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Family support, diabetes self-management behavior, and HbA1c levels in Manggarai Regency, East Nusa Tenggara

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Abstract

Purpose: This study examines the correlation between family support and diabetes self-management with control of blood sugar levels (HbA1c). **Methods:** This study employs a sequential mixed-methods approach, combining quantitative analysis with a cross-sectional design and qualitative analysis with a phenomenological design. This research was conducted in clinics and health centers with prolanis groups in Manggarai Regency, East Nusa Tenggara. **Results:** The average score for diabetes self-management was 4,482 (minimum 0 – maximum 10) and was significantly correlated with the control of blood sugar levels. The dimension of food control in diabetes self-management has a significant relationship with blood sugar control. The average value of family support is 2,433 (minimum 1, maximum 4) and shows no significant correlation with blood sugar control. The emotional dimension of family support significantly correlates with the control of blood sugar levels. **Conclusion:** Enhancing diabetes self-management behavior can lead to improved blood sugar control in Prolanis participants. This improvement can be facilitated by families who can accompany Prolanis participants at home.

Keywords: diabetes self-management; family support; HbA1c

INTRODUCTION

The number of people living with diabetes worldwide reached 463 million people in 2019 and is predicted to continue increasing by 51% or around 700 million people by 2045. Indonesia ranks 7th as the country with the most diabetes cases in the world, with an estimated 10.7 million cases [1]. According to Riskesdas, East Nusa Tenggara Province has the lowest prevalence of diabetes among all provinces in Indonesia, which also indicates that the coverage of blood sugar tests remains very low [2].

Diabetes imposes a very high financial burden and complications that can reduce the quality of life to the point of death. As a developing country, we must address the issue of diabetes effectively, one of which is through implementing prolanis. The purpose of prolanis is to maintain the health of people suffering from chronic diseases, including diabetes [3]. First-level health facilities are required to form prolanis clubs to conduct regular check-ups, which are funded by the government [4]. Manggarai Regency has not yet been able to lower blood sugar levels to reach the target, an HbA1c level of < 7% [5].

That target can be achieved with good behavior from Prolanis participants. Several studies have shown a significant relationship between diabetes self-management behavior and blood sugar control, with the patient at the center of diabetes management [1,6,7]. Diabetes self-management is defined as the behavior of diabetes patients to actively participate in the therapy they undergo to control blood glucose levels, manage food intake, engage in physical activity, and utilize healthcare services [8,9].

Social support also significantly impacts positive behavior in diabetes patients [10], especially for families with close interactions with Prolanis participants [11,12]. Family support is defined as the perception of people with diabetes regarding everything their family provides to them. It has four dimensions: emotional, esteem, instrumental, and informational [13,14].

The purpose of this research is to determine the demographic characteristics of Prolanis participants with diabetes in Manggarai Regency, including age, gender, education level, and income level, to know the results of blood sugar level examinations in Prolanis participants with diabetes in Manggarai Regency, and to examine the relationship between family support and diabetes self-management with blood sugar control (HbA1c).

METHODS

This research employed a sequential mixed-methods approach, which involved quantitative analysis of the collected data followed by qualitative analysis to explain the results of the quantitative analysis. Quantitative analysis uses a cross-sectional study design that simultaneously collects data on independent and dependent variables. The qualitative method employs a phenomenological research design to describe the meaning of Prolanis' activities in Manggarai Regency about controlling blood sugar levels.

The research was conducted at Public Health Centers and Private Clinics in Manggarai Regency, East Nusa Tenggara, that have the Prolanis Program. The prolanis group was selected randomly. The minimum sample size for this study is 140 research subjects. The qualitative research informants are the prolanis coordinators who were randomly selected, totaling three people.

The researchers' data collection follows the schedule agreed upon by the First-Level Health Facilities and the HbA1c testing laboratory in June 2022. Before data collection, the researcher provides instructions to the prolanis supervisor to assist in training the enumerator, ensuring that the research subjects understand the statements in the questionnaire and can complete it accurately under actual conditions. Thus, data collection can be conducted simultaneously on two research subjects.

Laboratory staff collect blood to check HbA1c levels while filling out the questionnaire at a different table. Then, the researcher provides the laboratory with a list of names to request secondary data from the HbA1c tests according to the list of research subjects.

Family support

This study uses the Hensarling Diabetes Family Support Scale (HDFSS) questionnaire to assess family support. This questionnaire consists of 29 items, including 10 statements on the emotional dimension, eight statements on the appreciation dimension, eight questions on the instrumental dimension, and the information dimension, which includes items 1, 2, and 3.

The subjects will fill in the column by indicating the frequency of family support received, with "always" valued at 4, "often" valued at 3, "rarely" valued at 2, and "never" valued at 1. The result of this questionnaire calculation is the average score of family support, which ranges from 1 to 4. This means the higher the score, the higher the family support felt by the research subjects.

Diabetes self-management

This study utilizes the Diabetes Self-Management questionnaire to evaluate family support. The questionnaire assesses the quality of diabetes self-management, which is calculated based on four aspects, each comprising 16 statements: blood sugar management, diet, physical activity, and utilization of healthcare services.

The research subjects will fill in the column by assessing the appropriateness of their behavior with each statement on the questionnaire, with the options of "very appropriate" valued at 3, "appropriate" valued at 2, "less appropriate" valued at 1, and "not appropriate" valued at 0. Then, the assessment results will yield a mean score of 0–10 for the self-management of diabetic patients, indicating that the higher the average score, the more effective the self-management performed by the patients.

Blood sugar level

This study utilized secondary data from the latest HbA1c level analysis results at clinical laboratories collaborating with the Prolanis program in Manggarai Regency to assess HbA1c levels.

Researcher

In the second phase of the research, the researcher became the study's instrument. Data collection was conducted through in-depth interviews, which lasted approximately 25 minutes and were recorded using a voice recorder. The researcher collected information based on the data and the results of the quantitative data analysis. The study's data analysis began with univariate analysis, which examined differences according to controlled and uncontrolled HbA1c levels, and then multivariate analysis to observe interactions between variables.

Variables with categorical data scales will be calculated in terms of the count and percentage of each variable. Variables with a numerical scale will be analyzed using the mean, median, and standard deviation, along with a 95% confidence interval. The following variable analysis is to see the strength of the relationship between the two variables. The bivariate analysis depends on the scale of the data for the analyzed variables.

Analysis of the relationship between family support variables, interval-scale diabetes self-management, and age-related external variables with HbA1c levels on an ordinal scale will be examined using a t-test. The analysis of the HbA1c level variable with other ordinal and nominal scale variables will be conducted using chi-square analysis. The study of the relationship between family support and diabetes self-management, which are interval-scaled variables with external variables that are nominal and ordinal, will be analyzed using a t-test. In contrast, external variables such as age, which are ratio-scaled, will be analyzed using linear regression.

Multivariate logistic regression analysis was conducted to reduce bias and identify confounding factors that influence the strength of the relationship between independent variables (self-management and family support) and the dependent variable (HbA1c levels). Qualitative Analysis is analyzed in the following way: 1) the researcher creates a transcript of the interview based on the recording taken; 2) the researcher reads the interview transcripts and listens to the interview recordings repeatedly; 3) the researcher coded each statement from the informants; 4) the researcher determines the significant meaning of the informant's statement; 5) the researcher categorizes the data to determine the main themes from the informant's statements; 6) the researcher summarizes and writes a narrative of the data analysis results to explain the findings from the previous quantitative analysis.

RESULTS

Table 1 presents the characteristics of 186 respondents with an average age of 64.41 years. Most respondents were female (57.53%) and had low income (70.43%), with the majority having low levels of education. The mean family support score was 2.433, with the highest support found in the information domain (2.588). Regarding diabetes self-management, the overall mean score was 4.482, and only 31.18% of respondents had controlled blood glucose levels (HbA1c).

Table 1. Characteristics of respondents (n=186)

Variables	n (%)	Mean ± SD
Age (years)		64.413 ± 3.786
Gender		
Female	107 (57.53)	
Male	79 (42.47)	
Education		
Not school	73 (39.25)	
Elementary	66 (35.48)	
Junior high school	29 (15.59)	
Senior high school	19 (5.38)	
Diploma/Bachelors	8 (4.30)	
Income		
Low	131 (70.43)	
High	55 (29.57)	
Family support (grade1 - 4)		2.433 ± 0.346
Emotional		2.542 ± 0.422
Reward		2.297 ± 0.417
Instrumental		2.374 ± 0.44
Information		2.588 ± 0.629
Diabetes self-management (Grade 0 – 10)		4.482 ± 1.094
Blood glucose management		4.28 ± 1.513
Food control		4.373 ± 1.982
Physical activity		3.668 ± 1.7
Health services		5.974 ± 1.515
Blood glucose control (HbA1c)		
Not controlled	128 (68.82)	
Controlled	58 (31.18)	

Older age is generally associated with an increased risk of diabetes and its complications, as physiological functions decline over time [15]. However, Table 2 in this study shows that age was not found to be significantly related to blood glucose control among the respondents. Similarly, age showed no association with diabetes self-management behaviors or the perception of family support. This may be due to the relatively narrow age range of the participants (58–78 years), which limits the variability needed to detect significant correlations. Nevertheless, age remains an essential factor that should not be overlooked in efforts to improve diabetes-related behaviors and outcomes.

Table 2. Relationship between respondent characteristics, family support, and diabetes self-management with blood sugar control

Variables	Blood glucose control (n, %)		p-value
	Not controlled HbA1c < 7.0%	Controlled HbA1c ≥ 7.0%	
Age (years)	64.5 (63.9-65.2)*	64.2 (63.2 – 65.2)*	0.560
Gender			
Female	74 (69.2)	33 (30.8)	0.907
Male	54 (68.4)	25 (31.6)	
Education			
Not school	48 (65.8)	25 (34.2)	0.525
Elementary	49 (74.2)	17 (25.8)	
Junior high school	21 (72.4)	8 (27.6)	
Senior highschool	5 (50)	5 (50)	
Diploma/Bachelor	5 (62.5)	3 (37.5)	
Income			
Low	89 (67.9)	42 (32.1)	0.690
High	39 (70.9)	16 (29.1)	
Family support	2.4 (2.4 – 2.5)*	2.5 (2.4 – 2.6)*	0.388
Emotional	2.5 (2.4 – 2.6)*	2.7 (2.6 – 2.7)*	0.015
Reward	2.3 (2.2 – 2.4)*	2.3 (2.2 – 2.5)*	0.503
Instrumental	2.4 (2.3 – 2.5)*	2.3 (2.2 – 2.4)*	0.275
Information	2.6 (2.4 – 2.7)*	2.6 (2.5 – 2.8)*	0.417
Diabetes self-management	4.2 (4 – 4.4)*	5.2 (4.9– 5.4)*	< 0.001
Blood glucose management	4.2 (3.9 – 4.4)*	4.2 (3.9 – 4.4)*	0.099
Food control	3.6 (3.3 – 3.9)*	6.1 (5.7 – 6.5)*	< 0.001
Physical activity	3.6 (3.3 – 3.9)*	3.8 (3.3 – 4.2)*	0.640
Health services	6 (5.8 – 6.3)*	5.8 (5.5 – 6.2)*	0.429

Gender was also found to have no significant relationship with blood glucose control among the respondents in this study. This aligns with the finding that gender was not associated with self-management practices or the perception of family support. While other studies have reported that men may have a higher risk of developing diabetes due to differences in glucose metabolism [16], such differences were not observed in this context. It is also worth noting that the selection of Prolanis participants did not take into account gender. However, gender-sensitive approaches may be needed in program implementation, particularly given the influence of paternalistic family structures.

Challenges arise when providing education and advice about diabetes. Because there are different levels of education within one group, additional individual education must be repeatedly provided in the local language that the participants understand. Previous analysis results indicate that education level is not related to blood sugar control and family support. However, another study showed a strong relationship, where the higher the level of education, the better the blood sugar control [17]. In the study by Al-Rasheedi, it was shown that there is no relationship between education level and blood sugar control [18].

The level of education has a significant relationship with the self-management of diabetes among the research subjects. The higher the level of education, the better the diabetes self-management scores of participants in the ProLanis program. The level of education is also significantly related to the dimension of blood sugar control. The question items in the blood sugar control dimension include blood sugar recording, which requires participants to record their blood sugar test results accurately. The level of education plays a crucial role in promoting better self-management behaviors among individuals with diabetes, which in turn improves blood sugar control in participants with diabetes.

Approximately 70% of the research subjects are low-income individuals, earning less than Rp 1,950,000 per month. The results of this study indicate no significant relationship between income level and blood sugar control, diabetes self-management, or family support. The prolanis activities carried out do not financially burden the patients. By becoming an active BPJS member, all treatments can be free. Prolanis members need financial support to encourage self-management behavior for diabetes. For example, they need proper footwear for exercise or transportation to get to healthcare facilities.

Family support also includes the financial needs of the research subjects, especially in the instrumental dimension. Families can provide financial support to meet daily needs, and its fulfillment depends on the income level [19]. Fulfilling needs can reduce the risk of complications from uncontrolled blood sugar levels [20].

The interview revealed that Prolanis participants still need to spend money to buy medicine if the supply from the community health center runs out. Participants are then advised to obtain medication from pharmacies that collaborate with BPJS or purchase it themselves at other pharmacies. However, not all participants can purchase the medication independently, so they do not take their diabetes medication.

DISCUSSION

Self-management of diabetes and blood sugar control

The self-management of diabetes performed by the research subjects has a significant relationship with blood sugar control. The higher the value of diabetes self-management, the better the blood sugar control results of the research subjects, similar to the study conducted by Zuqni [6]. In Ravi's study, diabetes self-management was not found to be significantly related to blood sugar control. In that study, blood sugar levels were measured using fasting blood sugar and blood sugar levels 2 hours after eating. Ravi suggested using HbA1c as done in this study [19].

There are four key dimensions of diabetes self-management: blood sugar management, food control, physical activity, and access to health services. The dimension of food control has a significant relationship with blood sugar control. Prolanis participants practice less food control. Two Prolanis program coordinators stated that participants consume more carbohydrates than other nutrients. Given the significant relationship between food control and blood sugar control, it is worth revisiting, particularly to manage food intake effectively with the support of the Prolanis participants' families.

Most prolanis participants work as farmers and gardeners. While tending to the garden and sweating, they consider themselves engaging in physical activity and exercising. However, the recommended forms of exercise are moderate-intensity aerobics such as brisk walking, leisurely cycling, light jogging, and swimming [21], so physical activity has a low value.

The value of visits to health services has the highest score compared to other dimensions of self-management because most Prolanis participants are retired and do not engage in various activities. Prolanis participants have a fixed and regular schedule. Some participants did not attend Prolanis activities because they were unable to travel alone, and their families were unable to accompany them due to work commitments.

The self-management of diabetes among ProLanis participants in Manggarai Regency remains inadequate, resulting in blood sugar control not reaching the target. Therefore, improvement in self-management is necessary, with a particular emphasis on food control as a priority, given its significant relationship with blood sugar control.

Family support and blood sugar control

The family support felt by the research subjects has no relationship with the blood sugar control of the research subjects. The dimensions of family support encompass emotional, esteem, instrumental, and informational aspects. The emotional dimension has a significant relationship with blood sugar control. The higher the perceived emotional support from the family, the better the blood sugar control of the research subjects.

Emotional support can reduce the stress experienced by diabetes patients, thereby improving blood sugar control [22]. Enhancing the family support felt by prolanis participants can begin with providing emotional support. The older the age, the more personal and emotional support must be given, as the influence on prolanis participants is very strong. This can change the participants' behavior to no longer consume medication when the test results show normal blood sugar levels.

Because his blood sugar levels were normal, he informed his family, and they assumed he was cured and no longer needed to undergo follow-up examinations or take his medications. So, he returned to his old lifestyle. So when he went to the healthcare facility, I rechecked his blood sugar, which was suddenly high. So I asked him why. Because my blood sugar was normal yesterday, my family thinks that I have recovered.

Because of the family's incorrect advice, the Prolanis supervisor also repeatedly explained to the participants and their families that the medication must always be taken. Thus, the informational dimension of family support can be fulfilled. The selection of information must also be carefully curated. Providing too much information to families and prolanis participants can confuse and worsen their behavior.

The form of the Manggarai family is paternalistic. All decisions, including those in the health field, are made by the head of the family or the elder in the household. Thus, decision-making must be based on knowledge, care, and respect for family members by the head of the family. We can approach the head of the family to provide understanding and good management of diabetes patients. Family support is

needed to accompany diabetes participants at home so that their behavior can be controlled and all their needs can be met. The family must improve emotional support because it significantly correlates with blood sugar control.

CONCLUSION

The average age of the research subjects is 68.4, with 42.47% being male. Additionally, 74.73% had not attended or only completed elementary school, and 70.43% had low levels. The number of research subjects with controlled blood sugar levels is 31.18%. The average score of diabetes self-management is 4.482, and it is significantly related to blood sugar control. The food control dimension in diabetes self-management is also significantly related to blood sugar control. The average family support score is 2.433, indicating a significant relationship between it and the control. However, the emotional dimension of family support has a significant and substantial effect on blood sugar control.

External variables do not significantly affect the relationship between diabetes self-management, family support, and blood sugar control. Improving self-management behavior of diabetes can enhance blood sugar control in prolanis participants. This improvement can be assisted by family members accompanying prolanis participants at home.

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