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**Original Research**

# Family-Centred Nursing Theory and the Functional Consequences Model Improve Diabetes Self-Management in Elderly Diabetics

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**ABSTRACT**

***Background:*** *The self-care management of older diabetics is inconsistent and exhibits low adherence. This incident may be influenced by the elderly's disease management capabilities and familial involvement, which may not be conducive to their health and care. This study aimed to develop a management plan for elderly diabetes mellitus that emphasizes self-efficacy and family involvement.*

***Methods:*** *This research employed an explanatory survey design with a cross-sectional methodology. The probability sampling method, particularly simple random sampling, was employed to choose respondents for this study from a cohort of 100 individuals with diabetes mellitus and their families. We created a thorough assessment questionnaire for diabetes mellitus management in the elderly, utilizing the functional consequence model and family-centred nursing theory as the research framework. The statistical method employed was SEM-PLS.*

***Results:*** *The outer model analysis revealed that all indicators of each construct were valid, with a factor loading value of > 0.7. The inner model analysis revealed that the variables family structure, family function, family stressors, elderly risk factors, age-related changes, and elderly consequence functions had a significant effect with a t-value of >1.96 and p-value <0.05.*

***Conclusion:*** *The diabetic mellitus management model, which is based on self-efficacy and familial support, improves self-care management among the elderly. Nurses should adopt the diabetic mellitus management model to increase patient autonomy and educate families on how to support their loved ones, thereby improving the self-care practices of elderly adults with diabetes.*

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## INTRODUCTION

Indonesia, which is a developing country, has an increase in life expectancy, which has an impact on the increase in the number of elderly people, where the elderly are a vulnerable group to experience health problems along with increasing age, namely

the beginning of a decline in function. One of the health problems that has a high prevalence in the elderly is diabetes mellitus (Arini et al., 2022). The significant increase in prevalence surely intensifies the burden on families, society, and the government. This may be due to the disease management practices of senior individuals with various non-communicable diseases, who frequently demonstrate reduced adherence to their treatment regimens, necessitating more substantial intervention from the government and society to improve their quality of life and health (Ratnawati et al., 2018).

Diabetes self-care management involves education, diet, physical activity, drug therapy, monitoring blood sugar levels, and foot care (Putra et al., 2023). Diabetes mellitus management behavior in the elderly is needed to prevent complications and ultimately improve the quality of life of elderly people with diabetes mellitus (Trisnadewi & Suniyadewi, 2022). In this study, we employed the family-centred nursing model and the functional consequences model to create a diabetes mellitus management model. This approach not only emphasizes the family approach but also emphasizes the self-sufficiency of elderly individuals with diabetes mellitus.

The family constitutes the most intimate environment for the elderly, significantly affecting their responses to diabetes mellitus (Nugroho & Banase, 2023). One theory supporting family involvement in disease treatment is family-centered nursing, which posits that the family is crucial to delivering nursing services, enabling the elderly to achieve optimal management of diabetes mellitus (Teli, 2019). Friedman explains that family structure and function play an important role in changing family members' behaviors to care for their health (Friedman & R. Bowden, 2010). Family involvement can help the elderly increase awareness and control of diabetes mellitus (Rostaminasab et al., 2023). However, the weakness of this theory lies in its disregard for the daily activities of the elderly.

This study aims to enhance the paradigm for addressing diabetic mellitus management in the elderly, utilizing Miller's functional consequences theory method. Miller's functional consequence theory emphasizes an individual's behavior in doing daily tasks that influence survival and enhance quality of life in managing diseases (Miller, 2018). This theory complements how the elderly's ability to fulfill daily activities contributes significantly to their disease management behavior (Yusriana et al., 2018). The ability of the elderly to perform daily activities, as outlined in the Self-Care Deficit Nursing Theory, supports disease management by enhancing independence, adherence, and well-being.

Family-centered nursing involves families as key partners through education and shared responsibilities, ensuring holistic and sustainable care (Abdel Razeq et al., 2024; Landry et al., 2023). Family-centered nursing is an approach where healthcare providers consider the family as an integral part of the patient’s care (Kuo et al., 2012). It emphasizes collaboration between nurses, patients, and their families to create care plans that respect the family's role in the patient’s life (Landry et al., 2023). This approach ensures that care is tailored to meet not just the patient's needs but also the family's preferences, beliefs, and cultural backgrounds. Nurses work to empower families, enhancing their abilities to care for the patients and participate in decision-making (Abdel Razeq et al., 2024).

The researcher evaluated the necessity for a holistic diabetes mellitus care approach, considering both the perspective of the patient and that of their family. This

study aims to create a diabetic mellitus treatment paradigm that incorporates self-efficacy and family engagement through the integration of two theories.

## MATERIALS AND METHOD

In the second phase of this explanatory survey research employing a cross-sectional approach, data collection was conducted through structured questionnaires administered to a representative sample of participants. This method facilitated the simultaneous assessment of both independent and dependent variables at a single point in time, enabling the analysis of potential causal relationships between variables within the study population. The cross-sectional design was particularly advantageous for identifying associations and generating hypotheses regarding the underlying mechanisms of the observed phenomena.

The study population was all elderly people and families living with elderly people with diabetes mellitus in one of the public health centers in Jember. The population for this study consisted of 198 individuals. A probability sampling technique, specifically simple random sampling, was used to select the sample. To perform randomization in selecting a sample from a population of 198 individuals, start by assigning each individual a unique number from 1 to 198.

From a population of 198 individuals, the researcher wanted to determine the sample size with an error rate of 7% (0.07); using the Slovin formula, the result was 100.4. Because the sample size must be a whole number, it is rounded to 100 individuals. Thus, for a population of 198 individuals and an error rate of 7%, a sample of 100 individuals is required. Use a random number generator tool or software, which can be accessed online, to generate 100 unique random numbers within this range. Ensure that each number is selected only once to avoid duplicates in the sample.

Then, match the generated numbers to the corresponding individuals in the population list. These selected individuals will form your sample, ensuring that everyone has an equal chance of being chosen, thereby maintaining the randomness and representativeness of the sample. The study included elderly individuals aged 45 years and older, with a history of diabetes mellitus for at least one year, who were able to communicate effectively and willing to sign an informed consent form. Elderly individuals with dementia were excluded from the study.

The variables in this study consist of independent variables including X1 = assessment of family structure containing (X1.1 = communication patterns & processes, X1.2 = role structure, X1.3 = power & value structure, X1.4 = value and norm structure), X2 = assessment of family function containing, (X2.1 = affective function, X2.2 = economic function, X2.3 = family care function), X3 = assessment of family stress containing (X3.1 = long-term stress), while the assessment of the elderly consists of X4 = assessment of elderly risk factors containing (X4.1 = pathological conditions, X4.2 = lack of information), X5 = assessment of age-related changes (X5.1 = decreased physiological function, X5.2 = potential for psychosocial and spiritual growth), X6 = assessment of elderly consequence functions containing (X6.1 = decreased quality of life and health function), thus the dependent variable is Y1 = diabetes mellitus management behavior.

The research instrument used a questionnaire that included respondent characteristics and a comprehensive nursing assessment of diabetes mellitus management in the elderly. The instrument was developed based on the Functional Consequences Model and Family-Centered Nursing Theory. The validity test results

show that all items that have an average calculated r (0.215) with a calculated r greather than the table r (0.195) are considered valid for use in this study. The reliability test results show a Cronbach's alpha of 0.85, exceeding the minimum threshold of 0.70, indicating that the instrument is reliable and consistent.

The data analysis in this study employed descriptive analysis to gain a comprehensive understanding of the characteristics of the respondents, their diabetes mellitus management behavior, and the factors that align with Miller and Friedman's theory. Furthermore, we conducted an inferential analysis to make decisions in this case, seeking a relationship between variables based on the proposed hypothesis. We used SEM-PLS (Structural Equation Modelling—Partial Least Square) as the statistical test.

The analysis of the structural equation model in PLS consists of an inner model that specializes in the relationship between latent variables (structural models) with indicators and an outer model that specializes in the relationship between latent variables (measurement models) with indicators. The model evaluation process is divided into three we evaluate the outer model based on the validity and reliability of the indicator, deeming it valid if the outer loading value exceeds 0.5 and the t-statistic value exceeds 1.96. We test reliability using indicators from the constructs that make up the model. 2).

The evaluation of the inner model aims to determine the magnitude of the influence or causal relationship between variables in the study, specifically by obtaining the R square value or coefficient of determination. 3) Hypothesis testing. The KEPK of Universitas dr. Soebandi has issued an ethical service letter for this study, bearing the number 570/KEPK/UDS/V/2024.

## RESULTS

Figure 1. appears to be a structural equation modelling (SEM) path diagram. It represents relationships between latent variables (depicted as blue circles) and their observed indicators (yellow rectangles). Each observed variable is connected to its latent variable with corresponding factor loadings (numerical values on arrows). The figure also shows the path coefficients (values on the arrows) between latent variables, explaining their direct influence on each other. The value inside each latent variable ircle is likely its R-squared value, indicating the proportion of variance explained by its predictors.

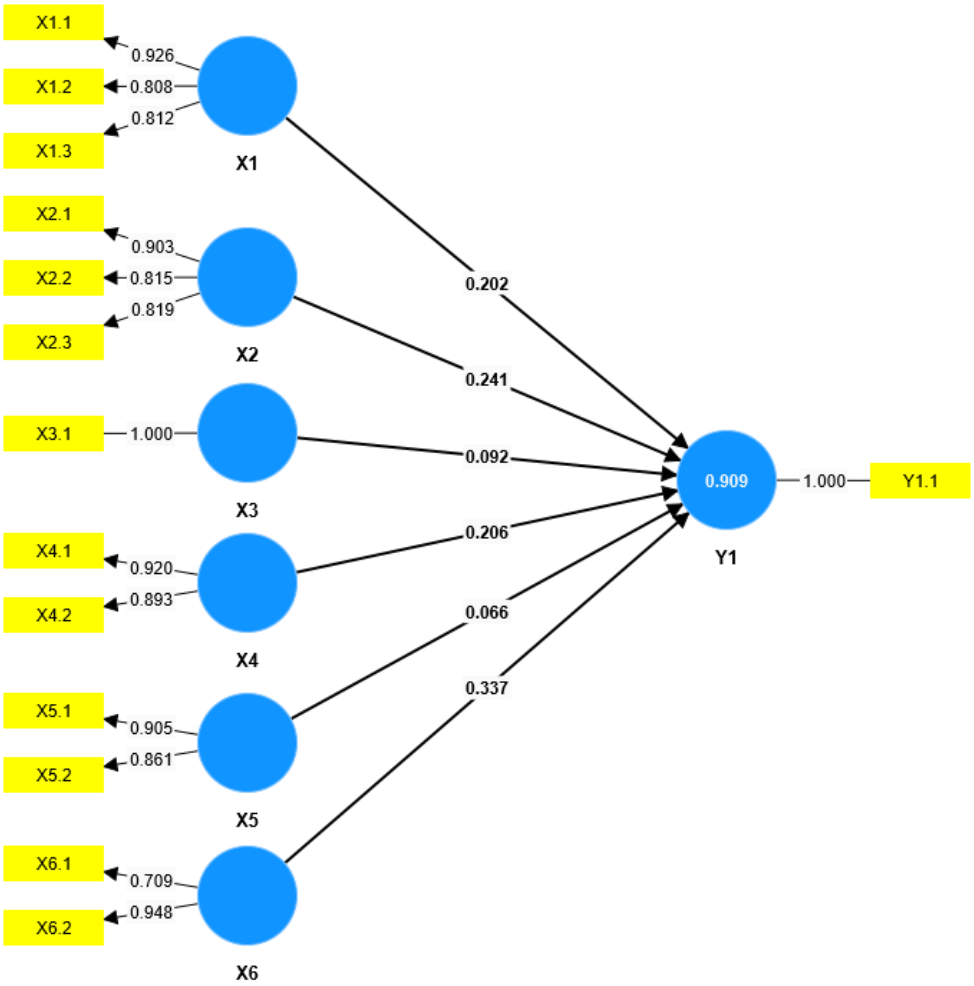


**Figure 1.** Construct Outer Model

This figure illustrates a structural equation model (SEM) highlighting the relationships between six latent variables (X1 to X6) and their observed indicators, as well as their influence on the outcome variable (Y1). Each latent variable, represented by a blue circle, is measured through multiple observed variables (yellow rectangles) with corresponding factor loadings (numerical values on arrows), indicating the strength of association. The path coefficients between latent variables, shown on the connecting arrows, represent the direct effects of one variable on another. The R-squared value within the dependent variable (Y1 = 0.909) indicates that 90.9% of its variance is explained by the predictor variables. This model provides insights into the interconnections and explanatory power of the constructs involved.

**Table 1.** Measurement Model (Outer Model)

| Variabel laten | | Variabel observed | | Loading Factor | AVE | Composite Reliability |
|---|---|---|---|---|---|---|
| X1 | Family Structure | X1.1 | Communication Patterns and Processes | 0.926 | 0.723 | 0.887 |
| | | X1.2 | Role Structure | 0.808 | | |
| | | X1.3 | Structure of Values and Norms | 0.812 | | |
| X2 | Family | X2.1 | Affective Function | 0.903 | 0.717 | 0.883 |

| Variabel laten | | Variabel observed | | Loading Factor | AVE | Composite Reliability |
|---|---|---|---|---|---|---|
| | Functions | X2.2 | Economic Function | 0.815 | | |
| | | X2.3 | Family Care Function | 0.819 | | |
| X3 | Family Stressors | X3.1 | Long Term Stressor | 1.000 | 1.000 | 1.000 |
| X4 | Elderly Risk Factors | X4.1 | Pathological Conditions | 0.920 | 0.822 | 0.902 |
| | | X4.2 | Information Assessment | 0.893 | | |
| X5 | Age-Related Changes | X5.1 | Physiological Function | 0.905 | 0.780 | 0.876 |
| | | X5.2 | Potential for Psychological and Spiritual Growth | 0.861 | | |
| X6 | Elderly Consequence Function | X6.1 | Quality of Life | 0.709 | 0.701 | 0.821 |
| | | X6.2 | Health Function | 0.948 | | |
| Y1 | Diabetes Self-Care Management | Y1.1 | Diabetes Self-care Management | 1.000 | 1.000 | 1.000 |

Table 1 shows that all indicators produce loading factor values greater than 0.7. Therefore, we declare all indicators valid to measure their variables based on convergent validity. The calculation of composite reliability values declares all indicators reliable for measuring their variables, with values greater than 0.7.

**Table 2.** Measurement Model (Inner Model)

| Variable | SSO | SSE | $Q^2$ (=1-SSE/SSO) | R Square Adjusted |
|---|---|---|---|---|
| Diabetes Self-Care Management (Y1) | 100.000 | 15.432 | 0.846 | 0.903 |

Table 2 indicates that the model yields a predictive relevance ($Q^2$) value exceeding zero, signifying its efficacy, while the modified R-squared value is 0.903, or 90.3%. This suggests that 90.3% of the variance in the Diabetes Mellitus Management Behaviour variable (Y1) can be elucidated by the variables Family Structure Assessment (X1), Family Function Assessment (X2), Family Stress Assessment (X3), Elderly Risk Factor Assessment (X4), Age-Related Change Assessment (X5), and Elderly Consequence Function Assessment (X6). The influence of the variables Family Structure Assessment (X1), Family Function Assessment (X2), Family Stress Assessment (X3), Elderly Risk Factor Assessment (X4), Age-Related Change Assessment (X5), and Elderly Consequence Function Assessment (X6) on the Diabetes Mellitus Management Behaviour variable (Y1) accounts for 90.3% of the contribution. The remaining 9.7% is attributable to additional variables not addressed in this study.

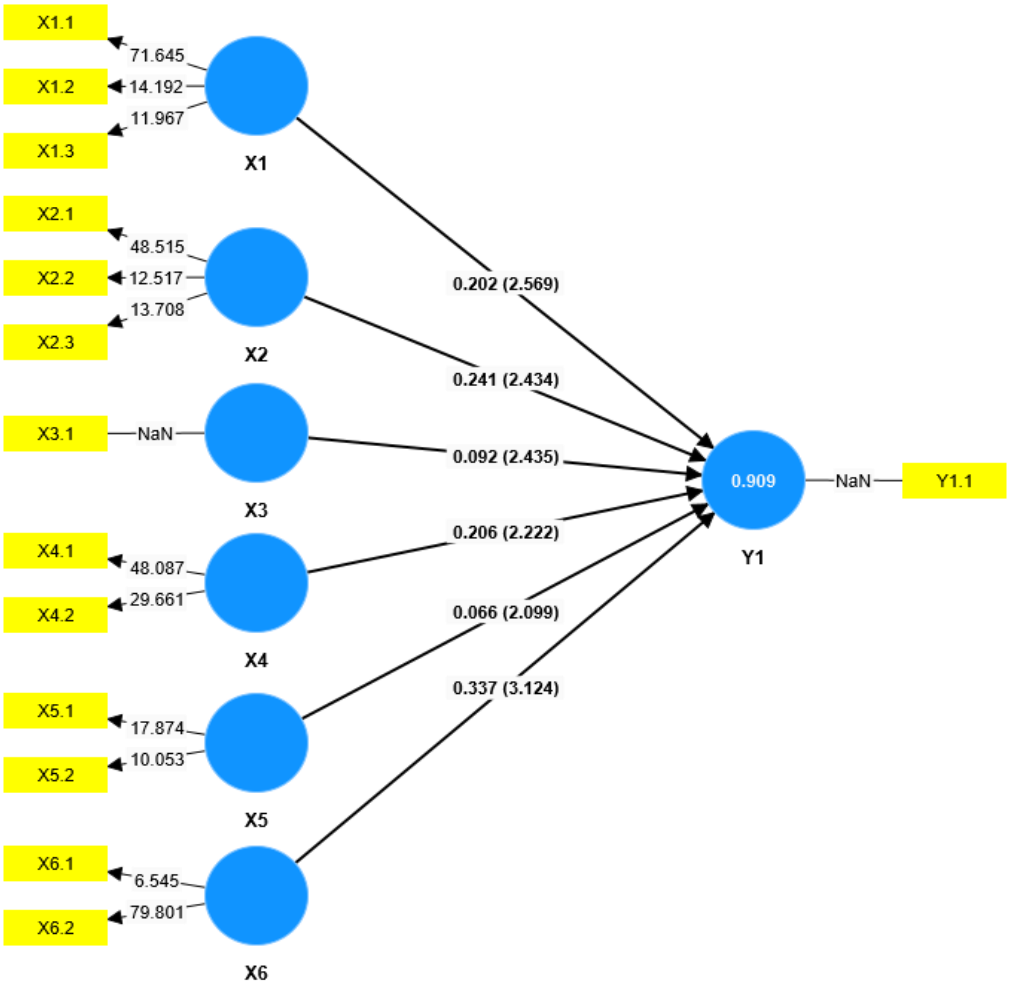


**Figure 2.** Construct Inner Model

The path coefficients between latent variables and the dependent variable (Y1) are presented along with their t-statistics, showing the strength and statistical significance of the direct effects. The R-squared value inside the latent variable Y1 (0.909) suggests that 90.9% of the variance in Y1 is explained by its predictors.

**Table 3.** Hypothesis Testing

| Direct Effect | Coefficient | T Statistics (\|O/STDEV\|) | P Values |
|---|---|---|---|
| Family Structure (X1) → Diabetes Mellitus Management Behaviour (Y1) | 0.202 | 2.569 | 0.010 |
| Family Functions (X2) → Diabetes Mellitus Management Behaviour (Y1) | 0.241 | 2.434 | 0.015 |
| Family Stressors (X3) → Diabetes Mellitus Management Behaviour (Y1) | 0.092 | 2.435 | 0.015 |
| Elderly Risk Factors (X4) → Diabetes Mellitus Management | 0.206 | 2.222 | 0.026 |

| Direct Effect | Coefficient | T Statistics (\|O/STDEV\|) | P Values |
|---|---|---|---|
| Behaviour (Y1) | | | |
| Age-Related Changes (X5) → Diabetes Mellitus Management Behaviour (Y1) | 0.066 | 2.099 | 0.036 |
| Elderly Consequence Function (X6) → Diabetes Mellitus Management Behaviour (Y1) | 0.337 | 3.124 | 0.002 |

Table 3 indicates that family structure, family function, family stressors, elderly risk factors, age-related changes, and elderly consequence functions exert a substantial influence, as evidenced by a t-value over 1.96 and a p-value below 0.05.

## DISCUSSION

This study found that family involvement is significant in influencing the behavior of diabetes mellitus management carried out by the elderly. The results obtained were $R^2$ Adjusted = 0.903 (>0.75), with a high $R^2$ Adjusted value indicating that the model could explain most of the variance in the data, taking into account the number of independent variables used. Family involvement in diabetes management is very important because support from the closest environment, especially the family, can affect the success of managing this disease (Kristianingrum et al., 2018).

**Family-Centred Nursing Theory** and the **Functional Consequences Model** highlight the significant role of the family in managing chronic diseases like diabetes (Abdel Razeq et al., 2024). By involving families in the care process, nurses can help create a supportive environment that empowers both patients and their families to manage the disease more effectively (Kuo et al., 2012). Family support, education, and encouragement are essential for mitigating the functional consequences of diabetes, leading to improved health outcomes and a better quality of life for patients (Baig et al., 2015).

The family can provide important emotional and psychological support for people with diabetes mellitus, especially the elderly (Pamungkas et al., 2017). This support can increase patient motivation to carry out proper care and deal with the stress associated with the disease (Mphasha et al., 2022). The family can improve healthy living behavior in people with diabetes mellitus (Badriah & Sahar, 2018). They can help with meal planning, physical activity, and pharmacological therapy, as well as diabetic foot care, all of which are very important in diabetes management.

Open communication within the family can increase a sense of security and encourage patients. Families who can understand the patient's condition and needs will provide emotional comfort and strengthen the spirit of undergoing treatment (Baig et al., 2016). Stress is a factor that can worsen diabetes because it can increase blood sugar levels (Safaruddin & Permatasari, 2022). Families can help patients manage stress by creating a comfortable, supportive, and harmonious environment (Busebaia et al., 2023). Positive coping mechanisms from the family can help the elderly face chronic diseases as a shared problem, thereby improving their disease management behavior (Setyoadi et al., 2023).

Family involvement as the main source of motivation can provide positive encouragement for patients (Rahmah et al., 2023). This presence can be in the form of

moral support in following a treatment program, as well as providing encouragement to achieve better health targets. Families must play a role in avoiding stigma or discrimination against diabetes patients (Grabowski et al., 2017). Full acceptance and equal treatment will help patients feel more comfortable and confident. The active role of the family in all aspects of diabetes management can help patients maintain a more stable health condition and reduce the risk of serious complications (Busebaia et al., 2023).

Nurses have an important role in increasing family involvement in the management of diabetes mellitus. Nurses are responsible for providing education to patients and their families about diabetes mellitus, including in the management of the disease (Alshammari et al., 2021). Nurses also play a role in providing emotional support to patients and families. They can help overcome the anxiety and stress that often accompany a diagnosis of diabetes, as well as motivate to maintain adherence to treatment and lifestyle changes (Vandali, 2019).

By involving families in the care process, nurses can strengthen their role as primary supporters of patients. Well-educated families tend to be better able to provide the support needed to achieve good blood sugar control. Through this approach, nurses not only help patients in diabetes management but also empower families to play an active role in the health care of their members who suffer from diabetes mellitus. This study also found that the elderly's self-efficacy, which includes elderly risk factors, elderly consequence functions, and age-related changes, can affect the behavior of elderly people with diabetes mellitus in managing their disease.

The elderly's self-efficacy greatly influences their self-care behavior in managing their disease (de Sousa et al., 2020). Elderly with high self-efficacy are more likely to carry out diabetes mellitus management (Klinis et al., 2022). High self-efficacy can motivate the elderly to take more active action in managing diabetes, which in turn can help them control their health conditions better (Qin et al., 2020). Conversely, the elderly with low self-efficacy may have difficulty in managing chronic diseases, which can have an impact on decreasing quality of life (Mukhopadhyay et al., 2023).

Age changes have a significant impact on the function of body organs in the elderly, especially for those with diabetes mellitus (Jiang et al., 2023). As age increases, various physiological and anatomical changes occur, which can worsen the health condition of the elderly and affect the management of their disease (Jiang et al., 2023). In the elderly with diabetes, this decline in organ function can be more complex because diabetes accelerates damage to several organs (Jiang et al., 2023).

Overall, empowering the elderly through increasing self-ability and family involvement in self-care at home is an important step in managing diabetes mellitus. Elderly people who have good self-ability in managing diabetes, such as regulating diet, monitoring blood sugar levels, and recognizing signs of hypoglycemia or hyperglycemia, will be better able to control their disease independently (Setyoadi et al., 2024). These management efforts can prevent serious complications and improve their quality of life.

Family involvement in caring for the elderly with diabetes is very helpful in providing emotional and physical support. Families can help ensure elderly compliance with treatment, accompany them when monitoring blood sugar, and regulate diets that are appropriate to their condition (Thongduang et al., 2022). Self-care performed by the elderly and their families at home allows for a more personalized and holistic approach, considering that each individual may have different needs (Nikpour et al., 2022).

This includes stress management, physical activity, and other healthy lifestyle habits that support diabetes control. By empowering the elderly and involving their families in self-care, diabetes complications such as neuropathy, nephropathy, or retinopathy can be prevented or minimized, as the elderly are better trained to recognize early symptoms of complications (Thongduang et al., 2022). Through empowerment, the elderly feel more empowered and less dependent on others, which improves their self-confidence and overall quality of life.

In addition, this intervention can also reduce the burden on the healthcare system by reducing the number of complications due to diabetes. The **Family-Centered Nursing Theory** highlights the role of family support in managing diabetes, while the **Functional Consequences Model** focuses on how self-efficacy and aging affect the elderly's ability to manage the disease. Together, they suggest that empowering the elderly with self-care and involving family in diabetes management improves disease control, prevents complications, and enhances quality of life.

## CONCLUSION

Self-ability and family involvement in managing diabetes mellitus influence the behavior of the elderly. We can use this diabetes mellitus management model to explain health behavior in elderly individuals with diabetes mellitus. Family involvement in providing care is the primary factor that can enhance diabetes mellitus management behavior in the elderly, as it contributes to the decline in self-ability that accompanies aging. As a nurse, it is important to involve the family in the management of diabetes mellitus in the elderly.

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