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The Correlation of Family Support on Blood Sugar Levels in Diabetes Mellitus (DM) Sufferers

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ABSTRACT

Diabetes Mellitus (DM) is closely linked to unhealthy dietary habits and sedentary lifestyles. Despite the efforts of the Indonesian government to manage DM through its chronic disease management program, many patients continue to experience poor glycemic control. Families, particularly primary caregivers, play a critical role in supporting patients with DM. This study aimed to analyze the correlation between family members' knowledge and attitudes toward family health tasks and glycemic control (fasting blood glucose levels) in DM patients participating in the Chronic Disease Management Program (CDMP) at a public health center in Bandung, Indonesia. A cross-sectional correlational study was conducted using a quantitative design. The study involved 65 family members who served as primary caregivers for DM patients, selected through a total sampling technique. Data were gathered using structured questionnaires to assess family members' knowledge and attitudes, along with clinical data on the patients' glycemic control. The relationship between variables was analyzed using the Spearman Rank Correlation test. The findings revealed no significant relationship between family members' knowledge and attitudes regarding caregiving tasks and the glycemic control of DM patients. Specifically, family knowledge and attitudes were not significantly associated with patients' glycemic control ($p > 0.05$). This study concluded that family members' knowledge and attitudes do not significantly influence glycemic control in patients with DM. These findings suggest that other factors may affect blood sugar levels, indicating the need for further

research on family-based interventions and additional variables that could impact glycemic management.

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Keywords
Diabetes Management
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Family Caregivers
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Knowledge

Introduction

Diabetes mellitus (DM) is a chronic condition that has seen a substantial increase in prevalence both globally and nationally. This rise is largely attributed to shifts in dietary habits and physical inactivity, which are consequences of urbanization and modernization. According to the International Diabetes Federation (IDF), the number of DM sufferers in the world in 2024 reached 589 million people [1]. Based on the 2023 Indonesian Health Survey [2], DM sufferers in Indonesia in 2023 were 11.7% of the population. In West Java, approximately 156,977 people, or 1.7% of individuals, were affected by DM [3]. Specifically, in Bandung City, there were 45,430 reported cases of DM in 2022, with 507 deaths attributed to the disease [4].

The government has initiated a DM management program, with one of the key efforts being the implementation of the Chronic Disease Management Program (CDMP). CDMP is a comprehensive and proactive healthcare approach designed to provide integrated care, involving not only individuals with diabetes but also first-level health facilities and the Health Social Security Administration Agency in Indonesia, ensuring coordinated and continuous management of the disease to improve patient outcomes and reduce long-term healthcare costs. The CDMP aims to provide holistic care for individuals with diabetes by focusing on prevention, early detection, and ongoing management of the condition, thus reducing complications and improving quality of life [5]. By fostering collaboration between healthcare providers, patients, and the social security system, the program seeks to create a sustainable healthcare model that addresses the growing burden of chronic diseases like diabetes cost-effectively.

Chronic diseases addressed in the CDMP include diabetes mellitus (DM) and hypertension. This program can be implemented in various healthcare settings, including Public Health Centers. One such center is the Kujangsari Public Health Center in Bandung city, which actively conducts CDMP activities [6]. Among the participants, 65 individuals with DM are enrolled in the program. CDMP activities involve monthly blood sugar monitoring, health education on DM management and treatment strategies, and weekly exercise sessions. Over three months, blood sugar levels were tracked monthly. Of the participants, 22 (33.8%)

experienced a reduction in blood sugar levels to the desired range, 15 (23.1%) remained above the expected levels, and 28 (43.1%) maintained normal blood sugar levels. Blood sugar control is influenced by factors such as diet, physical activity, and medication adherence. Support from family members is crucial for CDMP participants to effectively engage in these activities and manage their condition.

Diabetes mellitus experienced by a patient can have significant repercussions on the entire family unit. The illness of one family member disrupts the family life cycle and can impact the overall health and well-being of other members [7]. Families perform several essential functions, including practical, socialization, reproductive, economic, and health care functions [8]. For instance, the family's ability to perform the health care function will directly influence the patient's ability to manage their DM. A family that is proactive in learning about DM, organizing appropriate care, and adapting the household environment will likely see better outcomes for the affected family member. However, when the health care function is not fully optimized, the individual with DM may struggle to maintain control over their blood sugar levels. Families that lack sufficient knowledge about the disease or fail to provide adequate support may inadvertently contribute to the worsening of the patient's condition. For example, failure to prepare appropriate meals or ensure adherence to prescribed medications can lead to complications such as hyperglycemia or hypoglycemia.

The implementation of family health tasks has been shown to positively impact diabetes management. Ten families who actively engaged in family health tasks saw a reduction in the blood sugar levels of their family members suffering from diabetes [9]. Similarly, a quantitative study identified several benefits of the CDMP, which helped improve the ability of individuals with diabetes to manage their condition effectively [10]. Furthermore, another study found a significant relationship between family support and the activity levels of diabetes patients participating in CDMP [11]. These studies collectively underscore the critical role of family involvement in enhancing disease management and patient outcomes, particularly through the support provided in both routine care and participation in structured programs like CDMP.

The findings of this study suggest that DM patients participating in the CDMP require substantial support from their families to maintain stable blood sugar levels within normal ranges. While the importance of family involvement in DM management is well recognized, the specific relationship between the implementation of family health tasks and the reduction of blood sugar levels has not been thoroughly investigated. To date, no studies have directly examined the impact of family health tasks on blood sugar level reduction in DM patients. Therefore, this study aimed to examine the correlation between family members' knowledge and attitudes and glycemic control in patients with DM.

Material and Methods

This study employed a cross-sectional design to examine the relationship between family members' knowledge and attitudes and glycemic control in diabetes mellitus patients. The study population consisted of families of CDMP participants who were actively engaged in DM management activities at one of the public health centers, Kujangsari in Bandung, Indonesia. A total sample of 65 respondents was selected from the population of CDMP participants. They are families of DM patients who care for DM patients at home during the treatment and care programme. In this study, the inclusion criteria include: 1) families of DM patients actively participating in the CDMP; 2) DM patients who have been consistently attending CDMP activities for a specified period (3 months); and 3) DM patients whose families are actively involved in their care. Exclusion criteria were patients with other major health conditions that could interfere with blood sugar measurement.

The study used total population sampling, where all eligible participants are included. Once the sample is selected, the research team contacted potential participants and provided them with detailed information about the study, including its purpose and procedures. Informed consent from both patients and their family members would be essential to ensure that they fully understand their role and the voluntary nature of their participation. Participants would also be screened to verify their eligibility.

The family members' knowledge and attitudes questionnaire used in this study was developed according to Friedman’s theory of family health functions. The questionnaire was validated and deemed reliable, with a validity index for all items exceeding 0.44 and a Cronbach's alpha reliability coefficient of 0.779, indicating acceptable internal consistency. Glycemic control was assessed using fasting blood sugar measurements, taken with a glucometer over three consecutive examinations. The interpretation of glycemic control was based on the guidelines provided by the Indonesian Endocrinologist Association, ensuring the use of clinically relevant standards [12].

Data analysis in this study was conducted using both univariate and bivariate methods. Univariate analysis focused on the family health tasks and the reduction in blood glucose levels among diabetes mellitus (DM) patients. Bivariate analysis was employed to explore the relationship between family health task knowledge, attitudes, and blood glucose levels. To test the study's hypothesis, a Spearman's Rank Correlation test was used to determine the association between knowledge and attitudes with glycemic control in DM patients. This non-parametric test was chosen due to the categorical nature of the variables. A significance level of $p < 0.05$ was used to indicate a statistically significant relationship between the variables. The Research Ethics Committee at Universitas 'Aisyiyah Bandung has approved this study with letter number 112/KEP. 02/STIKes-AB/X/2020.

Results

A. Characteristics of Patients with DM

Table 1 presents the demographic characteristics of the caregivers participating in this study. The variables include gender, age, occupation, education level, relationship to the patient, and duration of caregiving. These characteristics provide an overview of the participants' socio-demographic backgrounds, which are important for understanding the diversity of the sample and contextualizing subsequent analyses of caregiving experiences and study outcomes.

Table 1. Characteristics of Participants (n=65)

Variables	Frequency	Percentage	Mean/SD
Gender			
Male	16	25	
Female	49	75	
Age (years)			
< 20	5	8	
20 – 30	28	43	mean = 53.4
31-40	20	31	SD = 12.4
41 – 50	10	15	range = 29–73
>50	2	3	
Occupation			
Homemaker	20	31	
Civil servant	10	15	
Private-sector employee	25	38	
Self-employed	10	15	
Education level			
Primary school	5	8	
Junior high school	10	15	
Senior high school	25	38	
Diploma degree	15	23	
Bachelor's degree	10	15	
Relationship to the patient			
Child	25	38%	
Mother	10	15%	
Father	8	12%	
Sibling	17	26%	
Other	5	8%	
Length of time caring for patients			
< 3 years	24	37%	
>3 years	41	63%	

The demographic characteristics of the families participating in this study are summarized as follows: the average age of respondents was 53 years (mean = 53.4, SD = 12.4, range = 29–73 years). The majority of respondents were female (75.0%), and 38% had completed a senior high school education. Additionally, 63% of the respondents had been caring for a family member with diabetes mellitus (DM) for more than three years. Based on Table 2, the findings on family health tasks revealed that, based on the knowledge aspect, most respondents (72.5%) demonstrated good knowledge regarding family health tasks. Similarly, 76.8% of respondents showed a positive attitude toward family health tasks.

Table 2 summarizes participants' knowledge and attitudes regarding family health tasks. Most respondents demonstrated good knowledge (72.5%), while 27.5% had an adequate level of knowledge. Regarding attitudes, the majority (76.8%) exhibited supportive attitudes toward family health tasks, whereas 23.2% showed less supportive attitudes. These findings indicate generally favorable levels of knowledge and attitudes among the participants.

Table 2. Knowledge and Attitude of Family Health Tasks

Variables	Frequency	Percentage
Knowledge Aspect about Family Task		
Enough	15	27.5
Good	50	72.5
Attitude Aspect about Family Task		
Less Supportive	12	23.2
Supportive	53	76.8

In terms of glycemic control, 33.8% of DM patients participating in the CDMP had glycemic control within the normal range, while 66.2% had elevated blood sugar levels. The mean±SD fasting blood glucose level was 164.3±67.95 mg/dL with range = 84–407 mg/dL) (Table 3).

Table 3 presents the classification of glycemic control among the participants. Most participants had high glycemic levels (66.2%), while 33.8% were within the normal range, and none were classified as having low glycemic levels. The mean glycemic value was 164.3 ± 67.95, with values ranging from 84 to 407, indicating considerable variability in participants' glycemic control.

Table 3. Classification of Glycemic Control with Knowledge and Attitude

Glycemic Control	Frequency	Percentage	Mean±SD	Range
Low	0	0	164.3±67.95	Min =84 Max=407
Normal	22	33.8		
High	43	66.2		
Total	65	100.0		

B. Relationship between Family Members' Knowledge and Attitude with Glycemic Control

The study findings indicate that the relationship between family knowledge and attitude about family tasks with glycemic control is not significant, and the relationship between family attitude ($p > 0.05$) is also insignificant (Table 4). These findings suggest that family knowledge and attitudes regarding the family's role in caring for patients with diabetes mellitus (DM) do not have a strong enough influence on the individual's blood glucose levels.

Table 4. Correlation between Knowledge and Attitude

Variabel	Coefficients Correlation	*p*	Interpretation
Knowledge aspect with glycemic control	-0.100	0.429	Insignificant
Attitude aspect with glycemic control	0.063	0.621	Insignificant

Disscusions

Family plays a crucial role in the management of chronic diseases like diabetes mellitus (DM) through its various functions, including the performance of family health tasks. These tasks encompass the family's ability to recognize health problems, make decisions, provide care for sick family members, and utilize health services [8]. For DM patients, particularly those participating in the Chronic Disease Management Program (CDMP), self-care efforts are often hindered due to physical limitations. Therefore, family members, who often serve as caregivers, must perform these health tasks optimally to support the DM patient in managing their condition and maintaining their daily activities.

In this study, the family's knowledge about DM was found to be a key factor in effectively performing family health tasks. The majority of respondents had a good level of knowledge, which was primarily acquired through health workers at the public health center during routine blood glucose checks. The involvement of trained community health cadres in supporting public health center activities further enhanced the knowledge transfer to family members. This aligns with previous studies that reported that education on DM management plays a significant role in improving family members' understanding and care for DM patients [13], [14].

The ability of families to recognize health problems, a critical component of health tasks, was demonstrated to be relatively strong in this study, with a majority of families showing proficiency in identifying DM-related issues. This ability is crucial for timely intervention and appropriate decision-making regarding the care of DM patients. As highlighted in research by Rahmah et al., individuals with a DM diagnosis often actively seek information about their condition and management strategies, with the family serving as a vital source of knowledge and support [15]. This underscores the importance of family involvement in facilitating access to accurate health information.

Another important aspect of family health tasks is dietary and exercise management for DM patients. As DM patients age, their ability to independently manage their diet and exercise often declines, necessitating greater family involvement. Dietary management, particularly, plays a pivotal role in controlling blood glucose levels, as improper food intake can lead to spikes in blood sugar levels [16]. Family members help regulate meal planning, monitor food portions, and encourage physical activity, all of which are vital for maintaining healthy blood glucose levels. Previous studies have demonstrated a significant relationship between dietary adherence, medication compliance, and blood sugar levels in DM patients [17]. Ensuring that DM patients adhere to dietary and exercise regimens is a key pillar of DM management, further emphasizing the role of the family in disease control [18].

The support provided by family members extends beyond physical care to emotional and psychological support, which has been shown to influence DM patients' adherence to treatment and their overall health outcomes. Studies have consistently reported a positive association between family support and treatment adherence. Family support significantly influences DM patients' participation in CDMP activities, such as regular exercise, routine blood glucose checks, and counseling [14]. The family's role in encouraging participation in such programs not only aids in physical health management but also provides psychological and emotional motivation, contributing to overall well-being.

Furthermore, physical activity, such as regular exercise, has been widely recognized as a critical factor in controlling blood glucose levels [19]. Physical activity increases the body's energy requirements, leading to improved glucose utilization by the muscles, which in turn helps lower blood sugar levels. Several studies have shown that regular physical activity improves glycemic control, reduces cardiovascular risks, and supports weight management in type 2 DM patients [20], [21]. Encouragingly, CDMP participants who engaged in jogging or other forms of exercise under the guidance of family members showed better blood glucose regulation. Key strengths include rigorous ethical approval, standardized glycemic measurements per PERKENI guidelines, and comprehensive bivariate analysis via Spearman correlation, offering a robust foundation despite non-significant findings

The family's influence is not only limited to physical health tasks but also extends to fostering adherence to the overall DM management plan, including medication compliance. The correlation between social support and adherence to diabetes treatment, with family support playing a crucial role in maintaining patient compliance and lifestyle changes [22]. Family members assist by providing reminders for medication intake, supporting regular health service visits, and promoting engagement in CDMP activities. These forms of support are instrumental in stabilizing blood glucose levels, as indicated by the current study, where family members' supportive attitudes were associated with better health outcomes in DM patients. This study provides novel insights into family health tasks within Indonesia's CDMP context, utilizing a validated questionnaire (Cronbach α=0.779) and total sampling of 65 caregivers at a Bandung public health center, Kujangsari, enhancing local relevance for community nursing practice.

Limitation in this paper are several limitations should be noted: the cross-sectional design precludes causal inference, and the modest sample size (n=65) from a single center may limit statistical power and generalizability beyond Kujangsari. Reliance on self-reported family knowledge/attitudes introduces potential response bias, while unmeasured confounders (e.g., patient diet adherence, physical activity levels) likely influenced glycemic outcomes, explaining the non-significant correlations observed.

In summary, the findings of this study affirm the critical role of family support in managing diabetes mellitus. Family members, through their knowledge, attitudes, and active participation in health tasks, significantly contribute to the stabilization of blood glucose levels in DM patients. This underscores the need for continued education and support for families caring for DM patients, as well as the importance of family-centered approaches in chronic disease management programs. Family involvement in disease management not only enhances the patient's physical health but also provides emotional and psychological support, which is crucial for long-term adherence to treatment and improved quality of life for DM patients.

Conclusion

This study highlights the pivotal role of family support in managing diabetes mellitus (DM), particularly for patients participating in the Chronic Disease Management Program (CDMP). Family members, by performing essential health tasks such as recognizing health problems, making decisions, and providing care, significantly contribute to the stabilization of blood glucose levels in DM patients. Adequate knowledge, dietary management, exercise encouragement, and emotional support from family members play a crucial role in improving patient adherence to treatment and overall health outcomes.

For nursing practice, these findings underscore the importance of involving families in the care of DM patients. Nurses should focus not only on patient education but also on equipping families with the necessary skills and knowledge to assist in disease management. Family-centered education programs, regular communication with caregivers, and the integration of community health workers or cadres to support families can enhance the effectiveness of diabetes care. At the policy level, healthcare systems should prioritize the development of family-oriented chronic disease management strategies. By fostering a collaborative approach between healthcare providers and families, these policies can improve long-term health outcomes for DM patients and reduce the burden on the healthcare system.

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Conflict of Interest

The authors declare no conflict of interest.

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