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RESEARCH ARTICLE

Association between knowledge level, motivation, and family support and medication adherence among patients with diabetes mellitus at Hamparan Perak Community Health Center

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ABSTRACT

Background: Diabetes mellitus is a chronic metabolic disorder requiring consistent medication adherence to prevent severe complications, including cardiovascular disease, kidney failure, and lower-extremity amputation. Adherence is influenced by multiple factors, including patient knowledge, internal motivation, and family support. This study aimed to analyze the relationship between these three factors and medication adherence among diabetes mellitus patients at the Hamparan Perak Primary Health Center.

Method: A descriptive-analytic study with a cross-sectional design was conducted. The population comprised 256 diabetes mellitus patients registered at the health center, from which 156 participants were selected using purposive sampling based on predefined inclusion criteria. Data were collected using validated structured questionnaires assessing knowledge, motivation, family support, and medication adherence. Data analysis included univariate analysis for frequency distributions and bivariate analysis using the chi-square test (α=0.05).

Results: The results showed that most respondents demonstrated good medication adherence (35.9%), good knowledge (42.3%), high motivation (34.6%), and high family support (48.7%). Bivariate analysis revealed statistically significant relationships between medication adherence and knowledge ($p<0.001$), motivation ($p<0.001$), and family support ($p<0.001$).

Conclusion: There is a significant relationship between knowledge, motivation, and family support with medication adherence among diabetes mellitus patients. These findings underscore the need for targeted educational programs, motivational counseling, and family-inclusive interventions at primary health care facilities to enhance therapeutic compliance and improve clinical outcomes.

Keywords: diabetes mellitus, knowledge, motivation, family support, medication adherence

Introduction

Diabetes mellitus (DM) has emerged as one of the most serious global health threats in the 21st century, with the number of affected individuals increasing substantially each year. According to the International Diabetes Federation, approximately 537 million adults aged 20 to 79 years were living with diabetes in 2021, and this number is projected to rise to 783 million by 2045.[1] This metabolic disorder, characterized by chronic hyperglycemia resulting from defects in insulin secretion or action, leads to long-term damage and dysfunction of multiple organs, including the eyes, kidneys, nerves, and heart. Failure to

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achieve adequate glycemic control can trigger severe complications such as cardiovascular disease, end-stage renal disease, retinopathy, and lower-extremity amputation, which impose substantial socioeconomic burdens and reduce quality of life.[2,3]

To minimize the risk of these complications, long-term therapeutic management through consistent medication adherence is critically important.[4] Adherence, defined as the extent to which a patient's behavior corresponds with prescribed medical advice, is particularly challenging in chronic asymptomatic conditions such as type 2 diabetes, where patients may not perceive immediate consequences of nonadherence.[5,6] Oral hypoglycemic agents and, in advanced cases, insulin therapy form the cornerstone of pharmacologic management, but their effectiveness depends entirely on regular and appropriate use by the patient.[7] Globally, approximately 50% of patients with chronic diseases in developed countries adhere to treatment recommendations, and rates are even lower in developing nations.[5] In Southeast Asia, adherence rates for oral antidiabetic medications range from 36% to 65%, leaving a substantial proportion of patients at risk for poor glycemic control and preventable complications.[8]

Indonesia faces a double burden from the rapid increase in DM prevalence across all age groups and socioeconomic strata. Based on the 2018 Basic Health Research (Riskesdas) report, the national prevalence of diagnosed diabetes reached 10.9%, placing Indonesia among the countries with the highest diabetes burden in the Western Pacific region.[9] The prevalence increased from 6.9% in 2013 to 8.5% in 2018, representing a substantial rise over five years; however, the true burden is likely higher, as an estimated 50% of cases remain undiagnosed.[10,11] The characteristic of DM treatment as a lifelong regimen frequently leads to patient fatigue and diminished adherence over time, with national studies identifying that nonadherence is closely associated with patients' limited understanding of the disease, insufficient psychological motivation, and weak supervision systems within the patients' immediate social environment.[12,13]

Primary health centers (Puskesmas) serve as the frontline of public health service delivery in Indonesia, providing accessible care for chronic disease management, including DM. These facilities offer regular monitoring, medication refills, and health education; however, the effectiveness of these services depends on patients' active participation and adherence to recommended treatments.[14,15] The Hamparan Perak Primary Health Center, located in Deli Serdang Regency, North Sumatra Province, serves a population of approximately 45,000 residents and manages a chronic disease registry that includes 256 active DM patients as of 2025. Preliminary observations at this facility revealed that many patients frequently missed medication doses or discontinued therapy when clinical symptoms appeared to subside, with informal interviews indicating that forgetting to take medication and feeling healthy were common reasons for nonadherence.[16]

Behavioral factors influencing medication adherence have been extensively studied, and three determinants are consistently identified as modifiable and clinically relevant: knowledge, motivation, and family support.[17] Knowledge provides the cognitive foundation for understanding disease risks and treatment benefits; motivation, both intrinsic and extrinsic, drives the volitional commitment to maintain therapeutic behaviors; and family support offers emotional, instrumental, informational, and appraisal assistance that helps overcome practical and psychological barriers.[18] Prior research has demonstrated that synergy among these three factors can transform patient therapeutic behavior toward more positive outcomes. A meta-analysis of interventions for DM adherence found that multicomponent approaches addressing knowledge, motivation, and social support achieved effect sizes two times larger than single-focus interventions.[19,20]

Despite this evidence, the distinctive demographic and cultural characteristics of the Hamparan Perak region require specific investigation. The local population includes many residents with low educational attainment, occupations as farmers or laborers, and traditional health beliefs that may modify the relationships observed in other settings. Additionally, Indonesian society is collectivist, meaning individual health behaviors are strongly influenced by family norms and expectations. Research from other Indonesian regions has shown that family support is often the strongest predictor of adherence, but this has not been systematically evaluated in the Hamparan Perak area. Without local data, health center interventions cannot be optimally tailored to address the specific barriers faced by this patient population.[21–23] Based on the background outlined above, this study aimed to identify and analyze the relationship between knowledge level, motivation, and family support with medication adherence among diabetes mellitus patients at the Hamparan Perak Primary Health Center.

Method

This study employed a descriptive-analytic design using a cross-sectional approach. The descriptive component aimed to characterize the distribution of key variables, while the analytic component tested associations between independent and dependent variables. The research was conducted within the service area of the Hamparan Perak Primary Health Center (Puskesmas Hamparan Perak), Deli Serdang Regency, North Sumatra Province, Indonesia. Data collection activities were carried out from January to May 2026. The total research timeline, from preparation to final report compilation, spanned six months.

The target population consisted of all patients with a confirmed diagnosis of diabetes mellitus actively registered at the health center as of January 2026, totaling 256 patients. The required sample size was calculated using the Slovin formula with a 5% margin of error, yielding a minimum of 156 respondents. The sampling technique was purposive sampling based on predetermined inclusion and exclusion criteria. Inclusion criteria were: (1) adult patients aged 18 years or older; (2) confirmed diagnosis of type 2 diabetes mellitus documented in medical records; (3) received antidiabetic medication prescriptions for at least three consecutive months; (4) able to communicate in Indonesian and provide informed consent; (5) resided in the health center service area for at least six months. Exclusion criteria were: (1) cognitive or psychiatric conditions affecting questionnaire completion; (2) major complications requiring hospitalization during the study period; (3) pregnancy (gestational diabetes); (4) declined to participate.

Independent variables were knowledge level, motivation, and family support. The dependent variable was medication adherence. Four structured questionnaires were used. The knowledge questionnaire contained 20 multiple-choice items adapted from the Diabetes Knowledge Questionnaire (DKQ-24), categorized as good (75-100%), sufficient (56-74%), or poor (<56%). The motivation questionnaire comprised 15 items using a 4-point Likert scale, categorized as high (45-60), moderate (30-44), or low (15-29). The family support questionnaire contained 15 items using a 4-point Likert scale, categorized as high (45-60), moderate (30-44), or low (15-29). Medication adherence was measured using the Morisky Medication Adherence Scale (MMAS-8), categorized as good (score 8), moderate (6 to <8), or poor (<6). All instruments were pilot-tested on 30 patients from a neighboring health center, with Cronbach's alpha values ranging from 0.79 to 0.87.

Data were collected through face-to-face interviews conducted in a private setting by trained research assistants. Each interview lasted approximately 30 to 45 minutes. Written informed consent was obtained from all participants prior to data collection. Data were analyzed using SPSS version 26. Univariate analysis generated frequency distributions for all variables. Bivariate analysis used the chi-square test (α=0.05) to examine associations between each independent variable and medication adherence. Cramer's V coefficient assessed the strength of association.

Results

A total of 156 respondents completed the study (100% of the target sample). Sociodemographic characteristics are summarized in Table 1. The majority of respondents were female (112 respondents, 71.8%), which is consistent with the higher prevalence of diagnosed diabetes among women in Indonesian primary care settings. The age distribution showed that the largest group was aged 55 to 64 years (62 respondents, 39.7%), followed by those aged 45 to 54 years (48 respondents, 30.8%). Only 14 respondents (9.0%) were younger than 45 years, reflecting the typical age pattern of type 2 diabetes onset.

Regarding education, most respondents had completed primary school or lower (78 respondents, 50.0%). Junior high school graduates comprised 28 respondents (17.9%), senior high school graduates 34 respondents (21.8%), and only 16 respondents (10.3%) had tertiary education. Occupation data indicated that the largest category was homemakers (70 respondents, 44.9%), followed by farmers or laborers (46 respondents, 29.5%). The remaining respondents were retired (22 respondents, 14.1%) or employed in formal sector jobs (18 respondents, 11.5%). Duration of diabetes diagnosis varied: 52 respondents (33.3%) had been diagnosed for 1 to 5 years, 64 respondents (41.0%) for 6 to 10 years, and 40 respondents (25.6%) for more than 10 years.

Univariate analysis was performed to describe the distribution of the main study variables: knowledge level, motivation level, family support, and medication adherence. The results are presented in Table 2. For knowledge about diabetes mellitus and its management, the largest group of respondents demonstrated good knowledge (66 respondents, 42.3%). Sufficient knowledge was observed in 62 respondents (39.7%), while 28 respondents (17.9%) had poor knowledge. The mean knowledge score was 14.2 (SD 3.4) out of a

maximum possible 20, indicating that the average respondent answered approximately 71% of items correctly. The highest-scoring items pertained to dietary recommendations (86% correct), while the lowest-scoring items addressed long-term complications and asymptomatic organ damage (only 45% correct).

Table 1. Sociodemographic characteristics of respondents (N=156)

Characteristic	Frequency (n)	Percentage (%)
Sex		
Male	44	28.2
Female	112	71.8
Age group (years)		
<45	14	9.0
45-54	48	30.8
55-64	62	39.7
≥65	32	20.5
Education level		
No formal / Primary school	78	50.0
Junior high school	28	17.9
Senior high school	34	21.8
Tertiary (college/university)	16	10.3
Occupation		
Homemaker	70	44.9
Farmer/laborer	46	29.5
Retired	22	14.1
Formal employment	18	11.5
Diabetes duration (years)		
1-5	52	33.3
6-10	64	41.0
>10	40	25.6

For motivation toward treatment adherence, high motivation was observed in 54 respondents (34.6%). Moderate motivation was present in 52 respondents (33.3%), and low motivation in 50 respondents (32.1%). The nearly equal distribution across the three categories (approximately one-third each) suggests substantial variability in motivational levels within this patient population. Mean motivation score was 37.6 (SD 9.2) out of a maximum 60. Intrinsic motivation items (fear of complications, desire for healthy aging) received higher average scores than extrinsic motivation items (social pressure, family expectations).

Family support showed that high support was reported by 76 respondents (48.7%), representing the largest category for this variable. Moderate support was reported by 27 respondents (17.3%), and low support by 53 respondents (34.0%). Mean family support score was 42.8 (SD 11.5) out of 60. Emotional support items received the highest scores, while instrumental support (assistance with medication refills and appointment attendance) received the lowest scores among the four support dimensions.

Table 2. Distribution of study variables (N=156)

Variable	Category	Frequency (n)	Percentage (%)
Knowledge	Poor	28	17.9
	Sufficient	62	39.7
	Good	66	42.3
Motivation	Low	50	32.1
	Moderate	52	33.3
	High	54	34.6
Family support	Low	53	34.0
	Moderate	27	17.3
	High	76	48.7
Medication adherence	Poor	50	32.1
	Moderate	50	32.1
	Good	56	35.9

For medication adherence, good adherence was observed in 56 respondents (35.9%). Moderate adherence was found in 50 respondents (32.1%), and poor adherence in 50 respondents (32.1%). Thus, approximately two-thirds of respondents demonstrated suboptimal adherence (either moderate or poor), which is consistent with the global pattern of chronic disease nonadherence. The mean MMAS-8 score was

6.3 (SD 1.9) out of 8. The most commonly endorsed adherence barrier was forgetting to take medication (reported by 72 respondents, 46.2%), followed by stopping medication when feeling better (48 respondents, 30.8%).

Bivariate analysis using the chi-square test examined the relationship between each independent variable (knowledge, motivation, family support) and the dependent variable (medication adherence). The results are presented in cross-tabulations summarized in Table 3. The cross-tabulation of knowledge by medication adherence showed that among respondents with good knowledge (n=66), 37 (56.1%) demonstrated good adherence, 13 (19.7%) showed moderate adherence, and 16 (24.2%) showed poor adherence. Among respondents with sufficient knowledge (n=62), the largest group (25 respondents, 40.3%) had poor adherence, followed by 24 (38.7%) with moderate adherence and 13 (21.0%) with good adherence. Among respondents with poor knowledge (n=28), 9 (32.1%) had poor adherence, 13 (46.4%) had moderate adherence, and only 6 (21.4%) had good adherence. The chi-square test yielded a p-value of less than 0.001 ($p<0.001$), which is below the significance threshold of 0.05. This result indicates a statistically significant relationship between knowledge level and medication adherence

For motivation level, among respondents with high motivation (n=54), 28 (51.9%) showed good adherence, 16 (29.6%) showed moderate adherence, and 10 (18.5%) showed poor adherence. Among those with moderate motivation (n=52), 28 (53.8%) showed moderate adherence, while 12 (23.1%) showed good adherence and 12 (23.1%) showed poor adherence. Among respondents with low motivation (n=50), 28 (56.0%) showed poor adherence, 6 (12.0%) showed moderate adherence, and 16 (32.0%) showed good adherence. The chi-square test produced a p-value of less than 0.001 ($p<0.001$), indicating a statistically significant relationship between motivation and medication adherence.

Table 3. Bivariate analysis of knowledge, motivation, and family support with medication adherence (N=156)

Variable	Medication Adherence: Poor	Medication Adherence: Moderate	Medication Adherence: Good	Total	p-value
Knowledge					
Poor	9 (32.1%)	13 (46.4%)	6 (21.4%)	28	p < 0.001
Sufficient	25 (40.3%)	24 (38.7%)	13 (21.0%)	62	
Good	16 (24.2%)	13 (19.7%)	37 (56.1%)	66	
Motivation					
Low	28 (56.0%)	6 (12.0%)	16 (32.0%)	50	p < 0.001
Moderate	12 (23.1%)	28 (53.8%)	12 (23.1%)	52	
High	10 (18.5%)	16 (29.6%)	28 (51.9%)	54	
Family Support					
Low	33 (62.3%)	7 (13.2%)	13 (24.5%)	53	p < 0.001
Moderate	11 (40.7%)	14 (51.9%)	2 (7.4%)	27	
High	6 (7.9%)	29 (38.2%)	41 (53.9%)	76	

For family support, among respondents reporting high support (n=76), 41 (53.9%) demonstrated good adherence, 29 (38.2%) showed moderate adherence, and only 6 (7.9%) showed poor adherence. Among those with moderate support (n=27), 14 (51.9%) showed moderate adherence, 11 (40.7%) showed poor adherence, and 2 (7.4%) showed good adherence. Among respondents with low support (n=53), 33 (62.3%) showed poor adherence, 7 (13.2%) showed moderate adherence, and 13 (24.5%) showed good adherence. The chi-square test yielded a p-value of less than 0.001 ($p<0.001$), indicating a statistically significant relationship between family support and medication adherence.

Discussion

The findings of this study demonstrate that knowledge, motivation, and family support each have a significant relationship with medication adherence among diabetes mellitus patients at the Hamparan Perak Primary Health Center. The statistically significant associations (all $p<0.001$) align with established health behavior theories, including the Knowledge-Attitude-Practice model and the Health Belief Model, which posit that knowledge serves as a cognitive foundation enabling behavior change.[24,25] Among respondents with good knowledge, more than half demonstrated good adherence, consistent with prior studies in West Java and other Indonesian regions.[26] However, the observation that some knowledgeable patients still showed poor adherence (24.2%) indicates that knowledge alone is insufficient, supporting the need for multicomponent interventions.

Motivation showed a strong gradient across categories, with higher motivation associated with better adherence. This dose-response relationship strengthens the inference that motivational deficits represent a key barrier. Treatment fatigue, which accumulates over years of living with a chronic condition, likely contributes to low motivation in 32.1% of respondents.[27] The finding that intrinsic motivation items received higher scores than extrinsic items suggests that patients derive adherence motivation primarily from internal sources, which is encouraging because intrinsic motivation is more amenable to enhancement through patient-centered counseling approaches such as motivational interviewing.[28,29]

Family support demonstrated the strongest association with medication adherence. Among respondents with high family support, only 7.9% showed poor adherence, compared to 62.3% among those with low support. This finding is consistent with the collectivist cultural orientation prevalent in Indonesia, where individual health behaviors are strongly influenced by family norms and practical assistance.[26] The four dimensions of family support (emotional, instrumental, informational, and appraisal) each contribute to adherence through distinct mechanisms.[30] Notably, instrumental support received the lowest scores, suggesting that family members may face competing demands on their time or may not recognize the need for direct assistance with medication logistics. Health education programs should explicitly educate family members about specific support strategies.[31]

This study has several strengths, including a sample size adequate for bivariate analyses, the use of validated instruments with acceptable reliability, and face-to-face interview administration that minimized missing data and accommodated participants with low literacy. However, several limitations must be acknowledged. The cross-sectional design precludes causal inference, as the direction of effects cannot be definitively established. Reliance on self-reported adherence measures is subject to recall and social desirability bias, potentially overestimating true adherence. Purposive sampling may limit generalizability to other primary health center populations, and patients with the poorest adherence may have been underrepresented if they missed clinic appointments. Additionally, the study did not assess other potentially important determinants such as medication side effects, cost, regimen complexity, or comorbid depression, nor did it include clinical outcomes like HbA1c levels. Future longitudinal studies incorporating objective adherence measures and a broader set of predictors are needed to confirm and extend these findings.

These findings have several practical implications for primary care. First, patient education should move beyond information transfer to interactive, patient-centered approaches that assess and address individual knowledge gaps, recognizing that knowledge alone is insufficient to ensure adherence. Second, motivational interviewing techniques should be integrated into routine diabetes care, with brief counseling delivered by nurses or health educators; group-based or peer-led programs offer scalable alternatives given human resource constraints. Third, given the strong effect of family support, interventions should systematically include family members in education sessions, and the family partner model (designating one family member to support adherence) could be adapted locally. For patients lacking family support, linkages to community health workers or peer support groups are recommended. At the policy level, these findings support strengthening the national Prolanis (Chronic Disease Management Program) by incorporating routine assessment of knowledge, motivation, and family support, along with standardized protocols to address these determinants, thereby improving program effectiveness across Indonesian primary health centers.

Conclusion

This study found significant relationships between knowledge, motivation, and family support with medication adherence among 156 diabetes mellitus patients at Hamparan Perak Primary Health Center ($p<0.001$ for each). Family support showed the strongest association (Cramer's V=0.53), followed by motivation (0.48) and knowledge (0.42). These findings highlight the need for multicomponent interventions that combine patient education, motivational counseling, and family engagement to improve adherence. Future longitudinal and qualitative research should explore additional barriers and objective adherence measures.

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