EXPERIMENTAL STUDY

Increasing self-care of patients with type-2 diabetes through implementation of nursing agency based on the health promotion model

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Abstract

Objective: To analyse the effect of nursing agency model on fasting and 2-hour postprandial glucose levels in type 2 diabetics.

Method: The quasi-experimental study was conducted from October to December 2021 in Lamongan, East Java, Indonesia, after approval from the ethics review committee of the University of Muhammadiyah, Lamongan, Indonesia. The sample comprised of type 2 diabetics of either gender aged 19-65 years who were able to move independently. The sample was divided into experimental group A, which was given nursing agency model training for six weeks, and control group B, which was only given diabetes treatment without any training. Patient self-care level was assessed using the Summary of Diabetes Self-Care Activities tool, while other variables were measured through fasting and 2-hour postprandial glucose levels. Data were analysed using a one-way covariance analysis test

Results: Of the 256 individuals assessed, 42(16.4%) met the inclusion criteria, and, of them, 30(71.4%) comprised the final sample; 10(33.3%) males and 20(66.6%) females. Overall, 19(63.3%) patients were aged >50 years, and duration of diabetes was 5-10 years in 23(76.7%) cases. There were 15(50%) patients in each of the two groups. There was significant difference in the mean scores of all dimensions of self-care behaviour between the groups, and it increased significantly in group A post-intervention (p=0.05). There was a significant decrease in fasting and 2-hour postprandial glucose levels in group A compared to group B post-intervention (p=0.001).

Conclusion: The application of the nursing agency model was found to be effective in increasing self-care ability and in reducing fasting and 2-hour postprandial blood glucose levels.

Keywords: Blood glucose, Fasting, Diabetes mellitus, Self-care, Nursing. (JPMA 73: S-130 [Suppl. 2]; 2023)

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Introduction

Diabetes mellitus (DM) is a complicated persistent disorder that calls for long-term treatment with multifactorial danger reduction strategies that go beyond glycaemic control.[1] People with M have a higher chance of developing a variety of serious and life-threatening fitness problems, leading to even higher hospitalisation costs, decreased quality of life (QOL), and increased mortality.[2] Ongoing patient self-control training and assistance are critical tools to prevent acute problems and to reduce the risk of long-term problems.[3]

DM is a persistent condition which affected 425 million people globally in 2017, with 79% of them residing in low- and middle-income countries (LMICs). The prevalence is anticipated to boom to 629 million by 2045. The illness affects 8.3% adults globally, with the largest group being of those aged 40-59 years. In addition, DM costs public finances a predicted United States $727 billion globally and accounts for 4 million deaths. Type 2 DM (T2DM), which causes 90% of the burden, is a disorder characterised by using B cell dysfunction and insulin resistance (IR), and, without adequate controls, results in macrovascular and microvascular complications.[4,5]

With the continuous increase in cases, the independence of DM sufferers needs to be encouraged. DM self-care currently being carried out includes DM diet education, DM treatment, physical activity, foot exercises and regular blood glucose control. Conditions with many patients who are unable to perform self-care are highly at risk of complications and even death. Short-term complications that can occur include hypoglycaemia and hyperglycaemic crisis / diabetic ketoacidosis, while long-term complications are macroangiopathic disorders, like coronary heart disease, foot ulcers, ischaemic stroke and haemorrhagic stroke, and microangiopathic disorders, like diabetic retinopathy, diabetic nephropathy and diabetic neuropathy.[1,5]

Increasing the patient's independence can be maximised by developing a 'nursing agency' theory based on self-care theory; a nursing agency is used because it has the advantage of developing the abilities/capacities of diabetic patients. This advantage can increase the patient's

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independence, especially in maintaining blood glucose levels within normal limits. The history of previous factors and environmental factors has not been studied optimally, as revealed by the Health Promotion Model (HPM) theory.[6]

The HPM theory examines in detail the history of the patient's health-related beliefs so that the nurses may intervene and take actions appropriate to such beliefs; these interventions can be promotive, preventive, and maintain the patient's condition.[6]

Uncontrolled blood sugar levels are caused by several factors, like feeling healthy, not regularly taking medicines, taking herbal medicines, and not following the recommended diet plan.[7]

Efforts should be made to normalise blood glucose levels in T2DM patients. There are 4 pillars of DM management: Education, Medical Nutrition Therapy, Physical Activity and Pharmacological Therapy.[5] The success of DM care requires a systematic approach to support efforts to change patient behaviour. Multidisciplinary team collaboration is very important in providing care to people with chronic illnesses, such as DM, especially facilitating patient self-care.[1] Health education has not always had meaningful success in terms of self-care, and there is a need to increase the independence of patients through the nursing agency model using a supportive, educative and counselling approach.

The current study was planned to analyse the effect of nursing agency model on fasting blood glucose (FBG) and 2-hour postprandial glucose (PPG) levels in T2DM patients.

Patients and methods

The quasi-experimental, non-randomised, case-control study[8] was conducted from October to December 2021 in Lamongan, East Java, Indonesia, after approval from the ethics review committee of the University of Muhammadiyah, Lamongan, Indonesia. The sample was raised using convenience sampling technique. Those included were T2DM patients of either gender aged 19-65 years having mild complications, such as mild and moderate hypertension (HTN), who were able to move independently and could read and write. Those excluded were T2DM patients with impaired activity or organ damage, like coronary heart disease and chronic renal failure, or had mental disorders, withdrew or had to be hospitalised at the time of the study, and those who were absent from all self-care management training sessions.

After taking informed consent from all the subjects, they were divided into intervention group A and control group B. Patients who were treated at the internal medicine polyclinic of the Diabetes Club of Muhammadiyah Hospital Lamongan, formed group A, while those treated at the Rumah Sakit Umum Daerah (RSUD; regional public hospital) Dr Soegiri, Lamongan, which is a referral centre in the region, formed group B.

Group A was given a module and training for six weeks, while the control group was only given a DM treatment module without any training. The independent variable was the application of the nursing agency module based on HPM.[8] The interventions included information on nursing care and DM counselling related to the 4 pillars of handling T2DM patients, according to 2019 recommendations of the Indonesian Endocrinology Association (PERKENI).[5] The application of the nursing agency model takes about 6 hours of self-care education and training, and is followed by practice and discussion. At the beginning of each session, the researchers asked the participants about the learning done on the preceding day, the trigger factors for the onset of symptoms, and then reviewed the self-care activities (SCAs) that had been carried out at home. Also, the sessions involved experiences with disease problems, discussion about alternative solutions and counselling. Patient progress was recorded on a proforma.

The intervention module was based on the result of a focus group discussion (FGD) with 10 T2DM patients and related stakeholders, like doctors, nurses and nutritionists, to find out the experiences and obstacles in T2DM management in the light of HPM[6]. The nursing agency intervention module covers 5 topics of self-care,[5,9,10] education about T2DM, diet, physical activity, glucose checking, and self-care of feet. Additional health information was given to the respondents according to their needs. The dependent variables were self-care, FBG, 2-hour PPG levels. SCA was measured using the Summary of Diabetes Self-care Activity (SDSCA) questionnaire,[11,12] which was adopted from earlier studies.[9,12,13] Validity and reliability of the instrument was established (r=0.917). FBG and PPG levels were measured using the electrophoresis method. SCAs, FPG, and PPG data were observed before the intervention and 3 months after the intervention

Data were analysed using the one-way covariance analysis (ANCOVA) test. to determine the effect of the Nursing Agency model on SCAs, FPG, and PPG. Baseline and post-intervention data were normally distributed, as shown by the Kolmogorov-Smirnov test. $P<0.05$ was considered statistically significant.

Results

Of the 256 individuals assessed, 42(16.4%) met the inclusion criteria, and, of them, 30(71.4%) comprised the

Tabl-1: Demographic characteristics.

Characteristics	n (%)
Gender	
Male	10 (33.3)
Female	20 (63.7)
Age	
31-45 years	7 (23.3)
46-50 years	4 (13.3)
>50 years	19 (63.3)
Duration suffering from Diabetes	
< 1 year	1 (3.3)
1-4 years	4 (13.3)
5-10 years	23 (76.7)
>10 years	2 (6.7)
Level of education	
Elementary education	4 (13.3)
Secondary education	8 (26.7)
Higher education	18 (60)
Work	
Entrepreneur	6 (20)
Farmer	3 (10)
Retired	6 (20)
Private	14 (46.7)
Housewife	1 (3.3)
Income	
<Minimum income	20 (66.7)
>Minimum income	10 (33.3)
Marriage history	
Married	28 (93.3)
Not married yet	2 (6.7)

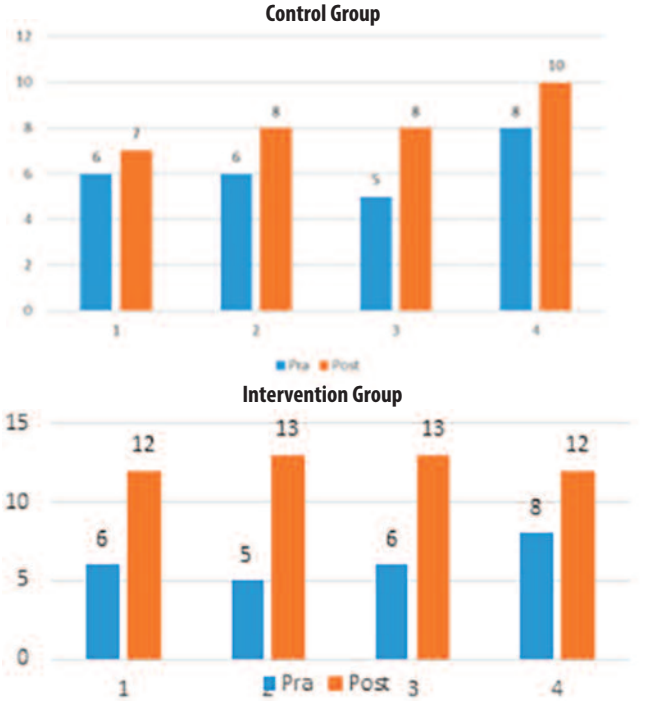
Tabl-2: Comparative analysis of SDSCA, fasting blood glucose (FBG) and 2-hour postprandial (PP) levels between the groups.

Variable		Group		n	*p*-value
		Intervention Mean±SD	Control Mean±SD		
SDSCA	Pre test	35.40±8.72	24.25±7.51	30,895	0.000
	Post test	51.40±8.7	29.26±10.06		
FBG level	Pre test	132.67±34.69	175.27±68.97	15,101	0.010
	Post test	114.47±13.84	162.07±5.13		
2-hour PP level	Pre test	204.67±63.60	263.13±90.99	70,000	0.000
	Post test	180.80±38.03	267.80±84.77		

SDSCA: Summary of diabetes self-care activity, SD: Standard deviation.

final sample; 10(33.3%) males and 20(66.6%) females. Overall, 19(63.3%) patients were aged >50 years, duration of diabetes was 5-10 years in 23(76.7%) cases, 18(60%) had higher-level education, 14(46.7%) were employed in the private sector, and 28(93.3%) were married (Table 1). There were 15(50%) patients in each of the two groups.

There was a significant difference in the mean score of all dimensions of self-care activity between groups (Figure), and it increased significantly in group A post-intervention (p=0.001). There was a significant decrease in 2-hour FBG and PPG levels in group A compared to post-intervention group B (Table 2), FBG was obtained (p=0.010) and PPG was obtained (p=0.001).



SDSCA: Summary of diabetes self-care activity, 1: Diet, 2: Physical activity, 3: Glucose check, 4: Footcare.

Figure: Comparison of SDSCA scores between the groups.

Discussion

There were differences in SCAs in the two groups. In the intervention group, it increased by 16 points, while in the control group, it increased by 5.01 points. The finding is supported by a previous study.[14] It has been suggested that the nursing agency model in intervention studies includes doing for others, leading others, providing support and motivation, and teaching or educating others,[8] as well as providing a supportive educational system that can improve patient SCA.[15] The application of the HPM approach increases the perceived benefits of DM self-management, perceived self-efficacy, social support and situational influence,[16] taking into account the 4 pillars of DM management.[5]

In the current study, the level of physical activity increased significantly in the current intervention group. The model promotes healthy behaviour and behavioural change by targetting important and influential behavioural elements.[17] The findings indicated that post-intervention awareness of the benefits of physical activity increased in the intervention group, because HPM-based training programmes are able to create a more positive perspective on the benefits of physical activity in patients.[18] Similar results have been reported earlier.[19]

In the current study, FBG levels decreased significantly in the intervention group, while the control group did not meet the standard levels. In the intervention group, there was an increase in the SDSCA score, especially in diet and physical activity behaviour which strongly correlated with FBG levels. The findings are consistent with previous research.[20] In general, initially, DM patients have less specific health literacy knowledge about diabetes,[21] and, therefore, intervention is needed to improve glucose control in DM patients who have low literacy.[22] Limiting carbohydrates and increasing physical activity can help maximise the metabolic benefits achieved.[23] Also, doing moderate levels of physical activity for 150 minutes a week is known to be effective in preventing and managing diabetes.[24]

In the current study, 2-hour PPG levels decreased in the intervention group, while the control group did not meet the standard level, indicating increased metabolism and increased body insulin sensitivity.[25,26] A structured exercise programme is highly recommended in T2DM patients to reduce insulin resistance[27]. Health professionals are best suited to help DM patients improve self-efficacy in managing DM, controlling glycaemia, and improving self-care.[28]

Factors like attitude of family members towards social education and physical activity also play a part.[29] Since social support and physical activity behaviour are inter-linked, family and community interventions are suggested to increase the level of social support for exercise and to increase the level of physical activity in T2DM patients.[30]

The current study has its limitations as the sample size was not calculated, and the sample size was small owing to the fact that most people lived far from the health facilities that were part of the study. Also, self-reported data allows for recall and other biases. Finally, the follow-up period was only 3 months. In this short period the behaviour changes were not optimal so it was difficult to evaluate the effectiveness of the intervention. Long-term observation is recommended for improving the self-care activities of DM patients and make them independent in self-management.

Conclusion

The nursing agency model based on HPM can be used to explain the health behaviour of diabetic patients by increasing health literacy and self-efficacy.

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References

1. American Diabetes Association. Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes-2018. Diabetes Care 2018;41(Suppl 1):s13-27. doi: 10.2337/dc18-S002.
2. Cho NH, Shaw JE, Karuranga S, Huang Y, da Rocha Fernandes JD, Ohlrogge AW, et al. IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. Diabetes Res Clin Pract 2018;138:271-81. doi: 10.1016/j.diabres.2018.02.023.
3. Davies MJ, D'Alessio DA, Fradkin J, Kernan WN, Mathieu C, Mingrone G, et al. Management of hyperglycaemia in type 2 diabetes, 2018. A consensus report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). Diabetologia 2018;61:2461-98. doi: 10.1007/s00125-018-4729-5.
4. Pantalone KM, Misra-Hebert AD, Hobbs TM, Ji X, Kong SX, Milinovich A, et al. Clinical Inertia in Type 2 Diabetes Management: Evidence From a Large, Real-World Data Set. Diabetes Care 2018;41:e113-4. doi: 10.2337/dc18-0116.
5. Indonesian Diabetes Association and Indonesian Society of Endocryology. Management and Prevention Guidelines Prediabetes in Indonesia 2019. Surabaya, Indonesia: Airlangga University Press; 2020.
6. Zhang P, Hu YD, Xing FM, Li CZ, Lan WF, Zhang XL. Effects of a nurse-led transitional care program on clinical outcomes, health-related knowledge, physical and mental health status among Chinese patients with coronary artery disease: A randomized controlled trial. Int J Nurs Stud 2017;74:34-43. doi: 10.1016/j.ijnurstu.2017.04.004.
7. Ministry of Health Republic of Indonesian. Key results of Riskesdas. [Online] 2018 [Cited 2022 December 29]. Available from URL: https://kesmas.kemkes.go.id/assets/upload/dir_519d41d8cd98f00/files/Hasil-riskesdas-2018_1274.pdf
8. Self- Care Theory in Nursing: Selected Papers of Dorothea Orem. In: Renpenning KM, Taylor SG, eds. New York, USA: Springer Publishing Company, Inc; 2003.
9. Becker H, Stuifbergen AK, Sands D. Development of a scale to measure barriers to health promotion activities among persons with disabilities. Am J Health Promot 1991;5:449-54. doi: 10.4278/0890-1171-5.6.449.
10. Borji M, Otaghi M, Kazembeigi S. The Impact of Orem ' s Self-care Model on the Quality of Life in Patients with Type II Diabetes. Biomed Pharmacol J 2017;10:213–20. DOI: 10.13005/bpj/1100.
11. Toobert DJ, Hampson SE, Glasgow RE. The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. Diabetes Care 2000;23:943-50. doi: 10.2337/diacare.23.7.943.
12. Shabibi P, Zavareh MSA, Sayehmiri K, Qorbani M, Safari O, Rastegarimehr B, et al. Effect of educational intervention based on the Health Belief Model on promoting self-care behaviors of type-2 diabetes patients. Electron Physician 2017;9:5960-8. doi: 10.19082/5960.
13. Klein S, Cohn SM, Alpers DH. Alimentary tract in nutrition. Mod Nutr Heal Dis 2006;2006:1115–42.
14. Allahyari J, Shirani N, Mansouri A, Sargolzaei MSS. Effect of Continuous Care Model on Self-care Behaviors in Patients with

Diabetes. J Diabetes Nurs2017;5:332-40.

15. Alligood MR. Nursing Theorists and Their Work, 9th ed. St. Louis, Missouri: Elsevier Inc; 2018.
16. Kurnia AD, Amatayakul A, Karuncharernpanit S. Diabetes Self Management among Adults with Type 2 Diabetes Mellitus in Malang, Indonesia. Int J Trop Med 2017;12:25–8.
17. Taymoori P, Niknami S, Berry T, Lubans D, Ghofranipour F, Kazemnejad A. A school-based randomized controlled trial to improve physical activity among Iranian high school girls. Int J Behav Nutr Phys Act 2008;5:18. doi: 10.1186/1479-5868-5-18.
18. Zamani-Alavijeh F, Araban M, Koohestani HR, Karimy M. The effectiveness of stress management training on blood glucose control in patients with type 2 diabetes. Diabetol Metab Syndr 2018;10:e39. doi: 10.1186/s13098-018-0342-5.
19. Rahimian M, Mohammadi M, Mehri A, Rakhshani MH. Impact of performing health promotion model intervention on physical activity of health volunteer of Torbat-E-Jam City, Iran. International Archives of Health Sciences 2016;3:87-91.
20. Tseng HM, Liao SF, Wen YP, Chuang YJ. Stages of change concept of the transtheoretical model for healthy eating links health literacy and diabetes knowledge to glycemic control in people with type 2 diabetes. Prim Care Diabetes 2017;11:29-36. doi: 10.1016/j.pcd.2016.08.005.
21. Abdullah A, Liew SM, Salim H, Ng CJ, Chinna K. Prevalence of limited health literacy among patients with type 2 diabetes mellitus: A systematic review. PLoS One 2019;14:e0216402. doi: 10.1371/journal.pone.0216402.
22. Bailey SC, Brega AG, Crutchfield TM, Elasy T, Herr H, Kaphingst K, et al. Update on health literacy and diabetes. Diabetes Educ 2014;40:581-604. doi: 10.1177/0145721714540220.
23. Magkos F, Hjorth MF, Astrup A. Diet and exercise in the prevention and treatment of type 2 diabetes mellitus. Nat Rev Endocrinol 2020;16:545-55. doi: 10.1038/s41574-020-0381-5.
24. Cosansu G, Celik S, Özcan S, Olgun N, Yıldırım N, Gulyuz Demir H. Determining type 2 diabetes risk factors for the adults: A community based study from Turkey. Prim Care Diabetes 2018;12:409-15. doi: 10.1016/j.pcd.2018.05.001.
25. Yang D, Yang Y, Li Y, Han R. Physical Exercise as Therapy for Type 2 Diabetes Mellitus: From Mechanism to Orientation. Ann Nutr Metab 2019;74:313-21. doi: 10.1159/000500110.
26. Dugan JA. Exercise recommendations for patients with type 2 diabetes. JAAPA 2016;29:13-8. doi: 10.1097/01.JAA.0000475460.77476.f6.
27. Sampath Kumar A, Maiya AG, Shastry BA, Vaishali K, Ravishankar N, Hazari A, et al. Exercise and insulin resistance in type 2 diabetes mellitus: A systematic review and meta-analysis. Ann Phys Rehabil Med 2019;62:98-103. doi: 10.1016/j.rehab.2018.11.001.
28. ElGerges NS. Effects of therapeutic education on self-efficacy, self-care activities and glycemic control of type 2 diabetic patients in a primary healthcare center in Lebanon. J Diabetes Metab Disord 2020;19:813-21. doi: 10.1007/s40200-020-00567-4.
29. Hosseini, E., Farzan, F. An Examination of the Role of Social Support in Women's Sport Commitment to Sports. Sport Management Journal 2018;10:137-48. doi: 10.22059/jsm.2018.203847.1606.
30. Dehghani-Tafti A, Mazloomy Mahmoodabad SS, Morowatisharifabad MA, Afkhami Ardakani M, Rezaeipandari H, Lotfi MH. Determinants of Self-Care in Diabetic Patients Based on Health Belief Model. Glob J Health Sci 2015;7:33-42. doi: 10.5539/gjhs.v7n5p33.