

The Effectiveness of Nurse-Based Counseling Innovation to Increase Self-Management of Diabetes Melitus in the Elderly in the Working Area of Dayeuhkolot Health Center, Bandung Regency

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ABSTRACT

Diabetes mellitus (DM) is a chronic disease with increasing prevalence among the elderly. However, DM self-management remains low due to physical and cognitive limitations and limited access to health information. This study aimed to determine the effectiveness of nurse-based counseling in improving DM self-management among elderly patients in the working area of Dayeuhkolot Health Center, Bandung Regency. A quasi-experimental study with a one-group pretest-posttest design involved 46 elderly patients with Type 2 diabetes selected through purposive sampling. Data were collected using the Diabetes Self-Management Questionnaire (DSMQ) before and after a four-week nurse-based counseling intervention. Univariate analysis used frequency distributions and means, while bivariate analysis used the Paired t-test. The mean self-management score increased from 52.3 (SD=6.8) before the intervention to 74.6 (SD=5.4) after the intervention. The Paired t-test showed a significant difference in self-management scores before and after the intervention ($p=0.000$; $\alpha<0.05$). Thus, nurse-based counseling was effective in improving DM self-management among elderly patients. Integration of nurse-based counseling into routine Chronic Disease Management Program (Prolanis) activities at health centers is recommended to support sustainable self-management.

Keywords: Counseling, Nurse, Self-Managed, Diabetes Mellitus, Elderly



INTRODUCTION

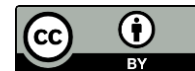
Diabetes mellitus (DM) is one of the biggest global health challenges of this century. The number of people with DM in the world has increased rapidly from 200 million people in 1990 to 830 million people in 2022, with a much faster increase in prevalence in low-and middle-income countries than in high-income countries. More than half of the world's people with diabetes are not even taking medication to control the disease in 2022, while treatment coverage remains lowest in low-middle-income countries. This condition shows that diabetes mellitus is not only a medical problem, but also a problem of the health care system and the ability of individuals to manage their diseases independently (World Health Organization, 2024).

The latest International Diabetes Federation (IDF) data reinforces this picture by saying that 589 million adults aged 20-79 will be living with DM in 2024, or the equivalent of one in nine adults in the world. This figure is projected to rise to 853 million people by 2050 if there is no significant intervention. DM is also recorded to cause 3.4 million deaths in 2024, or the equivalent of one death every nine seconds, and cause a health economic burden of more than one trillion US dollars. Such a large burden confirms the urgency of efforts to control DM in all layers of the population, including elderly age groups that are physiologically more susceptible to this disease (International Diabetes Federation, 2024).

At the provincial level, West Java contributed a lot of DM burden for Indonesia. Spatial-temporal mapping of DM risk in West Java for the period 2019-2023 shows that a number of regions, including Bandung City, West Bandung Regency, and Sumedang Regency, still have a relatively high risk until the end of the observation period. These areas require prevention and management strategies that are more effective than low-risk areas. This finding is an important basis for looking at DM conditions more specifically in the Greater Bandung region, including Bandung Regency (Syavera & Syazali, 2024).

More specifically in the city of Bandung, the Local Health Office data recorded that the prevalence of DM sufferers reached 2.3% of the total population aged 15 years and over in 2022, with the trend of new cases continuing to increase in the last year. The Bandung City Health Office even encourages people to routinely check themselves into puskesmas to detect DM early, considering that this disease has the potential to cause various serious complications. This fact shows that DM detection and management efforts in densely populated urban areas such as Greater Bandung, including the working area of the Dayeuhkolot Health Center in Bandung Regency, still require further strengthening, especially for vulnerable elderly groups (Ahmad & Joshi, 2023).

The vulnerability is closely related to the limited ability of self-management (self-management) in DM patients, especially the elderly. Seniors with DM tend to face physical limitations, decreased cognitive function, and the burden of comorbidities that make it more difficult for them to carry out self-management behaviors consistently and sustainably than patients of productive age. Recent narrative studies confirm that self-care in the elderly with chronic diseases requires a more adaptive and sustainable approach than conventional educational



approaches that are uniform for all age groups. It is this limitation that makes the elderly a group that requires a different and more intensive counseling Strategy (Ahmad & Joshi, 2023).

DM self-management itself is a series of self-care behaviors that include regulating diet, physical activity, monitoring blood sugar levels, medication adherence, and foot care, all of which are aimed at controlling blood glucose levels and preventing long-term complications. The ability to carry out this behavior consistently is greatly influenced by the knowledge, motivation, and support that patients receive from health workers and their social environment. Patients with good self-management have been shown to have more stable glycemic control and a lower risk of complications than patients with poor self-management. Therefore, the strengthening of self-management is one of the indicators of the success of nursing interventions in DM patients, including in the elderly group (Basir et al., 2022).

However, the ability to self-manage the elderly with DM is strongly influenced by the level of health literacy they have. A recent study in 81 elderly people with Type 2 DM showed a moderate-strength positive relationship between health literacy and self-care behavior ($r=0.406$; $p<0.001$), although the majority of respondents already had adequate health literacy. Seniors with low health literacy tend to have difficulty translating complex health information into real self-care actions. These findings recommend the development of health education that is more practical, simple, and easy to understand, including through simple visual media and ongoing assistance by health workers or local cadres (Alfita et al., 2026).

Unfortunately, the method of health education that has been widely applied in primary services is still dominated by a conventional approach in the form of one-way lectures without assistance or continuous behavioral evaluation. This approach has been proven to improve public health in general through the empowerment of clean and healthy living behavior, but its effectiveness in the elderly group with chronic diseases such as DM still needs to be studied more deeply because of the characteristics of different elderly learning needs. This gap is what drives the need for innovation in counseling models that are more structured and based on certain professional roles, one of which is nurses (Suprpto & Arda, 2021).

Nurses as health workers have a central role in providing continuing education to DM patients, not only as clinical care providers but also as educators and behavioral motivators. A recent study on the role of nurse educators in 59 elderly people with DM showed a significant relationship between the role of nurse education and the level of patient treatment adherence in primary care. Nurses who actively provide education about the importance of treatment adherence have been shown to contribute to increasing awareness of the elderly in maintaining their health conditions. These findings reinforce the argument that nurse-led and directly managed counseling innovations have the potential to greatly improve the health outcomes of elderly DM patients (Narmawan et al., 2026).

Several studies have also tested the effectiveness of nurse-based education models in improving DM self-management. The implementation of Diabetes Self-Management Education (DSME) in the working area of the West Limboto Health Center has been shown to be effective in



reducing blood glucose levels of Type 2 diabetes patients compared to before the intervention was given (Sudirman & Moedjo, 2021). The development of web-based nurse-based self-management education instruments and audio-visual media, known as the Nurse-Led Diabetes Mellitus Self-Management Education (Nu-DiMENTION) model, has also been declared valid and reliable in supporting changes in the self-management behavior of Type 2 diabetes patients.

In addition to the role of nurses, social support from families and communities is also an important factor that strengthens the success of DM self-management in the elderly. Research on social support and self-management in Type 2 DM seniors in the community shows that consistent support from the immediate environment contributes to improved adherence to self-care behaviors. However, most research on nurse-based education and counseling is still widely conducted in hospital settings or in the general population, while research with experimental designs that specifically target the elderly in puskesmas settings is still limited. This research gap is an important gap that needs to be filled, especially in areas with high risk of DM such as Bandung Regency (Arianti et al., 2023).

Based on the series of data and findings, researchers are interested in further assessing the effectiveness of nurse-based counseling innovation to increase self-management of DM in the elderly, by taking the research location in the working area of Dayeuhkolot Health Center, Bandung Regency. The selection of this location is based on the high risk of DM in the Greater Bandung area and the lack of optimal detection and management of elderly-based DM at the local primary service level. This interest is also driven by the lack of experimental studies that directly examine the impact of nurse-based counseling innovations on changes in self-managed behavior of the elderly in puskesmas, especially in Bandung Regency. Through this study, researchers hope to provide scientific evidence that is the basis for the development of nurse-based counseling programs that are more effective, applicable, and sustainable for the elderly with DM in primary health services.

METHODS

This study uses a quasi-experimental design with a pretest-posttest design of one group, which is a design that provides intervention on one group of subjects without a comparison group, with measurements made before (pretest) and after (posttest) the intervention is given. The study population was all elderly patients with Type 2 diabetes who were registered and actively undergoing control in the working area of Dayeuhkolot Health Center, Bandung Regency. The sample was 46 respondents selected using purposive sampling technique based on inclusion criteria aged ≥ 60 years, diagnosed with Type 2 diabetes by medical personnel for at least 6 months, able to communicate verbally and read well, and willing to follow the entire series of studies for 4 weeks. The exclusion criteria include elderly with severe cognitive impairment (Mini-Mental State Examination score <24), experiencing acute complications of diabetes (eg ketoacidosis or severe hypoglycemia) at the time of data collection, as well as elderly who are participating in similar diabetes education programs from other institutions. Data collection was conducted using

a Diabetes Self-Management Questionnaire (DSMQ) questionnaire that has been tested for validity and reliability, consisting of several domains (diet regulation, physical activity, blood glucose monitoring, and treatment adherence), filled by respondents before and after being given nurse-based counseling innovations that were carried out for four weeks through four face-to-face Sessions accompanied by audio-visual educational media and DM self-management booklets. Data on respondents' characteristics (age, sex, education level, and duration of DM) were also collected using demographic data questionnaires as supporting data for univariate analysis.

Data analysis was carried out in stages, including univariate and bivariate analysis. Univariate analysis was used to describe the characteristics of respondents and self-managed scores of DM before and after the intervention, presented in the form of frequency distribution, percentage, mean, and standard deviation. Bivariate analysis was conducted to test the difference in self-managed scores before and after the intervention using the Paired t-test, after first testing the normality of the data using the Shapiro-Wilk test to ensure normal distribution of data as a condition of use of the parametric test. Prior to the data collection, all prospective respondents were given an explanation of the objectives, procedures, benefits and risks of the study, as well as the right to resign at any time without any consequences. Respondents who were willing to participate then signed a consent sheet (informed consent) as proof of willingness to participate in the study voluntarily. Other principles of research ethics, namely anonymity and confidentiality, are also applied by keeping the identity of respondents secret and only using respondent codes in processing and reporting research data.

RESULTS

1. Characteristics of Respondents

Characteristics of respondents in this study include age, gender, education level, and duration of suffering from Type 2 diabetes mellitus, as presented in Table 1 below.

Table 1. Characteristics of Respondents (n=46)

Characteristics	Categories	f	%
Age	60-69 years old	27	58,7
	70-79 years old	15	32,6
	- 80 years old	4	8,7
Gender	Men	18	39,1
	Girls	28	60,9
Education Level	No school / elementary school	21	45,7
	SMP	14	30,4
	High school / college	11	23,9
Long suffering from DM	<5 years	19	41,3
	≥5 years	27	58,7



Based on Table 1, the majority of respondents are in the age group of 60-69 years (58.7%), dominated by women (60.9%), with the highest level of education in the category of no school/elementary school (45.7%), and more than half of respondents (58.7%) have suffered from Type 2 diabetes mellitus for ≥ 5 years. This characteristic indicates that the majority of respondents are young adults with a relatively low level of education and have lived with DM for a long time, so it potentially requires a simpler, concrete, and repeatable educational approach so that information about self-management of DM can be understood and applied optimally.

2. Distribution of DM Self-Managed Scores Before and After Intervention

Univariate analysis was conducted to determine the self-management score of respondents before and after the provision of nurse-based counseling innovation, as presented in Table 2.

Table 2. Distribution of DM Self-Managed Scores Before and After Intervention

Variable	Mean	SD	Min	Maks
Self-Managed Score Before Intervention (Pretest)	52,3	6,8	38	66
Self-Managed Score After Intervention (Posttest)	74,6	5,4	62	88

Table 2 shows that the average DM self-management score of respondents before the intervention was given was 52.3 (SD=6.8), which belongs to the category of low to moderate self-management. After being given nurse-based counseling innovation for four weeks, the average self-management score increased to 74.6 (SD=5.4), which is included in the category of good self-management. This increase in the mean score of 22.3 points descriptively indicates an improvement in the respondents self-management ability after receiving the intervention, although its statistical significance needs to be further confirmed through bivariate analysis.

3. Bivariate Analysis

Bivariate analysis was conducted to test the difference in DM self-management scores before and after the intervention using Paired t-test, after the data were declared to be normally distributed based on the Shapiro-Wilk test ($p > 0.05$). The test results are presented in Table 3.

Table 3. Test Results Paired T-Test Scores Self-Managed DM Before and After Intervention (n=46)

Variabel	Mean	SD	Mean Difference	t	p-value
Pretest	52,3	6,8	22,3	18,742	0,000
Posttest	74,6	5,4			

The Paired t-test results in Table 3 showed a value of $p = 0.000$ ($p < 0.05$), which means there is a statistically significant difference in DM self-management scores between before and after the provision of nurse-based counseling innovation. The mean difference value of 22.3 with a value of $t = 18.742$ indicates that the increase in self-management score is not caused by chance, but is a real impact of the intervention provided.

DISCUSSION

1. Distribution of DM self-managed scores before and after intervention

The results showed that the majority of respondents were in the age group of 60-69 years (58.7%), which belongs to the category of early elderly (young old). This age group still has a relatively better physical and cognitive capacity than seniors with older ages, so it is potentially easier to accept and practice the counseling materials provided. However, some of the respondents were also in the age group of 70 years and over (41.3%), which in general is more prone to decreased physiological function related to the aging process.

This finding is in line with the concept that aging causes various physiological and cognitive changes that affect the capacity of individuals to carry out self-care independently, including in people with chronic diseases such as DM. Self-care in the elderly with chronic diseases requires an approach that considers the functional limitations that accompany the aging process, rather than simply the delivery of general health information. Increasing age is often followed by decreased sensory, motor and memory abilities, which directly affects the ability of the elderly to absorb and apply self-care instructions (Alqahtani & Alqahtani, 2022).

The results also showed that the majority of respondents are female (60.9%) compared to men (39.1%). This proportion illustrates that patients with Type 2 diabetes in the elderly at the study site were dominated by women, which is consistent with the general pattern of patients with Type 2 diabetes in the elderly population in Indonesia. The characteristics of the respondents' education level showed that almost half of the respondents (45.7%) had no school or elementary school education, while respondents with high school/college education only amounted to 23.9%. This data illustrates that the majority of respondents in the study have a relatively low formal education background.

The level of education a person has is closely related to the ability of self-efficacy and self-care activities of DM patients. The higher a person's level of education, the more likely it is to seek and access health information so that his knowledge and confidence in managing the disease also increases. Conversely, a low level of education can be an obstacle in understanding complex health information, thus requiring a simpler and more concrete educational approach (Natashia et al., 2023).

Based on the duration of DM, most respondents (58.7%) had suffered from Type 2 DM for more than 5 years, while the rest (41.3%) had suffered from DM for less than 5 years. These data show that the majority of respondents have gone through the experience of living with DM in a fairly long period of time.

Duration of illness is related to the patient's cumulative experience in undergoing various forms of treatment and medication, which can affect attitudes and habits in carrying out self-management of the disease. Longer duration of illness is also often associated with a higher risk of complications if self-management is not carried out consistently, so patients with long duration of illness should ideally have more mature experience and awareness of the importance of self-management (Syavamaruah et al., 2025).



The results of univariate analysis in table 2 showed that the average self-management score of DM respondents before intervention (pretest) was 52.3 (SD=6.8), which is included in the category of low to moderate self-management. The score indicates that before receiving nurse-based counseling innovation, respondents' ability to carry out dietary regulation behavior, physical activity, blood glucose monitoring, and treatment adherence was still not optimal.

The low self-management score before this intervention is in line with various studies that show that self-care in the elderly with DM is still generally low, especially in the aspects of independent blood sugar monitoring and dietary regulation. The low self-management in this initial phase is often associated with the lack of continuing education received by patients at the primary care level, where the educational methods previously provided were still one-way and not accompanied by consistent behavioral evaluations (Ahmad & Joshi, 2023).

After being given nurse-based counseling innovation for four weeks, the average self-management score of respondents increased to 74.6 (SD=5.4), which is included in the category of good self-management. This increase in the average score of 22.3 points indicates a considerable change in the respondents' self-management ability compared to the conditions before the intervention.

This improvement in self-management scores after nurse-based education provision is consistent with research showing that the implementation of Diabetes Self-Management Education (DSME) guided by nurses in a structured manner is able to increase knowledge and change the self-management behavior of Type 2 diabetes patients significantly, compared to a one-time educational approach without ongoing assistance (Avelina et al., 2022).

The significant improvement in self-management scores reinforces the picture that active involvement of nurses as educators, rather than just one-way informers, contributes greatly to changes in respondent behavior. Face-to-face interaction conducted periodically for four weeks is thought to provide an opportunity for respondents to ask questions, practice, and get direct feedback on self-management behavior that has been practiced, so that the learning process becomes more meaningful than conventional counseling (Andriyanto et al., 2021).

Overall, the results of this univariate analysis illustrate a pattern of change that is consistent with the concept of self-care in chronic diseases, where self-management is not a static condition, but can be improved through targeted and continuous educational interventions. Improvements in self-management scores across all domains also indicate that nurse-based approaches are able to reach the learning needs of the elderly more personally than general education programs that are not tailored to the characteristics of the elderly population.

The researchers assume that the low self-management score in this initial condition reflects the not optimal continuing education program that has been received by respondents in the working area of Dayeuhkolot Health Center, so that this condition becomes an important basis that reinforces the need for the implementation of nurse-based counseling innovations as an effort to improve the self-management ability of elderly people with DM in the region. The large self-management score in this study is a synergistic result between the characteristics of respondents,

the majority of whom are early elderly, female who tend to be active in community health activities, and the design of nurse-based counseling interventions that are structured and repeated. The combination of these factors is thought to be the key to the success of this extension innovation in improving the ability to self-manage DM in the elderly in the working area of Dayeuhkolot Health Center, Bandung Regency.

2. The Effectiveness of Nurse-Based Counseling Innovation to Increase Self-Management of DM in the Elderly

The results of bivariate analysis using paired t-test showed that there was a significant difference between the score of diabetes mellitus self-management before and after the provision of nurse-based counseling innovation ($p < 0.001$). The mean difference value of 22.3 points with a t value of 18.742 indicates that the intervention provided is able to significantly improve the respondent's self-management ability. Descriptively, the average score of self-management increased from 52.3 at the time of pretest to 74.6 at the time of posttest. The increase showed that after participating in the counseling program for four weeks, most respondents experienced a change in self-management ability from a low-medium category to a good category.

The findings indicate that nurse-based counseling innovations have a positive impact on the ability of the elderly to manage diabetes mellitus independently. Diabetes self-management is an individual's ability to perform a variety of self-care activities consistently, including diet, physical activity, adherence to therapy, monitoring blood glucose levels, and foot care to prevent complications. The improvement in self-managed scores after the intervention showed that respondents not only acquired additional knowledge, but also began to implement better health behaviors in everyday life.

The results of this study are in line with the Consensus Report Diabetes Self-Management Education and Support (DSMES) which states that diabetes education provided systematically and continuously is an essential component in diabetes management. Structured education is proven to improve knowledge, skills, self-care behaviors, quality of life, and help patients achieve glycemic control targets. The report confirms that the successful management of diabetes depends not only on pharmacological therapy, but also on the patient's ability to self-manage independently (Powers et al., 2020).

The findings of this study are also consistent with the results of a systematic review and meta-analysis conducted by Chryala, Sherr, and Lipman (2016). The study showed that the Diabetes Self-Management Education (DSME) program provided meaningful improvements in self-management behavior and contributed to improved glycemic control in Type 2 diabetes patients. The authors explain that education carried out in stages, accompanied by evaluation and reinforcement of the material, is more effective in producing behavioral changes than education given only once. The similarity reinforces that the increase in self-managed scores in this study is a result that is consistent with previously reported scientific evidence.



Other studies have also shown that nurse-led educational interventions can improve the self-management of diabetic patients through increased knowledge, motivation, and adherence to therapy. Nurses have a strategic position as health workers who most often interact with patients so that they are able to provide ongoing assistance, identify obstacles experienced by patients, and provide feedback according to individual needs. Such approaches contribute to changes in health behavior that are more lasting in the long term (Suryadi, S., & Rismaida, M, 2026).

The success of the intervention in this study is likely to be influenced by the characteristics of extension conducted gradually over four weeks. Each counseling session provides an opportunity for respondents to understand the material, practice self-managed behavior at home, and then discuss the obstacles encountered at the next meeting. The learning process that takes place repeatedly allows reinforcement so that the information received is more easily understood and applied by the elderly.

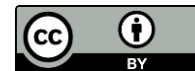
The results of this study can be explained using the Self-Care Deficit Nursing Theory developed by Dorothea Orem. According to Orem (2001), individuals who experience chronic diseases often experience limitations in meeting their self-care needs and therefore need help from health workers. The assistance is provided through a supportive-educative system, namely nurses play a role in helping patients improve their ability to self-care without taking over patient responsibilities.

In this study, nurses not only convey information about diabetes, but also guide respondents to be able to understand the importance of eating arrangements, physical activity, medication adherence, blood glucose monitoring, and Prevention of complications. The approach corresponds to the concept of self-care agency Orem, that is, the ability of the individual to perform the necessary actions to maintain health. The increase in self-management scores showed that respondents ' self-care agency abilities developed after obtaining educational support from nurses.

In addition to Orem theory, the results of this study can also be explained through The Theory Of Self-Efficacy developed by Bandura (1997). The theory explains that a person's belief in their ability to perform an action is an important factor that determines the success of behavior change. Individuals who have high levels of self-efficacy tend to be more confident in overcoming obstacles and maintaining health behaviors in the long term.

During the counseling process, respondents had the opportunity to discuss, ask questions, and practice some self-management skills directly. The experience of such success is one of the main sources of the formation of self-efficacy according to Bandura. As older adults begin to feel able to carry out self-care behaviors independently, such beliefs will increase motivation to maintain healthy behaviors in everyday life.

The characteristics of respondents as an elderly group is also a factor to be considered in interpreting the results of this study. Seniors generally experience a decrease in cognitive function, memory, and the ability to receive new information compared to younger age groups. Therefore, counseling provided in stages, using simple language, with concrete examples and repetition of



material, is more in line with the learning needs of the elderly group than one-time counseling using the lecture method.

The educational media used during the intervention also contributed to the improvement of respondents' self-management skills. The use of booklets and visual media helped respondents understand the material more easily because the information could be re-learned independently at home. Visual media also help strengthen the elderly's memory of the material that has been delivered so that the learning process becomes more effective than verbal information delivery alone.

The success of the intervention in this study was also influenced by the therapeutic relationship between nurses and respondents. Two-way communication allows respondents to express the difficulties experienced during diabetes self-management, while nurses can provide solutions that suit each individual's condition. The individualized approach is one of the advantages of nurse-based counseling compared to conventional counseling that tends to take place in one direction.

According to the researchers' assumptions, the increase in self-management scores was influenced not only by an increase in knowledge, but also by a change in the attitude and motivation of the respondents. During the intervention process, respondents received psychological support from nurses so that they were more confident in implementing self-care behaviors. These changes indicate that effective health education must be able to touch cognitive, affective, and psychomotor aspects simultaneously.

The results of this study have important implications for the practice of community nursing, especially in Dayeuhkolot Health Center. Nurses need to optimize their function as educators through the implementation of counseling programs that are structured, sustainable, and tailored to the characteristics of the elderly. This kind of education program can be integrated into the activities of The Chronic Disease Management Program so that the benefits can be felt sustainably by the community.

The findings also support the American Diabetes Association's recommendation that diabetes self-management education should be provided on an ongoing basis from diagnosis to long-term follow-up. Education that is carried out periodically allows health workers to evaluate changes in patient behavior, identify obstacles, and provide reinforcement to the behavior that has been formed so that the results of diabetes management can be maintained in the long term (American Diabetes Association, 2025).

Overall, the results of bivariate analysis showed that nurse-based counseling innovation effectively improved self-management of diabetes mellitus in the elderly in the working area of Dayeuhkolot Health Center. The improvement is supported by a structured educational process, ongoing mentoring, the use of appropriate educational media, and the active involvement of nurses as facilitators of behavior change. These findings reinforce the importance of developing nurse-based education programs as part of routine care in primary health facilities to improve patient self-management and prevent complications of diabetes mellitus.



CONCLUSIONS

This study aims to determine the effectiveness of nurse-based counseling innovation to increase self-management of diabetes mellitus in the elderly in the working area of Dayeuhkolot Health Center, Bandung Regency. The results showed an increase in the ability to self-manage DM after being given a nurse-based counseling intervention for four weeks. The average self-management score of respondents increased from 52.3 (SD=6.8) at the time of pretest to 74.6 (SD=5.4) at the time of posttest. The results of bivariate analysis using paired t-test showed that there was a statistically significant difference between the self-managed score before and after the intervention ($p=0.000$; $\alpha < 0.05$). This finding shows that nurse-based counseling innovation can improve the ability of the elderly to manage diabetes independently, including diet, physical activity, medication adherence, health condition monitoring, and complication prevention behavior.

Based on the results of the study, nurse-based counseling innovation can be considered as one of the effective health education strategies in supporting the improvement of self-management of DM in the elderly in primary health services, especially in the implementation of chronic disease management programs in puskesmas. However, this study has some limitations, namely the use of one group pretest-posttest design without a control group so that changes in self-managed scores have not been fully comparable with the group that did not get the intervention. Further research is recommended to use an experimental design with a control group, a larger sample size, and a longer follow-up period to evaluate the sustainability of the effectiveness of nurse-based counseling innovation on the management of diabetes mellitus in the elderly.

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