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Intervención y cuidados nutricionales individualizados en pacientes con diabetes mellitus de tipo 2 combinada con infarto

Individualised nutritional intervention and care in patients with type 2 diabetes mellitus combined with a heart attack

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Individualised nutritional intervention and care in patients with type 2 diabetes *mellitus* combined with a heart attack

Intervención y cuidados nutricionales individualizados en pacientes con diabetes mellitus de tipo 2 combinada con infarto

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ABSTRACT

Introduction: diet and nutrition interventions may prove more effective than drug interventions in reducing hyperglycaemia in patients with type 2 diabetes *mellitus* (DM). However, as individual responses to nutritional strategies can vary, it is crucial to develop tailored nutritional interventions to effectively manage hyperglycaemia.

Objective: to assess the effectiveness of individualised nutritional intervention and care in patients diagnosed with type 2 DM and concurrent heart attack.

Methods: this randomised controlled trial involved participants diagnosed with both type 2 DM and a recent heart attack. The intervention group received customised nutritional counselling and dietary plans adapted to their medical conditions, whereas the control group adhered to regular dietary recommendations. Baseline measures, including blood glucose levels, lipid profiles, and cardiac markers, were recorded and analysed between the groups.

Results: substantial improvements were observed in the health parameters of the intervention group. Notably, there were reductions in postprandial blood glucose levels, enhancements in lipid profiles, and more favourable cardiac marker profiles compared with those in the control group. The results also underscored the practicality and effectiveness of personalised nutritional interventions in clinical settings.

Conclusions: individualised nutritional intervention and care positively impacted the health outcomes of patients with type 2 DM and a recent heart attack, highlighting the value of personalised care approaches.

Keywords: Nutritional intervention. Clinical care. Type 2 diabetes *mellitus*. Myocardial infarction. Rehabilitation outcomes.

RESUMEN

Introducción: las intervenciones dietéticas y nutricionales pueden ser más eficaces que las farmacológicas para reducir la hiperglucemia en pacientes con diabetes de tipo 2. Sin embargo, debido a que las respuestas individuales a las estrategias nutricionales pueden variar, es fundamental desarrollar intervenciones nutricionales a medida para controlar eficazmente la hiperglucemia.

Objetivo: evaluar la efectividad de la intervención nutricional personalizada y la atención en pacientes diagnosticados de diabetes de tipo 2 complicada con infarto.

Métodos: este ensayo aleatorizado controlado involucró a participantes diagnosticados con diabetes de tipo 2 y ataques cardíacos recientes. El grupo de intervención recibió asesoramiento nutricional personalizado y planes dietéticos adaptados a sus condiciones médicas, mientras que el grupo de control siguió las recomendaciones dietéticas habituales. Se registraron y analizaron las mediciones de referencia entre los dos grupos, incluidos los

niveles de glucosa en sangre, el estado lipídico y los marcadores cardíacos.

Resultados: los parámetros de salud del grupo de intervención mejoraron significativamente. Cabe señalar que los niveles de azúcar en sangre posprandial disminuyeron, los niveles de lípidos aumentaron y los niveles de marcadores cardíacos fueron más favorables que los del grupo de control. Los resultados del estudio también destacan la utilidad y eficacia de las intervenciones nutricionales personalizadas en entornos clínicos.

Conclusión: las intervenciones nutricionales personalizadas y la atención han tenido un impacto positivo en los resultados de salud de pacientes con diabetes tipo 2 y ataques cardíacos recientes, destacando el valor de los métodos de atención personalizados.

Palabras clave: Intervención nutricional. Atención clínica. Diabetes de tipo 2. Infarto de miocardio. Resultados de la rehabilitación.

INTRODUCTION

Diabetes *mellitus* (DM) is a prevalent clinical condition characterised by continuously elevated blood glucose levels. It is estimated that by 2030, around 360 million people globally will be affected by this condition (1-3). Persistent hyperglycaemia poses serious health threats, impairing bodily functions and increasing the risk of cardiovascular and cerebrovascular diseases (4,5). Individuals with type 2 DM are particularly susceptible to cardiovascular issues, facing a threefold higher risk of acute myocardial infarction compared with those without diabetes. Coronary artery disease remains a leading cause of death among patients with type 2 DM, also causing a substantial increase in macrovascular complications (6,7). Despite advancements in medical treatments, managing blood glucose instability continues to be a formidable challenge. Therefore, the daily

nutritional rehabilitation nursing of diabetic patients is of paramount importance, especially in controlling blood glucose levels (8,9).

Currently, primary diabetes medications include metformin, sulfonylureas, GLP-1 receptor agonists, and SGLT-2 receptor antagonists. These medicines play a crucial role in managing diabetes by reducing elevated blood glucose levels (10-13). However, it is important to note that each medication carries its own set of side effects and safety concerns, such as hypoglycaemia, weight gain, and even cardiovascular events (13-15). This underscores the necessity for careful consideration and personalised approaches in selecting and administering these medications to patients with type 2 DM. Balancing the benefits of blood glucose control with the potential risks associated with each medication is essential for optimising overall diabetes management (16). Elderly patients with type 2 DM often find it challenging to understand diabetes and its complications, making effective cooperation with doctors difficult due to reduced tolerance, weakened memory, and heightened psychological sensitivity (17,18). In this context, nutritional intervention combined with personalised nursing is particularly crucial. It can effectively help analyse patients' rehabilitation needs and implement personalised interventions in psychology, medication, diet, rehabilitation training, and other aspects tailored to their specific needs, thus improving treatment outcomes (19-21).

Studies on elderly diabetic patients are limited, which makes it essential to improve treatment outcomes through comprehensive nutrition management and nursing measures. The objective of this study is to enhance blood glucose control and cardiovascular prognosis, especially in elderly patients with type 2 DM. The ultimate aim is to reduce the mortality gap between patients with type 2 diabetes and non-diabetic patients.

MATERIALS AND METHODS

Participants

This study was conducted at our hospital and included 60 patients with type 2 diabetes combined with myocardial infarction between April 2021 and March 2023. The patients were randomly assigned to either a control group or a nursing group. The control group comprised 30 cases, with a men-to-women ratio of 22:8 and an average age of 70.23 ± 1.06 years. The nursing group also included 30 cases, with a men-to-women ratio of 21:9 and an average age of 70.18 ± 1.11 years.

The inclusion criteria were as follows: patients 1) meeting diagnostic criteria for type 2 DM and myocardial infarction; 2) at least 60 years old; and 3) providing informed consent and signature. The exclusion criteria were as follows: patients 1) with organ failure, malignant tumours, or mental illness; and 2) lacking necessary data.

Type 2 DM was diagnosed based on typical symptoms, such as polydipsia, polyphagia, polyuria, and unexplained weight loss, coupled with a random blood glucose level of > 11.1 mmol/L, a fasting blood glucose level of > 7.0 mmol/L, a blood glucose level of > 11.1 mmol/L 2 hours post-meal, or a glycosylated haemoglobin level of > 6.5 %. Myocardial infarction was defined by myocardial ischemic symptoms and troponin concentrations higher than the 99th percentile, new ECG evidence of ST-segment elevation or left bundle branch block, or angiographic evidence of coronary artery occlusion.

This study was approved by the Ethics Committee of North China Petroleum Bureau General Hospital, and all participants were provided with written information about the study and gave their written informed consent prior to participation.

Patient intervention

All patients underwent a nutritional intervention that involved crafting a diet plan tailored to their individual health conditions and nutritional needs. This diet focused on coarse grains, ensuring a sufficient intake of dietary fibre, vitamins, minerals, and trace elements. It eliminated

added sugars, maintaining a carbohydrate energy supply ratio of approximately 55 %, and required patients to abstain from oils and spicy foods.

The interventions should be conducted as follows:

1. Psychological nursing: engage actively with patients by evaluating their backgrounds, lifestyles, and interests. Provide tailored health education, highlighting the critical role of rehabilitation training. Continuously assess and address the psychological states of patients, offering solutions tailored to enhance emotional well-being. Teach patients emotional management skills and encourage engaging in positive distractions such as reading, watching television, and listening to music. Maintain robust communication with patients' families to reinforce family intervention and meet the reasonable needs of patients.
2. Medication instruction: regularly instruct patients on the correct use of hypoglycaemic drugs as prescribed by their doctors. Educate patients about the drugs to prepare them for any potential adverse reactions. Advise patients to promptly contact their doctor if they experience any discomfort to prevent conditions from worsening. Administer insulin subcutaneously if necessary to control blood glucose levels.
3. Rehabilitation exercise: Monitor patients' conditions and develop effective rehabilitation plans based on their specific complaints and cardiac function indicators. Initiate functional training when the patient's condition stabilises, beginning with bed exercises. Gradually introduce limb movements and progress to standing, walking, and outdoor activities, aligning with the patient's recovery timeline. Encourage self-care practices and normal physical activities after 21 days.

Clinical examination

Following treatment, fasting blood glucose, postprandial blood glucose, and glycosylated haemoglobin levels were assessed. Cardiac function was evaluated through measurements of the left ventricular ejection fraction (LVEF), stroke volume, the rate of increase in left ventricular pressure, and heart rate. Cardiovascular events such as cardiac death, recurrence of acute myocardial infarction, intractable angina pectoris, and severe ventricular arrhythmia were also recorded. Laboratory indicators included total blood protein, albumin, urea, haemoglobin, total bilirubin, white blood cell count, neutrophil counts, and lymphocyte counts.

Questionnaire survey

The patients' quality of life was assessed using the ThemOS 36-Item Short Form Health Survey, focusing on vitality, physiological function, emotional function, and social function. The self-rating anxiety scale (SAS) and self-rating depression scale (SDS) were used to evaluate patients' mood post-treatment, with higher scores indicating more severe mood disturbances. A questionnaire survey was conducted, categorising the results into three levels of satisfaction: very satisfied, generally satisfied, and dissatisfied. The final satisfaction was calculated using the following formula: (very satisfied + generally satisfied) / number of cases × 100 %.

Statistical analysis

Statistical analyses were performed using SPSS software, version 26.0 (IBM Corp, Armonk, USA). The independent samples t-test or chi-square (χ^2) test was utilised for group comparisons. The Anderson-Darling test was used to check the normal distribution of continuous variables. For normally distributed data, the results were expressed as mean ± standard deviation ($\overline{x} \pm s$). All tests were two-tailed, and a *p*-value of < 0.05 was considered statistically significant.

RESULTS

Control of blood glucose and cardiovascular function

As shown in table I, the fasting blood glucose, 2-hour postprandial blood glucose, glycosylated haemoglobin, and protein levels of patients in the control group were 7.55 ± 1.19 mmol/L, 9.33 ± 1.01 mmol/L, and 7.86 % ± 0.75 %, respectively. For the patients in the nursing group, these values were 6.33 ± 0.46 mmol/L, 8.29 ± 0.38 mmol/L, and 6.33 ± 0.27 %, respectively. All blood glucose indicators in the nursing group were lower than those in the control group, and the differences were statistically significant ($p < 0.05$). Additionally, the LVEF, stroke volume, rate of left ventricular pressure rise, and heart rate for the control group were 61.26 % ± 5.33 %, 69.21 ± 5.18 mL, 1,168.66 ± 69.22 mmHg/s, and 79.25 ± 4.22 beats/min, respectively. In contrast, the nursing group recorded values of 71.55 % ± 2.02 %, 79.23 ± 2.05 mL, 1,321.06 ± 26.36 mmHg/s, and 71.22 ± 1.66 beats/min, respectively. The LVEF, stroke volume, and rate of increase in left ventricular pressure were higher in the nursing group, whereas the heart rate was lower compared with the control group; these differences were statistically significant ($p < 0.05$).

As indicated in table II, regarding the incidence of adverse cardiovascular events, the control group experienced two cases of cardiac death, three cases of acute infarction recurrence, four cases of intractable angina, and three cases of severe ventricular arrhythmia, resulting in an overall incidence rate of 40 %. Conversely, the nursing group had only two cases of acute infarction recurrence and one case of intractable angina pectoris, with an overall incidence of 10 %. The incidence of adverse cardiovascular events was significantly lower in the nursing group than in the control group, with the differences being statistically significant ($p < 0.05$).

We also assessed differences in serum indicators between the groups. There were no substantial differences in serum total protein, albumin, haemoglobin, cholesterol, leukocytes, neutrophils, and lymphocytes between the two groups. However, the serum urea concentration was 6.24 ± 0.84 mmol/L in the nursing group and 7.39 ± 2.01 mmol/L in the control group, a statistically significant difference (table III). It is important to note that all serum indicators remained within normal values.

Quality of life, psychological status and treatment satisfaction of patients

As shown in table IV, the vitality status score, physiological functioning score, functioning score, and social functioning score in the control group were 61.99 ± 8.96, 60.47 ± 8.96, 62.88 ± 8.16, and 63.85 ± 8.25, respectively. In the nursing group, these scores were 72.23 ± 3.09, 73.25 ± 3.12, 75.96 ± 3.08, and 74.36 ± 3.49, respectively. All quality-of-life indicators in the nursing group were higher than those in the control group, with the differences being statistically significant ($p < 0.05$). Additionally, the SAS and SDS scores in the control group were 32.16 ± 2.12 and 30.26 ± 2.05, respectively, whereas in the nursing group, they were 46.26 ± 5.68 and 42.86 ± 5.33, respectively. All psychological condition indicators in the nursing group were higher than those in the control group, indicating statistically significant differences ($p < 0.05$).

As indicated in table V, regarding patient satisfaction with medical care, the control group reported seven cases of ‘very satisfied’, 15 cases of ‘fairly satisfied’, and eight cases of ‘not satisfied’, resulting in an overall satisfaction rate of 73.3 %. Conversely, the nursing group reported 11 cases of ‘very satisfied’, 18 cases of ‘fairly satisfied’, and only one case of ‘not satisfied’, leading to an overall satisfaction rate of 96.7 %. The satisfaction levels of patients in the nursing group were significantly higher than those in the control group, with the differences being statistically significant ($p < 0.05$).

DISCUSSION

Type 2 DM combined with heart attacks in the elderly is a relatively common condition. The coexistence of these two conditions can lead to more severe health complications, necessitating a comprehensive medical and nursing approach to management and treatment (22-24). In this study, patients with type 2 DM who experienced heart attacks received nutritional interventions and clinical nursing care. This approach facilitated the effective monitoring of patients' psychological status. Through various methods of emotional guidance and support, patients' inner worries and fears were alleviated, enhancing their cooperation with the treatment. Consequently, in terms of rehabilitation, the study group exhibited lower glycaemic indexes, improved cardiac function, and reduced anxiety and depression. Additionally, the combined application of nutritional intervention and clinical care addressed the adverse effects of medication by instructing patients on its correct use. With the stabilisation of their conditions, effective rehabilitation training was also implemented, which had a preventative impact on relevant adverse events, resulting in lower cardiovascular adverse events in the study group. After receiving comprehensive and effective nursing care, the patients' recovery accelerated, thereby enhancing their quality of life. The quality-of-life scores of the study group were higher than those of the control group, underscoring the substantial value of the nutritional and clinical nursing interventions. Moreover, the study group's satisfaction with nursing care reached 97.56 %, which was markedly higher than that of the control group. This study provides a validated nursing approach for the clinical treatment and care of patients with type 2 DM and heart attacks.

For elderly patients, the probability of developing type 2 DM is extremely high, and the threat to their health and lives is increasing (25,26). In recent years, the number of elderly people has been rising, leading to an increase in the prevalence of various geriatric diseases

(27,28). The causes of type 2 DM are complex and closely related to biological damage and insulin secretion dysfunction. As the disease progresses, patients may also develop a variety of renal, cerebral, cardiac, and fundus comorbidities (29,30).

Myocardial infarction, an extremely common clinical cardiovascular disease, occurs due to atherosclerosis of the coronary arteries, leading to ischemia and hypoxia of the myocardium (29,31). Patients with this condition often experience substantial chest pain and show abnormalities on electrocardiograms; in severe cases, shock and heart failure may occur. Attacks can be triggered by overexertion, emotional disturbance, overeating, straining to defecate, alcohol abuse, or smoking. Myocardial infarction may also lead to complications such as cardiac rupture, ventricular wall thrombosis, arrhythmia, heart failure, post-infarction syndrome, and focal fibrosis, with older patients being at higher risk (32). Consequently, timely treatment and early intervention are generally advocated in clinical settings to protect the health and safety of these patients. During treatment, it is crucial to incorporate effective nursing guidance to optimise the therapeutic effect (33).

Nutritional intervention and clinical care form a substantial part of the care model, which places a strong emphasis on supporting the patient’s recovery process. This approach allows for an effective analysis of the patient’s recovery needs and for tailoring interventions in psychological support, medication, diet, and rehabilitation training accordingly. This comprehensive care helps to mitigate relevant interference factors and risk factors, enhancing therapeutic outcomes (34,35).

Combining clinical care with nutritional therapy provides an effective care process for elderly patients with type 2 DM and heart attacks. This integration aids healthcare teams in delivering more consistent care, reducing inconsistencies and errors in patient management, and ultimately improving the quality of care (36,37).

This study has some limitations, including the small study population, which may have resulted in insufficient statistical power, thereby reducing the reliability and generalisability of the study's results. The diversity of the population means that a small sample is likely to introduce selection bias, rendering the findings less comprehensive and representative. Additionally, the study lacked extended follow-up; insufficient follow-up time may prevent a thorough understanding of the long-term impacts of the treatment, thus failing to adequately assess the durability and long-term safety of the intervention. Long-term follow-up is crucial for observing potential changes in treatment effects, detecting side effects belatedly, and monitoring for recurrence of the disease. However, constraints related to resources and time made it challenging for us to conduct follow-up over a sufficiently extended period.

CONCLUSIONS

Individualised nutritional intervention and care appear to have beneficial effects on health outcomes in patients with type 2 DM who have recently experienced a heart attack. Considering the specific needs of patients with chronic conditions, developing personalised nutrition strategies is crucial for enhancing overall healthcare approaches for this patient population.

REFERENCES

1. Lovic D, Piperidou A, Zografou I, Grassos H, Pittaras A, Manolis A. The Growing Epidemic of Diabetes Mellitus. Curr Vasc Pharmacol 2020;18(2):104-9. DOI: 10.2174/1570161117666190405165911
2. Zimmet P, Alberti KG, Magliano DJ, Bennett PH. Diabetes mellitus statistics on prevalence and mortality: facts and fallacies. Nat Rev Endocrinol 2016;12(10):616-22. DOI: 10.1038/nrendo.2016.105
3. Glovaci D, Fan W, Wong ND. Epidemiology of Diabetes Mellitus and Cardiovascular Disease. Curr Cardiol Rep 2019;21(4):21. DOI: 10.1007/s11886-019-1107-y
4. Bigna JJ, Nansseu JR, Katte JC, Noubiap JJ. Prevalence of prediabetes and diabetes mellitus among adults residing in Cameroon: A systematic review and meta-analysis. Diabetes Res Clin Pract 2018;137:109-18. DOI: 10.1016/j.diabres.2017.12.005
5. Tu WJ, Xue Y, Nie D. The Prevalence and Treatment of Diabetes in China From 2013 to 2018. JAMA 2022;327(17):1706. DOI: 10.1001/jama.2022.3014
6. Tonyan ZN, Nasykhova YA, Danilova MM, Glotov AS. Genetics of macrovascular complications in type 2 diabetes. World J Diabetes 2021;12(8):1200-19. DOI: 10.4239/wjd.v12.i8.1200
7. Viigimaa M, Sachinidis A, Toumpourleka M, Koutsampasopoulos K, Alliksoo S, Titma T. Macrovascular Complications of Type 2 Diabetes Mellitus. Curr Vasc Pharmacol 2020;18(2):110-6. DOI: 10.2174/1570161117666190405165151
8. Lv S, Yu S, Chi R, Wang D. Effects of nutritional nursing intervention based on glycemic load for patient with gestational diabetes mellitus. Ginekol Pol 2019;90(1):46-9. DOI: 10.5603/GP.2019.0007
9. Ge Y. Effect of Standardized Nutritional Intervention in Patients with Nasopharyngeal Carcinoma Receiving Radiotherapy

Complicated with Diabetes Mellitus. Dis Markers 2022;2022:6704347. DOI: 10.1155/2022/6704347

10. Frieling K, Monte SV, Jacobs D, Albanese NP. Weight loss differences seen between glucagon-like peptide-1 receptor agonists and sodium-glucose cotransporter-2 inhibitors for treatment of type 2 diabetes. J Am Pharm Assoc (2003) 2021;61(6):772-7. DOI: 10.1016/j.japh.2021.06.015
11. Palmer SC, Tendal B, Mustafa RA, Vandvik PO, Li S, Hao Q, et al. Sodium-glucose cotransporter protein-2 (SGLT-2) inhibitors and glucagon-like peptide-1 (GLP-1) receptor agonists for type 2 diabetes: systematic review and network meta-analysis of randomised controlled trials. BMJ 2021;372:m4573. DOI: 10.1136/bmj.m4573
12. Li S, Vandvik PO, Lytvyn L, Guyatt GH, Palmer SC, Rodriguez-Gutierrez R, et al. SGLT-2 inhibitors or GLP-1 receptor agonists for adults with type 2 diabetes: a clinical practice guideline. BMJ 2021;373:n1091. DOI: 10.1136/bmj.n1091
13. Shi Q, Nong K, Vandvik PO, Guyatt GH, Schnell O, Rydén L, et al. Benefits and harms of drug treatment for type 2 diabetes: systematic review and network meta-analysis of randomised controlled trials. BMJ 2023;381:e074068. DOI: 10.1136/bmj-2022-074068
14. Weinberg Sibony R, Segev O, Dor S, Raz I. Drug Therapies for Diabetes. International Journal of Molecular Sciences 2023;24(24):17147. DOI: 10.3390/ijms242417147
15. Saito Y, Tanaka A, Imai T, Nakamura I, Kanda J, Matsuhisa M, et al. Long-term effects of ipragliflozin on blood pressure in patients with type 2 diabetes: insights from the randomized PROTECT trial. Hypertens Res 2024;47(1):168-76. DOI: 10.1038/s41440-023-01494-6
16. Srivastava SP, Upadhyay P, Das S, Tiwari N, Mishra S, Tripathi SM. Managing diabetic complications with alternative therapeutic strategies. Curr Diabetes Rev

2024;20(5):e070923220791. DOI: 10.2174/1573399820666230907112430

17. Sanz-Cánovas J, López-Sampalo A, Cobos-Palacios L, Ricci M, Hernández-Negrín H, Mancebo-Sevilla JJ, et al. Management of Type 2 Diabetes Mellitus in Elderly Patients with Frailty and/or Sarcopenia. Int J Environ Res Public Health 2022;19(14):8677. DOI: 10.3390/ijerph19148677
18. Chinese Elderly Type 2 Diabetes Prevention and Treatment of Clinical Guidelines Writing Group; Geriatric Endocrinology and Metabolism Branch of Chinese Geriatric Society; Geriatric Endocrinology and Metabolism Branch of Chinese Geriatric Health Care Society; Geriatric Professional Committee of Beijing Medical Award Foundation; National Clinical Medical Research Center for Geriatric Diseases. [Clinical guidelines for prevention and treatment of type 2 diabetes mellitus in the elderly in China (2022 edition)]. Zhonghua Nei Ke Za Zhi 2022;61(1):12-50. Chinese. DOI: 10.3760/cma.j.cn112138-20211027-00751
19. Brenner R, Witzig-Brändli V, Vetsch J, Kohler M. Nursing Interventions Focusing on Self-efficacy for Patients With Multiple Sclerosis in Rehabilitation: A Systematic Review. Int J MS Care 2022;24(4):189-98. DOI: 10.7224/1537-2073.2021-166
20. Linn AJ, van Dijk L, van Weert JCM, Gebeyehu BG, van Bodegraven AA, Smit EG. Creating a synergy effect: A cluster randomized controlled trial testing the effect of a tailored multimedia intervention on patient outcomes. Patient Educ Couns 2018;101(8):1419-26. DOI: 10.1016/j.pec.2018.03.017
21. Munro CL. Individual genetic and genomic variation: a new opportunity for personalized nursing interventions. J Adv Nurs 2015;71(1):35-41. DOI: 10.1111/jan.12552
22. Gruneir A, Markle-Reid M, Fisher K, Reimer H, Ma X, Ploeg J. Comorbidity Burden and Health Services Use in Community-Living Older Adults with Diabetes Mellitus: A Retrospective

Cohort Study. Can J Diabetes 2016;40(1):35-42. DOI: 10.1016/j.jcjd.2015.09.002

23. Bullock JE. Provider adherence to American Diabetes Association cardiovascular risk-reduction guidelines: An integrative review. J Am Assoc Nurse Pract 2024;36(1):17-22. DOI: 10.1097/JXX.0000000000000920

24. Abukhalil AD, Alyan M, AbuAita W, Al-Shami N, Naseef HA. Adherence to Clinical Guidelines on STATIN Prescribing Among Diabetic Patients Aged 40-75 Years Old in a Primary Care Setting: A Cross-Sectional Study. Patient Prefer Adherence 2022;16:1855-63. DOI: 10.2147/PPA.S376000

25. Ho HY, Chen MH, Lou MF. Exploring the experiences of older Chinese adults with comorbidities including diabetes: surmounting these challenges in order to live a normal life. Patient Prefer Adherence 2018;12:193-205. DOI: 10.2147/PPA.S147756

26. Kim O, Dan H. Experience of Elderly Korean Women with Diabetes and Multimorbidity in Elderly Couple Households: A Qualitative Study. Healthcare (Basel) 2022;10(9):1675. DOI: 10.3390/healthcare10091675

27. Namazi Shabestari A, Saeedi Moghaddam S, Sharifi F, Fadayevatan R, Nabavizadeh F, Delavari A, et al. The Most Prevalent Causes of Deaths, DALYs, and Geriatric Syndromes in Iranian Elderly People Between 1990 and 2010: findings from the Global Burden of Disease study 2010. Arch Iran Med 2015;18(8):462-79.

28. Naseri P, Amiri P, Masihay-Akbar H, Jalali-Farahani S, Khalili D, Azizi F. Long-term incidence of cardiovascular outcomes in the middle-aged and elderly with different patterns of physical activity: Tehran lipid and glucose study. BMC Public Health 2020;20(1):1654. DOI: 10.1186/s12889-020-09747-6

29. Malabu UH, Vangaveti VN, Kennedy RL. Disease burden evaluation of fall-related events in the elderly due to

hypoglycemia and other diabetic complications: a clinical review. Clin Epidemiol 2014;6:287-94. DOI: 10.2147/CLEP.S66821

30. Longo M, Bellastella G, Maiorino MI, Meier JJ, Esposito K, Giugliano D. Diabetes and Aging: From Treatment Goals to Pharmacologic Therapy. Front Endocrinol (Lausanne) 2019;10:45. DOI: 10.3389/fendo.2019.00045
31. Rush CJ, Berry C, Oldroyd KG, Rocchiccioli JP, Lindsay MM, Touyz RM, et al. Prevalence of Coronary Artery Disease and Coronary Microvascular Dysfunction in Patients With Heart Failure With Preserved Ejection Fraction. JAMA Cardiol. 2021;6(10):1130-43. DOI: 10.1001/jamacardio.2021.1825
32. Schmid A, Petrovic M, Akella K, Pareddy A, Velavan SS. Getting to the Heart of the Matter: Myocardial Injury, Coagulopathy, and Other Potential Cardiovascular Implications of COVID-19. Int J Vasc Med 2021;2021:6693895. DOI: 10.1155/2021/6693895
33. Korteland TW, Koorengevel KM, Poslawsky IE, van Meijel B. Nursing interventions for patients with postpartum psychosis hospitalized in a psychiatric mother-baby unit: A qualitative study. J Psychiatr Ment Health Nurs 2019;26(7-8):254-64. DOI: 10.1111/jpm.12542
34. Smith-Ryan AE, Hirsch KR, Saylor HE, Gould LM, Blue MNM. Nutritional Considerations and Strategies to Facilitate Injury Recovery and Rehabilitation. J Athl Train 2020;55(9):918-30. DOI: 10.4085/1062-6050-550-19
35. Moisey LL, Merriweather JL, Drover JW. The role of nutrition rehabilitation in the recovery of survivors of critical illness: underrecognized and underappreciated. Crit Care 2022;26(1):270. DOI: 10.1186/s13054-022-04143-5
36. Liebl A, Khunti K, Orozco-Beltran D, Yale JF. Health economic evaluation of type 2 diabetes mellitus: a clinical

practice focused review. Clin Med Insights Endocrinol Diabetes 2015;8:13-9. DOI: 10.4137/CMED.S20906

37. Faruqi N, Thomas L, Parker S, Harris-Roxas B, Taggart J, Spooner C, et al. Primary health care provider-focused interventions for improving outcomes for people with type 2 diabetes: a rapid review. Public Health Res Pract 2019;29(4):29121903. DOI: 10.17061/phrp29121903

Table I. Clinical outcomes of nursing interventions

	Control group	**Nursing group**	**t-value**	***p*-value**
Blood glucose				
Fasting blood glucose (mmol/L)	7.55 ± 1.19	6.33 ± 0.46	6.196	< 0.05
Postprandial 2h blood glucose (mmol/L)	9.33 ± 1.01	8.29 ± 0.38	6.099	< 0.05
Glycosylated hemoglobin (%)	7.86 ± 0.75	6.33 ± 0.27	12.381	< 0.05
Cardiovascular function				
LVEF (%)	61.26 ± 5.33	71.55 ± 2.02	11.609	< 0.05
Volume per stroke (mL)	69.21 ± 5.18	79.23 ± 2.05	11.426	< 0.05
Rate of rise in left ventricular pressure (mmHg/s)	1168.66 ± 69.22	1321.06 ± 26.36	13.171	< 0.05
Heart rate (bpm)	79.25 ± 4.22	71.22 ± 1.66	11.372	< 0.05

Table II. Comparison of cardiovascular events

	Control group *n* (%)	**Nursing group *n* (%)**	χ^2 **value**	***p*-value**
Cardiac death	2 (6.67)	0 (0.00)		
Recurrent acute infarction	3 (10.00)	2 (6.67)		
Persistent angina pectoris	4 (13.33)	1 (3.33)		
Severe ventricular arrhythmia	3 (10.00)	0 (0.00)		
Overall incidence	12 (40.00)	3 (10.00)	7.509	< 0.05

Table III. Indicators of laboratory tests in patients

	Control group	**Nursing group**	**t-value**	***p*-value**
Total serum protein (g/L)	62.73 ± 9.39	65.47 ± 12.08	0.68	0.502
Serum albumin (g/L)	35.44 ± 8.25	32.11 ± 6.67	1.25	0.22
Serum urea (mmol/L)	7.39 ± 2.01	6.24 ± 0.84	2.24	< 0.05
Hemoglobin (g/L)	130.37 ± 25.64	124.39 ± 17.72	0.78	0.442
Total cholesterol (mmol/L)	2.94 ± 1.54	3.3 ± 1.1	0.76	0.453
White blood cells ($\times 10^9$/L)	8.29 ± 0.88	7.87 ± 1.18	1.08	0.287
Neutrophils (%)	70.77 ± 11.47	68.75 ± 9.24	0.55	0.588
Lymphocytes (%)	2.35 ± 0.72	2.41 ± 0.71	0.23	0.816

Table IV. Quality of life and psychological status of patients

	Control group	**Nursing group**	**t-value**	***p*-value**
Quality of life				
Vitality status score	61.99 ± 8.96	72.23 ± 3.09	6.942	< 0.05
Physiological functioning score	60.47 ± 8.96	73.25 ± 3.12	8.638	< 0.05
Emotional functioning score	62.88 ± 8.16	75.96 ± 3.08	9.595	< 0.05
Social functioning score	63.85 ± 8.25	74.36 ± 3.49	7.507	< 0.05
Psychological condition				
SAS	32.16 ± 2.12	46.26 ± 5.68	14.878	< 0.05
SDS	30.26 ± 2.05	42.86 ± 5.33	14.143	< 0.05

Table V. Satisfaction of patients admitted for treatment

	Control group *n* (%)	**Nursing group *n* (%)**	χ^2 **value**	***p*-value**
Very satisfied	7 (23.33)	11 (36.67)		
Fairly satisfied	15 (50.00)	18 (60.00)		
Not satisfied	8 (26.67)	1 (3.33)		
Satisfaction	22 (73.33)	29 (96.67)	7.288	< 0.05