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The Effect of Nurse Coaching Program in Preventing Diabetes Mellitus Complications Behaviours and Improving HbA1c in Patients with Type 2 Diabetes Melliitus : A Pilot Study

Dayan Hisni*, Intan Asri Nurani

Study Program of Nursing, Unviersitas Nasional, Jakarta, Daerah Khusus Ibukota, Jakarta 12520, Indonesia

**Corresponding Authors Email: dayanhisni@civitas.unas.ac.id*

ABSTRACT

Background: Prevention of DM complications must involve the patient as the centre of care. One of the strategies of a patient-centred approach is coaching. However, there are not many studies describing the construction of coaching from a combination of nursing theories between the Theory of Integrative Nurse Coaching (TINC) and interpersonal theory to prevent DM complications and improve HbA1c levels. The specific elements of TINC theory that were used in the study were nurse coaching content to change the behaviours, while the interpersonal theory phases of nurse coaching consisted of orientation, identification, exploration, and termination. The objectives of the study were to determine the feasibility and evaluation of nurse coaching programmes and their impact on preventing DM complication behaviours and reducing HbA1c levels. **Methods:** This study employed a quasi-experimental design. The nurse coaching programme was twelve weeks long with some steps and methods according to the interpersonal relationship theory. Fourteen patients with DM were allocated into either the experimental group or the control group, with 7 respondents per group. The behaviours of preventing DM complications were examined by a questionnaire of the Summary of Diabetes Self-care Activities (SDSCA), while HbA1c was measured by the HbA1c and ACR analyser. These examinations were performed and compared at baseline and 12 weeks after the end of the intervention. **Results:** The respondents receiving the nurse coaching programme revealed significant improvement in the Preventing Diabetes Mellitus Complications Behaviours ($p < 0.05$) and HbA1c level ($p < 0.05$) compared to those receiving the standard care. **Conclusion:** This study reported that nurse coaching is feasible for implementation. The integration of the Theory of Integrative Nurse Coaching (TINC) with interpersonal theory effectively supported behaviour change and improved glycaemic control.

Keywords: Nurse Coaching Program; Pilot Study; Preventing DM Complications Behaviour; HbA1c Level

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disease described by increasing blood glucose. Type 2 DM is more familiar, and the complications of its increase are both macrovascular and microvascular (Magliano & Boyko, 2021). Williams and MSPAS (2017) stated that around 20-40% of people with type 2 DM will develop diabetic nephropathy within 5 years after diagnosis. In addition, another study confirmed that both strict HbA1c (< 6.0%) and poor HbA1c (≥ 8.0%) in patients with type 2 DM are associated with an enlarged risk of macrovascular complications and death (Tan *et al*., 2023).

DM complications are caused by fluctuations in blood glucose and uncontrolled hyperglycaemia (Ojo *et al*., 2023). These mechanisms affect protein glycation and oxidative stress. Protein glycation is defined as a non-enzymatic process or spontaneous reaction between glucose and molecules that contain haemoglobin and other tissue proteins. While oxidative stress is an imbalance between antioxidants and pro-oxidants, which

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develops cell damage and hyperglycaemia. Hyperglycaemia will cause apoptosis in vascular endothelial cells through the overproduction of mitochondrial superoxide. This condition will produce free radicals that affect endothelial dysfunction, leading to DM complications, both acute and chronic (Fang *et al*., 2024).

The cost of treating DM complications is increasing every year. Magliano & Boyko, 2021, reported that about 8.1 million USD was spent treating DM complications in the South Asia region. While in Indonesia, the cost was spent at about 11-14 million rupiah each year. This cost is covered by the Indonesian national health insurance agency, known as BPJS. It is an authorised government body known for providing social health insurance programs to Indonesian citizens. When the DM complications cannot be prevented, it will affect the deficit of BPJS (Abror, Andayani & Sulistiawaty, 2019; Putri Darmawan & Perwitasari, 2019). Furthermore, the American Diabetes Association Professional Practice Committee (2025) also stated that patients with DM complications reported a decrease in income of 88% compared to those without complications. Therefore, intervention to prevent DM complications is strongly needed.

Numerous studies have been done regarding how to prevent DM complications (Rahim, Thosingha & Puwarawuttpanit, 2024; Zhu *et al*., 2024). However, the prevalence of type 2 DM complications is still high. Diet, DM medication adherence, physical exercise, foot care, blood glucose monitoring and education are the activities that prevent DM complications (American Diabetes Association Professional Practice Committee, 2025). Yet not all DM patients comply with these behaviours (Govindani *et al*., 2024; Ye *et al*., 2024) because they are not related to emergent awareness. Whereas preventing DM complications behaviours cannot be carried out without self-awareness and cannot be forced by others. The performance of these behaviours is purely a matter of self-awareness. There are many methods to increase self-awareness; one of them is coaching. Dossey, Luck and Schaulb (2015) clearly stated that coaching increases awareness, which becomes a basic way to reach behaviour change.

Coaching helps people become who they want to be on all levels by increasing awareness and bringing about behaviour change (Stone, 2007; Wolever *et al*., 2013). Some studies have proven that coaching improved behaviours and clinical outcomes in patients with type 2 DM. However, the specific intervention of coaching for nurses is still unclear to discuss, especially the effect of nurses coaching on DM patients by integrating nursing theories as a content and phase of nurse coaching. In addition, there are few studies that discuss the effects of coaching led by nurses on preventing DM complication behaviours and HbA1c (Dailah, 2024; Sulfikar, Irwan & Restika, 2023).

Hence, this study planned to investigate the effect of nurse coaching by applying the Theory of Integrative Nurse Coaching (TINC) and interpersonal relationships to create the preventing DM complications behaviours which could be improved HbA1c levels.

METHODOLOGY

Design

A pilot study was conducted to check the feasibility of the nurse coaching program. A two-group pretest–post-test quasi-experimental study was conducted to demonstrate the effect of a nurse coaching programme on the behaviours of preventing DM complications and HbA1c levels of patients with type 2 DM.

Setting

This study was conducted at the Public Health Centre from August to October 2023.

Participants

The participants were patients with type 2 DM by using purposive sampling. The inclusion criteria were (1) HbA1c $\geq$ 6.5% (2) having no history of DM complications; (3) having diabetes for at least a year; (4) having fluency in written and verbal Indonesian communication; (5) being able to make a home visit; (6) having no mental health issues or hearing impairments; and (7) being in the presence of a family member who resides with the patient.

Pilot Study

A pilot study is frequently used to test the data collection procedure in arrangement for the real study or the guideline. Using an effect size (d) from a prior study, the power analysis determined the sample size for the actual study. It showed an effect size of 1.83; alpha was 0.5; and the power of the test was 0.84. Thus, 37 respondents were recruited for each group (the experimental group (EG) and the control group (CG)). Seventy-four patients were registered and assigned into two groups. To avoid a type II error, the sample size was increased by 10% (Polit & Beck, 2010). Thus, the sample size of the actual study was 68 respondents. The researchers determined that 10–20% of the original study should be included in this pilot study. Thus, 14 respondents were registered in this study. Then, they were randomly divided into both the EG and the CG, which were matched based on gender and age. The CG (n = 7) just received standard care; the EG (n = 7) received a nursing coaching program and standard care.

Data Collection

Data collection was done in a sequential manner. The head of the nursing staff at the public health centre was well-informed about the study by the researchers. The patients were investigated based on their medical records. Then, each respondent was accessed and asked for permission to introduce the study. In addition, the respondents who were eligible for this study were assessed. Lastly, the researchers began data collection by using an individual nurse coaching program with respondents at EG for 12 weeks. The program's details are presented in Figure 1.

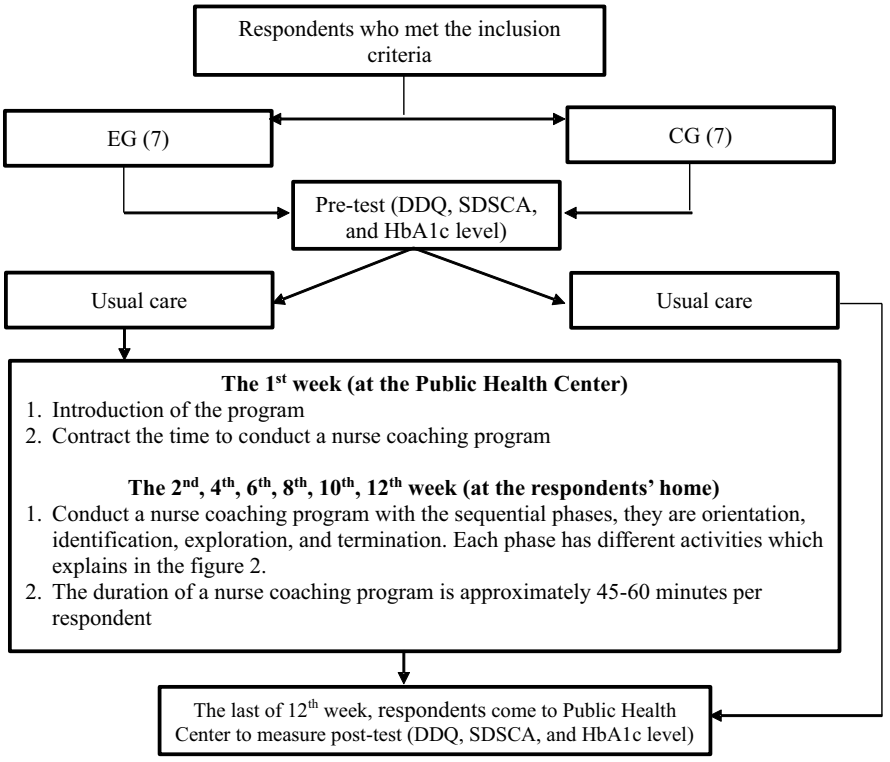

Figure 1: The Details of the Nurse Coaching Program During the 12 Weeks

There were three sections of the structured questionnaire that were used to collect the data: (1) the Demographic Data Questionnaire (DDQ); (2) the Summary of Diabetes Self-Care Activities (SDSCA); and (3) the HbA1c and ACR analyser to examine the HbA1c level. The DDQ was developed by the researcher; the original version of the SDSCA was developed by Toobert, Hampson and Glasgow (2000). It described diabetes self-care activities during the past 7 days and consisted of 14 items, including dietary behaviours (6

items), physical activity (2 items), blood glucose monitoring (1 item), medication (1 item), and foot care (4 items). Scores were calculated for each of the five domains. A high score on the SDSCA showed that the respondents perform the behaviours of preventing DM complications more frequently. In this study, the SDSCA was back translated into an Indonesian version. The validity of the SDSCA in the Indonesian version was approved by two experts from the Faculty of Liberal Arts at Universitas Nasional to examine the grammar and sentences. The internal consistency reliability of the SDSCA was 0.89. This result was deemed reliable (Polit & Beck, 2010). HbA1c and ACR analysers were provided by the Public Health Centre. To this tool has a good standard; it is calibrated every six months by the distributor of the tool's manufacturer.

Data Analysis

Data analysis was conducted sequentially, which consisted of entering, recording, cross-checking, and analysing using SPSS for MacBook Version 25. To examine the DDQ, statistical data were used. The independent t-test and the chi-square test were applied to investigate the characteristics of the differences between the EG and the CG at baseline. Prior to determining the appropriate statistical test, normality tests and homogeneity of variance were tested. The researchers used the Independent-t-test for examining the differences of the mean score of the behaviours of preventing DM complications and HbA1c level between the EG and the CG, while the paired t-test was used to test the differences of the mean score of the behaviours of preventing DM complications and HbA1c level in both the EG and the CG pre- and post-receiving the programme.

Procedure of a Nurse Coaching Program

Respondents in the EG received an individual nurse coaching program, which consisted of four phases. The four phases of the program were orientation, identification, exploration, and termination. Meanwhile, respondents in the CG only received standard care, such as educational activities and medical check-ups, every six months. The detailed procedure of the nurse coaching program is presented in figure 2.

There were seven registered nurses who were recruited as nurse coaches who met the criteria. They received training in a nurse coaching program over three days, directly from researchers who are certified by the National Certification Body for Professionalism as professional coaches. Following their training, they proceeded to individual assignments, where they conducted nurse coaching with five respondents. The results of the assignment were then discussed in a mentoring session with researchers to identify obstacles or barriers experienced during the self-assignment. The individual nursing coaching test, conducted using the offline method, was assessed with a checklist for the nursing coaching model developed by the researchers. Prospective coaches were declared to have passed and be competent if the total score of the checklist reached 100. After they passed and were competent enough to become coaches, the next step was to implement the nursing coaching model.

Conceptual Framework

The conceptual framework of the study has been constructed by integrating two nursing theories. The first was the Theory of Integrative Nurse Coaching (TINC), proposed by Dossey, Luck and Schaulb (2015) to explain the nurse coaching concept. To achieve harmony and inner balance, as well as to decide on specific health goals and wish to modify behaviours, TINC helps the respondent increase her/his awareness and choice. The theory consists of five components: 1) nurse coach self-development; 2) integral perspectives and change; 3) integrative lifestyle health and wellbeing (ILHWB); 4) awareness and choice; and 5) listening with HEART. The main component of this theory that was used in this study was Integrative Lifestyle Health and Wellbeing (ILHWB). It was used for the activities of each phase of a nurse's coaching program. The second theory was interpersonal relationship theory proposed by Peplau (1997) as guidance for the nurse coaching phases, which consisted of orientation, identification, exploration, and termination phases. The main idea of this theory is to focus on the importance of the nurse-patient relationship in healthcare. The theory emphasises the role of communication, collaboration, and empathy in building connections that facilitate healing. Therefore, these theories are suitable for combining to create a nurse coaching program. Figure 2 displays the conceptual framework of the study.

Nurse Coaching Program	
Nurse Coaching Program Phase	**Activities**
Orientation	Contract the time for the nurse coaching session which will be performed Build trusting relationships between nurses and patients by a. Performing reframes by seeking similarities through asking something. For example: 1) what kind of foods do you like? 2) where were you born? 3) so on. b. Explaining confidentiality. Asking the patient to determine the agenda of nurse coaching session and set the goal(s) before nurse coaching begins.
Identification	Asking the patient to describe the goal(s), set the due date, take steps to meet the goal(s), identify the strength, support, chance, and challenge he/she faced to meet the goals(s).
Exploration	Asking the patient to make priority regarding the actions which he/she carried out to meet the goal(s) based on their listed, make the due date for performing the actions, and make successful parameters in order to researcher know the progress of the successful.
Termination	Close the nurse coaching session Ask the patient to give feedback during performing nurse coaching session and the time for the next session. Closing

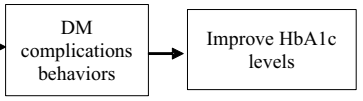

Figure 2: Conceptual Framework of the Study

Ethical Consideration

The researchers obtained ethical clearance from the Faculty of Nursing, Universitas Indonesia, number KET-227/UN2.F12.D1.2.1/PPM.00.02/2022, on 15th August 2022. Furthermore, permission to access patients with type 2 DM was granted from the Ministry of Health of the Republic of Indonesia with reference number 351/HM.10.02 on 4th July, 2023.

Every respondent provided their informed consent in accordance with the usual protocol, which upholds the respondents' autonomy, confidentiality, anonymity, and privacy. The respondents received courteous treatment and were made fully aware of their freedom to choose whether or not to participate in the study as well as their right to withdraw at any moment without facing repercussions.

RESULTS

Demographic Data of the Respondents

Table 1 indicates that there were no statistically significant differences between the demographic data of the EG and the CG. Most of the respondents had completed their final year of high school, both in the EG (71.4%) and in the CG (57.1%). There were no significant differences regarding gender in this study. The average age of the respondents in the EG was 48.00 years (SD = 1.63), while in the CG it was 47.86 years (SD = 1.57). Regarding the duration of DM, there were no differences between the EG (M = 6.00; SD = 1.15) and the CG (M = 5.71; SD = 0.75).

Table 1: Data Demographic Questionnaire (n = 14)

Variables	EG		CG		*p*
	n	%	n	%	
Gender					1.00[a]
Male	4	57.1	3	42.9	
Female	3	42.9	4	57.1	
Education Levels					0 .80[b]
Junior High School	1	14.3	2	28.6	
Senior High School	5	71.4	4	57.1	
Bachelor Degree	1	14.3	1	14.3	
Age (years) (Min-Max = 45-50)	M = 48.00	SD = 1.63	M = 47.86	SD = 1.57	0.87[c]
Duration of DM (years) (Min-Max = 5-8)	M = 6.00	SD = 1.15	M = 5.71	SD = 0.75	0.59[c]

a Fisher's exact test; b Pearson chi-square test; c Independent-t-test; M = mean; SD = standard deviation

Effect of a Nurse Coaching Program on Behaviour of Preventing DM Complications

Table 2 showed the average score of the behaviours of preventing DM complications between the EG and the CG prior to getting the nurse coaching programme, which reported no significant difference ($t = 0.27$; $p >$

0.05). Yet, after obtaining the nurse coaching, the mean score of the preventive DM complications behaviours showed a significant difference between the EG and the CG ($t = -10.73$; $p < 0.05$).

Table 2: Comparison of the Pre-Test and Post-Test Mean Score of The Behaviours of Preventing DM Complications (BPDMC) Between EG and CG

Variable	EG		CG		95%CI		*t*	*p*
	M	SD	M	SD	Lower	Upper		
BPDMC								
Pre-test	54.14	13.33	56.43	17.59	-15.89	20.46	0.27	0.78
Post-test	89.14	3.53	49.43	9.12	3.69	-47.77	-10.73	0.00

M = Mean score; SD = standard deviation; p = p-value

Table 3 described the mean score of the behaviours of preventing DM complications within the EG and the CG. There was a significant difference in the mean score of behaviours for preventing DM complications before and after participating in the nurse coaching program in the EG ($p < 0.05$) and in the EG ($p > 0.05$).

Table 3: Pre-Test and Post-Test Mean Score of the BPDMC within EG and CG

Variable	Pre-test		Post test		95%CI		*t*	*p*
	M	SD	M	SD	Lower	Upper		
EG								
BPDMC	54.14	13.33	89.14	3.53	-46.20	-23.80	-7.64	0.00
CG								
BPDMC	56.43	17.59	49.43	9.12	-3.59	17.59	1.61	0.15

M = Mean score; SD = standard deviation; p = p-value

Effect of a Nurse Coaching Program on HbA1c levels

Table 4 explained that there was no significant difference in the mean score of HbA1c levels between the EG and the CG before receiving the nurse's coaching ($p > 0.05$). Nevertheless, following the program, there was a significant difference ($p < 0.05$) in the HbA1C levels between the EG and the CG.

Table 4: Comparison of the Pre-Test and Post-Test Mean Score of the Hba1c Level Between EG and CG

Variable	EG		CG		95%CI		*t*	*p*
	M	SD	M	SD	Lower	Upper		
HbA1c level								
Pre-test	7.08	0.97	7.05	0.90	-1.12	1.06	-0.57	0.95
Post-test	6.10	0.46	7.11	0.94	0.11	1.91	2.55	0.03

M = Mean score; SD = standard deviation; p = p-value

Table 5 shows that there was a significant difference in the mean score of the HbA1c level before and after receiving the nurse coaching program in the EG ($p < 0.05$), whereas in the EG ($p > 0.05$).

Table 5: Pre-Test and Post-Test Mean Score of the HbA1c level within EG and CG

Variable	Pre-test		Post test		95%CI		*t*	*p*
	M	SD	M	SD	Lower	Upper		
Experimental Group (EG)								
HbA1c level	7.08	0.97	6.10	0.46	0.47	1.49	4.75	0.00
Control Group (CG)								
HbA1c level	7.05	0.90	7.11	0.94	-0.30	0.18	-0.57	0.58

M = Mean score; SD = standard deviation; p = p-value

DISCUSSION

Demographic Data

The results of the study revealed that most of the respondents in the EG were males, while in the CG were

females. A study reported that as women get older, they are more likely to experience impaired insulin secretion, insulin action, or both, leading to hyperglycaemia (Magliano & Boyko, 2021). Most of the respondents graduated from senior high school, which reflects their knowledge regarding DM complication behaviours. A previous study reported that someone who graduated from senior high school had excellent knowledge regarding self-regulated learning that made them think abstractly and critically (Kesuma, Retnawati & Putranta, 2021). The finding of this study also explained that the mean age was significantly similar in both the EG (M = 48 years) and the CG (47.86). With increasing age, the self-efficacy of type 2 DM patients in performing complication prevention behaviours decreases. The average DM duration was not significantly different between the EG and the CG. A previous study explained that the duration of DM influences behaviours. The longer the DM duration, the better the behaviour (Kurtanty *et al*., 2023).

Effect of a Nurse Coaching Program on The Behaviours of Preventing DM Complications

The introduction of nurse coaching led to an improvement in preventing DM complications in this study. Dossey, Luck and Schaulb (2015) reported that TINC facilitates the respondent to improve her/his awareness and choice(s), which are vital for behavioural change. Besides that, there are five components of TINC; one of them is nurse coach self-development. This component requires respondents to independently report on their personal goals, action plans, readiness, priorities, and commitment to change. In addition, the interpersonal relationship proposed by Peplau (1997) also stimulated the behaviour change by constructing a relationship of mutual trust between a nurse and respondent. Without a relationship of mutual trust between nurses and respondents, nurses will not be able to get important information related to their health and achieve their goals.

The nurse coaching program was conducted sequentially every two weeks during a 12-week period. The first process was the orientation phase; The results of this phase could help the researcher obtain a deeper understanding of the respondent's desires, self-care activities, and beliefs. The second phase was identification; During the study, some of the respondents' reported challenges related to the DM diet. They explained that Indonesian culture has a routine for preparing numerous foods during celebrations, but they did not think about the amount of nutrients. Consequently, some respondents struggled to keep up with the challenges of implementing an appropriate DM diet. However, they explained the strategy for addressing these challenges. The strategy came from their principle of increasing self-awareness to remain and avoid certain foods during events. The strategy was enhanced by nurse coaching, which improved self-awareness, a fundamental aspect of behaviour change (Dossey, Luck & Schaulb, 2015). This finding was similar to a previous study, which conveyed that a highly committed person was able to maintain a stage of dietary improvement and regularly engage in various healthy behaviours (Jafari *et al.*, 2024).

The next phase was exploration; the respondents explored their actions that should be taken to achieve the goal(s), then prioritised those actions by listing which actions should be performed earlier, determining the due date to take the actions, and explaining the successful indicators that those actions had been completed. Conner *et al*. (2022) explained that prioritising actions in routine activities in daily life was a valuable strategy to encourage behaviour change. The final phase was termination. The researcher closed the nurse coaching session and asked for feedback from the respondents. Then, they set the time for the next coaching session. In this study, the follow-up was done every day by creating a WhatsApp group so the respondents could discuss matters related to their activities and manage the DM. Besides providing a nurse coaching program, the researchers also delivered individual education before nurse coaching started and distributed the Behaviours of Preventing DM Complications booklet both in the EG and in the CG. The main contents of the booklet are about the five pillars of type 2 DM management. These pillars are based on guidelines from the Endocrinology Society of Indonesia, known as Perkeni (Indonesia, 2021).

Effect of a Nurse Coaching Program on HbA1c Levels

The HbA1c level is not directly influenced by a nurse coaching programme. The programme serves as a clinical surrogate. There were some factors influencing the HbA1C level in the EG that demonstrated a significant reduction after receiving the nurse coaching program. The EG did well in the exploration phase of nurse coaching, which was the first reason for the study's HbA1c reduction. They performed the DM self-care activities based on the priorities that were set while conducting a nurse coaching session to achieve the goals.

This outcome aligns with previous studies showing that limiting calorie intake enhances cell activity and insulin demand while lowering glucose absorption. Eventually, the DM complications were prevented (Ansari *et al*., 2023; Ikeda, Yamaguchi & Nishi, 2025).

Physical exercise also improved the HbA1c. Each respondent receives a BPDMC booklet as a guideline for proper diabetes management. The American Diabetes Association Professional Practice Committee (2025) stated that regular exercise for at least 30 minutes a day for 3–5 days per week proved to reduce HbA1c. Another study reported that a 30% increase in all-cause mortality and a 40% increase in CVD mortality were linked to every 1% increase in HbA1c level (Ghanem *et al.*, 2025).

Limitation

The limitation of the study was that it was conducted within 12 weeks, which might not be enough time to evaluate a long-term behavioural change in patients with type 2 DM.

CONCLUSION

This pilot study confirms the acceptability and feasibility of implementing a nurse coaching programme. According to the results, the pilot study demonstrated that a nurse coaching programme integrating the TINC and interpersonal relationship theories could improve the prevention of DM complication behaviours and HbA1c level in patients with type 2 DM after the twelve-week programme.

This programme can be implemented by nurses in community or hospital settings. This programme is one of the crucial initiatives in the diabetes care unit of the public health centre in Indonesia, and it should be regarded as such by policymakers. To achieve Indonesia's goal of lowering the incidence of DM complications, a nurse coaching program has been implemented. The program's continued use, with a larger sample size and longer follow-up, is advised by the results to assess its sustainability and improve participants' behaviours related to diabetes complications. The future scope of the study is about nursing intervention to prevent DM complications. It includes exploring the long-term effectiveness of the nurse coaching program in preventing DM complications, as well as its impact on different demographic groups and healthcare settings. Additionally, further research could evaluate the integration of digital tools to enhance the program's reach and sustainability.

Conflict of Interest

The authors declare that they have no competing interest.

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