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Health Locus of Control and Family Support as Predictors of Physical Activity Adherence in Patients with Type 2 Diabetes Mellitus

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ABSTRACT
Physical activity adherence is a crucial component of diabetes self-management. Psychosocial determinants, including Health Locus of Control (HLoC) and family support, significantly influence behavioral outcomes among individuals with Type 2 Diabetes Mellitus (T2DM). This study aims to analyze the predictive roles of HLoC and family support on physical activity adherence in T2DM patients. A descriptive correlational cross-sectional study was conducted with 59 T2DM patients. Data were obtained using validated questionnaires. Chi-square test was applied with significance level p < 0.05. Family support showed a significant association with adherence (p = 0.000), whereas HLoC did not (p = 0.164). Family support is a key determinant of adherence to physical activity. HLoC alone does not independently predict adherence.

Keywords:
Health locus of control; family support; physical activity adherence; type 2 diabetes mellitus; self-management

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Introduction

Type 2 Diabetes Mellitus (T2DM) is one of the most pressing global public health challenges, characterized by chronic hyperglycemia resulting from impaired insulin action or secretion (Association, 2021). According to the International Diabetes Federation (Federation, n.d.), more than 537 million adults worldwide currently live with diabetes, and projections indicate an alarming increase to 783 million by 2045. The escalating prevalence of T2DM is driven by sedentary lifestyles, urbanization, increased caloric intake, and aging populations (Cho et al., 2022). The global economic burden of diabetes is similarly substantial, with annual expenditures estimated to surpass USD 966 billion, reflecting both direct healthcare costs and indirect productivity losses due to disability and premature mortality (Bommer et al., 2018)

In Indonesia, the diabetes epidemic is growing at a concerning rate. The Indonesian Basic Health Research (Kesehatan, 2023) reports that the prevalence of diabetes continues to increase annually, and Indonesia now ranks among the top five countries th the greatest number of adults living with

diabetes (Federation, 2021). West Sumatra, one of the provinces experiencing a rapid rise in metabolic diseases, contributes significantly to the national statistics (Kesehatan, 2023). A tertiary hospital in Bukittinggi where this study was conducted reported 137 new T2DM cases in six months, demonstrating the increasing burden and demand for effective management strategies (Hospital, 2024). Such data underscore the need for a deeper understanding of behavioral and psychosocial factors that influence patient self-management behavior, particularly adherence to lifestyle modification.

Among the essential components of T2DM self-management, physical activity is considered a cornerstone intervention. Regular physical activity has well-documented benefits, including enhancing insulin sensitivity, lowering HbA1c levels, improving cardiovascular function, reducing stress, controlling weight, and increasing overall physical fitness (Colberg et al., 2016) (Association, n.d.) 2024). Evidence suggests that at least 150 minutes of moderate-intensity exercise per week can significantly reduce diabetes-related complications (Organization, 2020). Despite these benefits, adherence to physical activity remains low across multiple populations, with studies indicating that less than half of T2DM patients consistently follow recommended exercise regimens (Kassavou et al., 2019); (Plotnikoff et al., 2017).

The low adherence to physical activity is often attributed to complex interactions between biological, psychological, social, cultural, and environmental factors. In many Asian cultures, including Indonesia, self-management behaviors are heavily influenced by family dynamics and social expectations rather than solely individual motivation (Sari & Nursalam, 2020); (Tan et al., 2018). This reveals the importance of exploring psychosocial constructs that shape health behaviors, particularly Health Locus of Control (HLoC) and family support, which are central predictors investigated in this study (Wallston, 2004); (Abdoli et al., 2021).

Health Locus of Control (HLoC), a psychological construct introduced by Rotter (1966), refers to individuals' generalized expectation about whether health outcomes are controlled by internal or external factors. Individuals with an internal HLoC believe their health is determined by personal actions, self-discipline, and behavioral effort, which often correlates with higher motivation for self-management (Wallston et al., 1978). Conversely, individuals with an external HLoC attribute outcomes to external forces, such as fate, luck, divine will, healthcare providers, or significant others (Wallston et al., 1978). Although theoretical frameworks propose that internal HLoC should positively affect adherence to healthy behaviors, empirical findings remain inconsistent. Studies in Western populations demonstrate strong correlations between internal HLoC and adherence (Norman et al., 1998), (Chen

et al., 2020), 2020), yet findings from collectivist societies show that external factors, especially family involvement, may overshadow internal motivational constructs (Abdoli et al., 2021); (Tan et al., 2018).

In Indonesia's collectivistic cultural context, family plays a central role in decision-making, emotional regulation, daily activities, and healthcare navigation (Sari & Nursalam, 2020). Therefore, family support becomes a critical determinant of health behavior. Family support encompasses emotional support (encouragement, empathy), instrumental support (accompanying exercise, preparing meals), informational support (reminders, education), and appraisal support (feedback and reinforcement) (Friedman et al., 2003). A substantial body of evidence underscores that stronger family support leads to improved medication adherence, dietary control, glucose monitoring, and physical activity participation among T2DM patients (Mayberry & Osborn, 2014).

Additionally, family systems theory suggests that individuals exist within interdependent social units; thus, health behavior cannot be understood solely at the personal level (Bowen, 1978). Family members influence motivation, accountability, self-efficacy, and behavioral patterns (Fiese et al., 2016). Several studies demonstrate that diabetic patients with strong family support have higher adherence rates, better glycemic control, and improved psychological well-being (Rosland et al., 2010) (Pamungkas et al., 2017). However, few studies have examined the combined influence of both HLoC and family support as predictors of physical activity adherence, especially within Indonesian populations where cultural norms amplify the family's role (Pranata et al., 2022).

Understanding these psychosocial determinants is essential for designing culturally appropriate interventions. While many diabetes education programs focus primarily on individual behavior change, emerging evidence suggests that such approaches may be insufficient in collectivist societies (Huang et al., 2021). Instead, family-centered diabetes care may provide stronger outcomes by leveraging existing support systems within the patient's daily environment (Mayberry & Osborn, 2014). Despite increasing interest in this area, research gaps persist. Limited studies investigate whether family support moderates or strengthens the relationship between HLoC and adherence (Abdoli et al., 2021). Similarly, existing studies rarely incorporate both constructs simultaneously to predict physical activity adherence. This creates an important opportunity for research to fill these gaps and offer empirical evidence for practice recommendations.

Given these considerations, this study aims to evaluate the relationship between Health Locus of Control, family support, and physical activity adherence among patients with T2DM in Bukittinggi, Indonesia. By understanding the predictive roles of these psychosocial

factors, healthcare professionals can develop more targeted, culturally sensitive, and effective interventions to improve diabetes self-management outcomes.

Methods

This study employed a descriptive correlational cross-sectional design to examine the relationships between Health Locus of Control (HLoC), family support, and physical activity adherence among patients with Type 2 Diabetes Mellitus (T2DM), enabling the assessment of psychosocial factors and adherence behaviors simultaneously without manipulating the study environment. The study was conducted in February 2025 at the outpatient clinic of RSUD Dr. Achmad Mochtar Bukittinggi, West Sumatra, Indonesia. A total of 59 patients with Type 2 Diabetes Mellitus (T2DM) participated in the study. Participants were recruited using an accidental (convenience) sampling technique, whereby eligible patients attending the clinic during the data collection period were invited to participate. Inclusion criteria were: (1) age ≥18 years, (2) confirmed diagnosis of Type 2 Diabetes Mellitus by a physician, (3) ability to communicate effectively in Indonesian, and (4) willingness to participate as indicated by signed informed consent. Patients with severe acute complications, cognitive impairment, or physical conditions that prevented engagement in physical activity were excluded from the study.

Data were collected using structured questionnaires consisting of four sections: Sociodemographic and Clinical Characteristics. This section gathered information on age, gender, education level, duration of diabetes, and comorbid conditions. Data were obtained through self-report and confirmation from medical records where available. Health Locus of Control was measured using an adapted Health Locus of Control Scale for chronic illness, which assesses beliefs about internal control and external control (powerful others and chance) over health outcomes using Likert type items, with higher scores indicating stronger locus of control orientation. Family support was measured using a Family Support Scale assessing emotional, instrumental, informational, and appraisal support from family members through Likert-type items, with higher scores indicating stronger perceived family support related to physical activity adherence in patients with T2DM. Physical Activity Adherence Scale. Physical activity adherence was assessed using a Physical Activity Adherence Scale measuring consistency, frequency, and compliance with recommended physical activity through Likert-type items, with higher scores indicating better adherence to diabetes self-management recommendations. All instruments underwent content validity evaluation prior to data collection. Content validity was assessed by a panel of nursing and chronic disease experts to ensure clarity, relevance, and cultural appropriateness of the items.

The instruments were revised based on expert feedback to improve

comprehensibility. Reliability testing demonstrated acceptable to good internal consistency for all scales. The Health Locus of Control Scale showed good reliability with a Cronbach's alpha coefficient of α = 0.82. The Family Support Scale demonstrated excellent reliability (α = 0.88), indicating strong internal consistency across items. The Physical Activity Adherence Scale showed acceptable reliability with a Cronbach's alpha of α = 0.79. These results indicate that all instruments were reliable for measuring the intended constructs in this study population. Data were collected through structured face-to-face interviews conducted by trained enumerators to ensure consistency and reduce respondent misunderstanding. Interviews were conducted in a private setting within the outpatient clinic to maintain confidentiality and encourage honest responses. Data analysis was performed using statistical software. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize demographic and clinical characteristics. The Chi-square test was employed to evaluate the relationships between Health Locus of Control, family support, and physical activity adherence. Statistical significance was set at $p < 0.05$. This study received ethical approval from the appropriate Institutional Ethics Review Board (Protocol No. 25-03-1395). All participants were provided with complete information regarding the study objectives, procedures, potential risks, and benefits. Written informed consent was obtained prior to participation, and confidentiality and anonymity were strictly maintained throughout the research process.

Results

A total of 59 respondents participated in this study. Data analysis was conducted to describe respondent characteristics, distribution of Health Locus of Control (HLoC), levels of family support, and adherence to physical activity. Inferential analysis using Chi-square tests was performed to determine relationships between HLoC, family support, and adherence to physical activity.

a. Characteristics of Respondents
   The demographic characteristics showed that the majority of respondents were female (64,4%), and more than half worked as housewives (55,9%), suggesting that most participants spent more time at home and were influenced heavily by household dynamics. This demographic profile is relevant in explaining patterns of physical activity and reliance on family support.

Table 1. Respondent Characteristics (n = 59)

Characteristics	n	%
Gender		
Female	38	64.4%
Male	21	35.6%
Occupation		
Housewives	33	55.9%
Retired	10	16.9%
Private workers	16	27.1%

The predominance of female respondents and housewives may influence lifestyle behaviors, social environments, and sources of motivation, contributing to variations in physical activity adherence.

The majority of respondents (62,7%) reported having an external HLoC, indicating that most individuals believed health outcomes were determined by external forces such as healthcare providers, fate, or family influence.

b. Distribution of Health Locus of Control (HLoC)

Table 2. Distribution of Health Locus of Control

HLoC Category	n	%
Internal HLoC	22	37.3%
External HLoC	37	62.7%

Interpretation:
This finding suggests that external beliefs remain dominant in this cultural context. Such orientation may affect self-initiated actions, as individuals with external HLoC may rely more heavily on others for decision-making.

c. Levels of Family Support

Family support was categorized as good or poor. Most respondents (59%) reported poor family support, while only 40,7% reported good support.

Table 3. Levels of Family Support

Family Support Level	n	%
Good support	24	40.7%
Poor support	35	59.3%

Interpretation:
A majority experiencing poor support is concerning since family involvement is known to play a crucial role in diabetes self-management.

d. Physical Activity Adherence
Adherence was categorized based on frequency, consistency, and meeting recommended exercise duration. Approximately 67.8% of respondents were categorized as adherent, while 32.2% were non-adherent.

Table 4. Physical Activity Adherence

Adherence Level	n	%
Adherent	40	67.8%
Non-adherent	19	32.2%

Interpretation:
Despite relatively low levels of family support, adherence was moderately high, potentially influenced by health education or intrinsic motivation. However, deeper analysis suggests adherence correlates more strongly with family support.

e. Relationship Between HLoC and Physical Activity Adherence
The Chi-square test indicated no significant relationship between HLoC and adherence (p = 0.164).

Table 5. Cross-tabulation: HLoC and Adherence

HLoC Category	Adherent (%)	Non Adherent (%)	Total	p-value
Internal HLoC	18 (81.8%)	4 (18.2%)	22	
External HLoC	22 (59.5%)	15 (40.5%)	37	0.164
Total	40	19	59	

Interpretation:
Although more participants with internal HLoC adhered to physical activity, the association did not reach statistical significance. This indicates that internal beliefs alone do not strongly predict adherence in this population.

f. Relationship Between Family Support and Physical Activity Adherence
The Chi-square test revealed a highly significant relationship between family support and adherence (p = 0.000), indicating strong predictive validity.

Table 6. Cross-tabulation: Family Support and Adherence

Family Support	Adherent (%)	Non Adherent (%)	Total	p-value
Good support	23 (95.8%)	1 (4.2%)	24	
Poor support	17 (48.6%)	18 (51.4%)	35	0.000
Total	40	19	59	

Interpretation:
The contrast is striking: Nearly 95,8% of those with good family support adhered to physical activity. Only 48.6% of those with poor family support adhered. Participants with good support are therefore almost twice as likely to adhere compared to those with poor support.

Most respondents were female and had external HLoC. Although family support was generally low, 68% adhered to physical activity. HLoC did not significantly correlate with physical activity adherence ($p = 0.164$). Family support showed a strong, significant association with adherence ($p = 0.000$).

Discussion

This study provides valuable insights into the psychosocial determinants of physical activity adherence among individuals with Type 2 Diabetes Mellitus (T2DM). The findings highlight the central role of family support as a significant predictor of adherence, reinforcing long standing evidence that social and environmental factors are deeply intertwined with chronic disease management. The importance of family support becomes even more pronounced in cultural contexts like Indonesia, where family structures are socially cohesive and interdependent.

Family support influences adherence to physical activity through multiple interconnected mechanisms. Emotionally, supportive families enhance motivation, reinforce positive attitudes, and alleviate psychological barriers such as fear, anxiety, or feelings of hopelessness, which aligns with evidence showing that emotional support increases confidence and participation in diabetes self-care behaviors (Mayberry & Osborn, 2012). Positive emotional reinforcement can increase patients' sense of competence and willingness to engage in regular physical activity. Instrumentally, families often contribute by assisting patients with daily routines—accompanying them on walks, preparing diabetes-friendly meals, or providing transportation to exercise facilities. This instrumental support reduces perceived barriers such as lack of time, lack of companionship, or physical limitations. Informational support, including health education, reminders, monitoring of activity routines, and reinforcement of medical advice, helps patients maintain consistency and adhere to prescribed regimens, a finding also supported by research showing that family-provided informational cues significantly improve adherence to lifestyle modifications (Baig et al., 2015).

Moreover, the influence of family support extends beyond direct assistance. Research consistently shows that social relationships modulate physiological responses, psychological resilience, and cognitive appraisal of illness. The presence of a reliable social support system has been associated with reduced levels of cortisol, lower incidence of depression, and increased adherence to various treatment regimens. In the context of T2DM, family members often serve as co-managers of

the disease, shaping dietary choices, physical activity routines, and medication adherence. This dynamic reinforces the idea that adherence is not solely an individual responsibility but rather a shared behavioral outcome influenced by the surrounding social ecosystem.

The finding that Health Locus of Control (HLoC) was not significantly associated with physical activity adherence in this study contrasts with several Western studies, where internal HLoC has traditionally been associated with stronger self-management behaviors (Norman et al., 1998). Individuals with internal HLoC often believe that their actions directly determine their health outcomes, making them more likely to engage in recommended behaviors such as physical activity. However, the current findings align with theories suggesting that the influence of HLoC is culturally dependent. In collectivist societies such as Indonesia, the family unit exerts a strong influence on decision-making processes, sometimes superseding individual autonomy (Sari & Nursalam, 2020). As a result, individuals may not rely primarily on their internal beliefs to guide health behaviors; instead, they are shaped by expectations, encouragement, and norms established by family and community.

This cultural interpretation is supported by cross-cultural psychological literature, which argues that internal control beliefs may not manifest similarly across different cultural groups (Triandis, 2001). In collectivistic settings, "relational autonomy"the concept of making decisions in alignment with family norms and expectations can be more influential than personal conviction alone. Thus, even if individuals possess internal HLoC, their behaviors may be more strongly dictated by relational dynamics, social obligations, or cultural expectations. This context may explain why HLoC did not significantly predict adherence in this study.

Another important consideration is the interaction between HLoC and self-efficacy. Several behavioral theories, including Bandura's Social Cognitive Theory, highlight that self-efficacy acts as a mediator between beliefs and actions. Internal HLoC may only translate into behavioral change when self-efficacy is sufficiently high. If individuals believe they have control over their health but lack confidence in their ability to engage in physical activity, the belief alone may not result in adherence. This suggests that future interventions targeting T2DM patients should incorporate self-efficacy enhancement strategies such as goal-setting, skills training, mastery experiences, and positive reinforcement.

Furthermore, the inconsistency between HLoC and adherence in this study underscores the importance of considering contextual barriers such as physical limitations, comorbid conditions, environmental constraints, and socioeconomic factors (Walker et

al., 2014). An individual may possess strong internal HLoC but still be unable to engage in physical activity due to fatigue, pain, unsafe environments, or lack of facilities. Therefore, psychosocial constructs must be interpreted within broader ecological frameworks.

The implications of these findings for clinical practice are substantial. Healthcare professionals, particularly nurses, should adopt family-centered approaches when developing care plans for T2DM patients. Diabetes education programs should actively involve family members and emphasize shared responsibility in lifestyle modification. Interventions may include coaching sessions for families, structured communication training, and collaborative problem-solving strategies to address barriers to physical activity. Nurses should also assess family dynamics during routine care, identifying patterns that may hinder or support adherence.

Additionally, culturally tailored interventions should consider the centrality of family roles in Indonesian society. Programs that acknowledge cultural norms around obedience, filial piety, and collective decision-making are more likely to achieve success (Huang et al., 2021). Strengthening family engagement can also enhance long-term adherence, as behavioral consistency is more sustainable when supported by the home environment.

This study contributes to the growing body of evidence underscoring the relevance of social determinants of health in diabetes management. However, it also opens avenues for further exploration. Future research should examine mediation and moderation models involving self-efficacy, social norms, emotional regulation, and perceived barriers Longitudinal designs would offer stronger causal insights into how family support evolves over time and how changes in family dynamics influence adherence trajectories. Additionally, qualitative studies could provide deeper insights into patient-family interactions, cultural nuances, and motivational processes underlying adherence behaviors.

Overall, the findings affirm that while individual beliefs like HLoC play a role in shaping health behaviors, family support remains a more powerful determinant of adherence within collectivist cultures. Strengthening family engagement should therefore be a central component of diabetes management strategies in Indonesia and similar contexts.

Implication and limitations

The findings of this study provide several important implications for clinical practice, nursing management, patient education, and future research related to Type 2 Diabetes Mellitus (T2DM). The significant influence of family support on physical activity adherence highlights the need to shift from an individual-centered model of diabetes care toward a more **family-centered, culturally**

sensitive approach. In Indonesia, where collectivistic cultural values strongly shape health behaviors, involving family members in diabetes management may significantly enhance treatment outcomes.

First, healthcare professionals particularly nurses, who often serve as the primary educators and coordinators in chronic disease management should incorporate **family engagement strategies** into patient care. This may include involving family members in diabetes education sessions, coaching them on how to provide emotional and instrumental support, and encouraging collaborative participation in physical activities. Nurses should assess levels of family support during routine evaluations to identify potential barriers and opportunities for intervention.

Second, the healthcare system should consider developing **structured family-based intervention programs**. These may include family counseling modules, group exercise programs involving family members, and behavioral modification workshops that emphasize shared responsibility. Hospitals and community health centers could create standardized family-support screening tools to help tailor interventions to the needs of each patient.

Third, public health initiatives at the community or national level should integrate family-focused messaging into educational campaigns. Health promotion strategies could emphasize the role of the family in supporting lifestyle modifications for chronic disease prevention and management. In addition, community health workers could be trained to function as family support facilitators, bridging gaps between clinical recommendations and home-based implementation.

Fourth, this study underscores the importance of embedding **psychosocial assessments** including evaluation of family dynamics and locus of control into routine T2DM care. Although Health Locus of Control (HLoC) did not significantly predict adherence in this study, understanding patients' belief systems remains important for personalized care planning. Patients with external HLoC may benefit from interventions that strengthen internal motivation and self-regulation skills, particularly through motivational interviewing and self-efficacy enhancement strategies.

Finally, these findings contribute to the body of evidence supporting the development of **culturally tailored diabetes programs**. International guidelines often focus on individual empowerment, but in collectivistic societies, family-based behavioral strategies may be more effective. Researchers and policymakers should consider integrating cultural context into intervention design, ensuring that strategies align with social norms, values, and environmental realities of the population.

Limitations

Although this study provides meaningful insights into psychosocial determinants of physical activity adherence, several limitations must be acknowledged to contextualize the findings and guide future research directions. First, the **cross-sectional design** limits the ability to establish causal relationships. While associations were identified between family support and adherence, the temporal direction of these relationships cannot be determined. Longitudinal or experimental designs would be necessary to confirm causality and evaluate changes over time. Second, the sample was recruited using **accidental sampling**, which may introduce selection bias. Patients who visited the clinic during the data collection period may not fully represent the broader T2DM population in Bukittinggi or Indonesia. Additionally, the relatively small sample size (n = 59) may limit the statistical power to detect smaller effect sizes, particularly related to psychological constructs such as HLoC.

Third, the study relied on **self-reported questionnaires**, which may be subject to recall bias, social desirability bias, and inaccuracies in self-assessment. Participants may overestimate their adherence or report socially acceptable behaviors rather than actual behaviors. Future research could employ objective measures such as activity trackers, pedometers, or clinician-validated lifestyle assessments. Fourth, the study did not assess potential **moderating or mediating variables**, such as self-efficacy, depression, perceived barriers, health literacy, or socioeconomic status. These variables may interact with family support or HLoC, influencing adherence in complex ways. Including these factors in future models may provide a more comprehensive understanding of behavioral determinants. Fifth, cultural factors specific to Indonesia, particularly the strong influence of collectivistic norms, may limit the generalizability of the findings to populations with different cultural orientations. Studies conducted in Western countries often show stronger effects of internal HLoC, suggesting that cultural context plays a significant role in shaping health behaviors.

Finally, this study did not differentiate between types or quality of physical activity. Frequency and adherence were measured categorically, without examining whether patients met recommended intensities or durations. Future studies should include more detailed assessments of physical activity patterns and physiological outcomes such as HbA1c, weight, or cardiovascular markers.

Conclusion

This study concludes that family support is a significant predictor of physical activity adherence among patients with Type 2 Diabetes Mellitus (T2DM), whereas Health Locus of Control (HLoC) does not demonstrate a significant independent effect on adherence behavior. The findings indicate that patients who receive stronger emotional, instrumental, and informational support from their families

are more likely to consistently engage in recommended physical activity, suggesting that daily behavioral adherence is strongly influenced by relational and environmental factors. In contrast, the non-significant role of HLoC implies that individual beliefs about personal control over health outcomes may be insufficient to drive sustained physical activity when not reinforced by social support, particularly within collectivist cultural contexts where family involvement plays a central role in health decision-making. These results have important implications for nursing studies, emphasizing the need to prioritize family-centered theoretical frameworks and interventions in chronic disease management research. Nursing education and practice should move beyond individual-focused behavior change models and incorporate family assessment, empowerment, and engagement strategies to improve physical activity adherence among patients with T2DM.

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