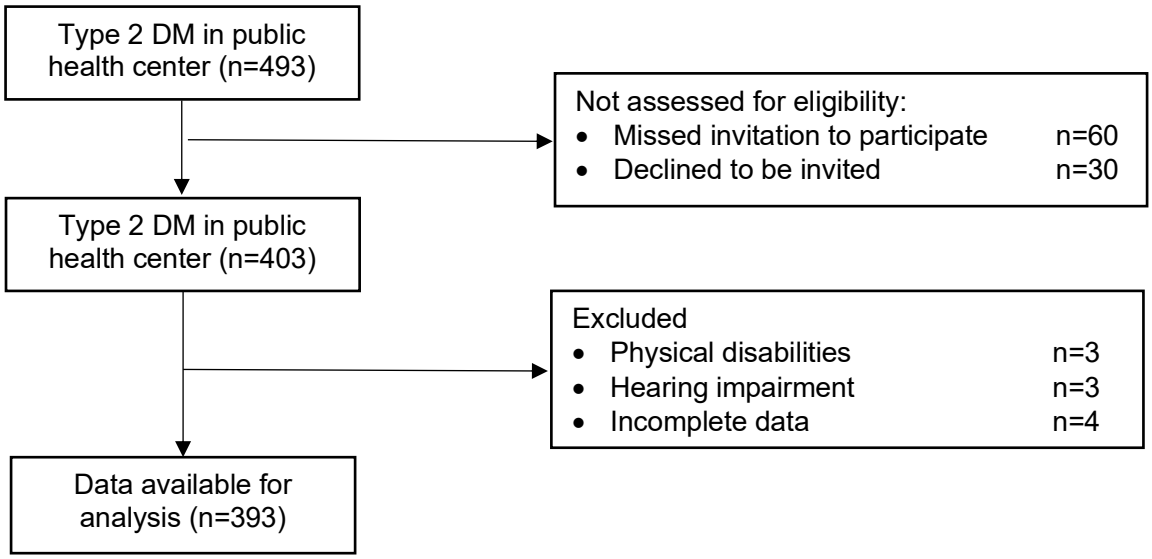

Figure 1. The CONSORT guidelines in the study

Population and Sample

The study population comprised patients with type 2 DM registered at the Matraman public health center in Jakarta. There were 393 patients. Because the DM population in Jakarta is well defined, the Slovin formula was used to determine the sample size for this study.

Sample size was calculated using Slovin's formula, where n = N/(1 + N × e^2), with N = 393 (the identified population size) and e = 0.05 (margin of error at the 95% confidence level), yielding n = 79.8. To account for a 10% potential non-response or dropout, the target sample was set at 89. Purposive sampling was used to approach the participants. Those who are 18 years old or older, able to communicate in the Indonesian language with no impairment or physical disabilities, have been included in the study. However, those who did not complete the study were excluded.

Instrument and Data Collection

Several tools were used in the study, including participants' demographic data, the Diabetes Knowledge Questionnaire-244 (DKQ-24), the Hensarling Diabetes Family Support Scale (HDFSS), and the Summary of Diabetes Self-Care Activities (SDSCA). Demographic data were developed by researchers and included age, gender, education level, and DM duration. Education was measured self-reportedly, with categories ranging from elementary through senior high school to university or college. For disease duration, specify medical record verification as less than 5 years versus 5 years or more. For age, specify a continuous variable in years, with mean, standard deviation, and range reported; the DKQ-24 was used to measure participants' knowledge of diabetes self-care activities. This tool consisted of 24 items with true/false or do not know responses, scored from 0 to 48, where 0 indicated incorrect or do not know, and 1 indicated correct. This tool has been validated and is reliable in a previous study of patients with type 2 DM, with a Cronbach's alpha of 0.73 (Cahyaningsih et al., 2024). The HDFSS was to measure family support regarding diabetes self-care activities among participants with type 2

DM. The HDFSS, with 25 items on a 4-point Likert scale, scored from 0 to 75, with higher scores indicating better support. The HDFSS used in this study has been previously validated, with a Cronbach's alpha of 0.96 (Jurdiansyah et al., 2025). The SDSCA, with 14 items using a 7-day recall, scored 0-98, with higher scores indicating better self-care, and had a Cronbach's alpha of 0.89 (Hisni & Nurani, 2025).

Prior to conducting the study, the researchers met with the head of public health to discuss the study and explain its purpose. After the study was approved, the researchers contacted the nurses responsible for non-communicable outpatient care at the public health center to confirm participants' eligibility. The researchers orally explained to each participant the purpose of the study, the confidentiality of all participant data, and that only researchers would have access to it. To introduce the study, each participant was asked for their consent. Additionally, the study's qualified participants were scrutinized.

Data Analysis

Normality was assessed using the Shapiro-Wilk test. Because the data violated normality assumptions (p-values < 0.05), nonparametric tests were employed. The Mann-Whitney U test was used to compare self-care scores between two independent groups, including gender, education level, and disease duration. Spearman's rank correlation coefficient examined associations between continuous variables, including age, knowledge, and family support, with self-care activities. Correlation strength was interpreted using standard guidelines: 0.00 to 0.19 as very weak, 0.20 to 0.39 as weak, 0.40 to 0.59 as moderate, 0.60 to 0.79 as strong, and 0.80 to 1.00 as very strong. Statistical significance was set at $p<0.05$. All analyses were conducted using SPSS version 29.

Ethical Consideration

In October 2025, the Faculty of Health Sciences at Universitas Nasional's institutional review board granted ethical clearance with permission number 107/e-KEPK/FIKES/X/2025. The study was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants after explaining the study purpose, voluntary participation, confidentiality measures, including de-identified data storage, and the right to withdraw without penalty. Participants received no financial compensation.

RESULT

Demographic Data of Participants

According to Table 1. It can be explained that more than half of the participants were female (70.8%) and that most of them graduated from elementary, secondary, or senior high school (85.4%). Regarding the duration of DM, 76.4% have been diagnosed with type 2 DM for more than 5 years. The mean age of the participants was 62.31 (SD=8.83), diabetes knowledge was 36.94 (SD=5.42), family support was 73.83 (SD=13.51), and diabetes self-care was 71.40 (SD=13.73).

Table 1. Demographic data of participants (n=89)

Characteristics	Frequency	Percentage	Median	Interquartile range
Gender				
Male	26	29.2		
Female	63	70.8		
Education				
Elementary through senior high school	63	70.8		
University or college	26	29.2		
Duration of DM				
< 5 years	21	23.6		
≥ 5 years	68	76.4		
Age (years) (Min-max=37-77)	M=62.31	SD=8.83	64.00	12
Diabetes knowledge (Min-Max=17-46)	M=36.94	SD=5.42	37.00	6
Family support (Min-max=34-96)	M=73.83	SD=13.51	76.00	15
Diabetes self-care activities (Min-max=34-94)	M=71.40	SD=13.73	75.00	13

*M= mean; SD=Standard Deviation

The Association Between Gender, Education, and Duration of DM with Diabetes Self-Care Activities

The association between gender, education, and DM duration with diabetes self-care activities is shown in Table 2. It can be concluded that there was a difference in the average diabetes self-care activities score between participants with education from elementary to high school and those with university or college education. In addition, the disease duration showed a significant difference in the average score between less than 5 years and more than 5 years for diabetes self-care practice among patients with type 2 DM. However, there was no significant difference between males and females in terms of diabetes self-care activities.

Table 2. Differences in diabetes self-care activities by gender, education, and duration of DM (n=89)

Independent variables	Diabetes self-care activities					
	Mean	SD	95% CI		p-value*	Effect size
			Lower	Upper		
Gender			-5.282	7.508	0.527	-0.06
Male	72.19	14.50				
Female	71.08	13.50				
Education levels			1.096	12.854	0.048	-0.20
Elementary to higher school	66.94	15.86				
University or college	73.91	11.79				
Duration of DM			-19.489	-6.998	0.002	-0.32
< 5 years	61.29	16.71				
≥ 5 years	74.53	11.06				

*Mann-Whitney test

Based on Table 3, there was a positive and significant relationship among age, diabetes knowledge, and family support with diabetes self-care activities. Furthermore, age demonstrated

a strong positive correlation with self-care activities (r=0.730, p<0.001, R^2=0.533), accounting for 53.3% of the variance. Diabetes knowledge showed a weak positive correlation (r=0.285, p=0.007, R^2=0.081), while family support exhibited a weak correlation (r=0.219, p=0.039, R^2=0.048).

Table 3. Correlation between diabetes knowledge, family support, and diabetes self-care activities

Independent variables	Diabetes self-care activities		
	r	p*	R^2
Age	0.730	<0.001	0.533
Diabetes knowledge	0.285	0.007	0.081
Family support	0.219	0.039	0.048

*Spearman Rank test; r=correlation coefficient

DISCUSSION

This study identifies age as the predominant determinant of diabetes self-care activities among urban Indonesian adults with Type 2 DM, exhibiting a stronger association than knowledge, family support, education, or disease duration. The strong positive correlation (r=0.730) aligns with previous reports indicating that patients aged 50 and older often practice better self-care. This finding contrasts with Western studies that frequently report declining self-care in elderly populations due to cognitive and physical limitations (Fonseca et al., 2024). In the Indonesian context, this discrepancy may be explained by several sociocultural mechanisms. First, older patients often benefit from multigenerational household structures in which adult children provide instrumental support with medication management and healthcare navigation. Second, retirement status among older adults may afford greater time for self-care activities than among working-age patients. Third, the "health shock" phenomenon, in which diagnosis prompts behavior modification, may have differentially affected older participants diagnosed at younger ages, allowing for longer adaptation periods. These results suggest that age-related factors, including cumulative self-management experience and increased health consciousness, are more influential than previously assumed in this population (Wang et al., 2025).

Regarding socioeconomic and clinical factors, patients with university education demonstrated higher self-care scores, though the effect was modest compared to age (p=0.048). This contrasts with findings emphasizing education as a primary determinant (Nadatien et al., 2024). The discrepancy may reflect Jakarta's unique context, where universal health coverage and widespread diabetes education programs at public health centers may have democratized access to knowledge, thereby reducing educational disparities. Additionally, disease duration was significantly associated with self-care, with patients diagnosed for ≥5 years showing better adherence. This suggests that longer duration allows patients to develop effective coping strategies, recognize symptoms, and adjust lifestyles through experience. Conversely, patients in the early adjustment phase (<5 years) often require more intensive guidance to develop optimal behaviors, indicating that self-care competence is a learned skill that evolves alongside disease perception.

Psychosocial factors, specifically diabetes knowledge and family support, showed significant but weaker positive correlations with self-care activities. Consistent with prior literature, knowledge plays a foundational role in shaping behaviors and anticipating complications (Cho et al., 2022). Adequate knowledge facilitates the adoption of healthier

lifestyles and adherence to treatment regimens (Sunny et al., 2025). Similarly, family support was associated with better self-care, as evidenced by medication supervision, diet management, and accompaniment during physical activities. Families play a critical role in boosting patient confidence and motivation (Busebaia et al., 2023; Zeren & Canbolat, 2023). However, the modest strength of this association, despite Indonesia's cultural emphasis on family, suggests the presence of nuances. Family support is universal rather than variable in this population, creating a ceiling effect or suggesting that support quality matters more than quantity. Furthermore, family involvement may sometimes manifest as overprotection, potentially reducing patient autonomy in self-care, a dynamic that warrants further qualitative exploration.

This study found no significant gender differences in self-care activities, contradicting several studies reporting female predominance in diabetes management (Jyotsana et al., 2024; Zaini et al., 2025). This null finding may reflect evolving gender roles in Jakarta, where male breadwinner expectations are shifting, enabling men to engage more in health behaviors. Alternatively, it may be attributed to sampling bias, given the female majority (70.8%) in this study. Another plausible explanation lies in Indonesian cultural norms that emphasize family-centered rather than individual health behaviors; such collectivist values may override gender-specific self-care patterns, leading to more uniform adherence across genders when family support is present.

These findings highlight the complexity of diabetes management in urban Indonesia, where demographic and sociocultural factors intersect. The predominance of age as a predictor underscores the need for age-stratified interventions that leverage the strengths of older patients while providing targeted support for younger diagnoses. While knowledge and family support remain essential, their modest predictive power suggests that interventions must move beyond education alone to address structural and experiential barriers (Chen et al., 2025). Understanding these associations is vital for developing culturally appropriate, resource-efficient interventions that account for Indonesia's family-centric healthcare dynamics and the specific challenges of rapid urbanization.

Limitations

Several limitations of this study warrant acknowledgment. Primarily, the cross-sectional design precludes causal inference, suggesting that the observed strong association between age and self-care may reflect cohort effects rather than aging processes. The reliance on self-reported measures, specifically the SDSCA, introduces potential social desirability and recall biases; future research would benefit from incorporating objective clinical markers such as HbA1c levels or pharmacy refill records to enhance validity. Generalizability is further constrained by the single-center, purposive sampling strategy within a Jakarta public health center, which may introduce selection bias toward more health-conscious patients and limit applicability to private healthcare settings or diverse socioeconomic strata across Indonesia. Additionally, the study did not assess potential confounders, including diabetes complications, depression, health literacy, or medication regimen complexity, all of which may influence self-care capacity. Finally, the modest sample size (n=89) may have limited statistical power to detect smaller effect sizes, particularly regarding the non-significant gender differences observed.

CONCLUSION

This study establishes age as the predominant predictor of diabetes self-care behaviors among urban Indonesian adults with Type 2 diabetes mellitus, explaining a substantial proportion

of the observed variance. Consequently, diabetes management strategies in similar sociocultural contexts should shift toward age-stratified interventions, prioritizing intensive structured education for younger patients and those earlier in their disease trajectory, while leveraging existing family support systems and experiential learning for older adults. Healthcare providers are encouraged to assess not only knowledge deficits but also age-related facilitators and barriers, such as time availability, caregiving structures, and cumulative self-management experience. To build upon these findings, future research should employ longitudinal designs to clarify causal relationships, incorporate objective clinical measures, and explore the moderating role of family dynamics across diverse Indonesian settings. Ultimately, expanding investigations to include rural and private healthcare sectors will be essential to enhance the generalizability of these results and optimize population health outcomes.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this study.

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