Supplementary Materials

Table 1. Selected articles

Author, Year	Title	Design	Objectives	Result
Zhang et al. (2022)	Evaluation of Clinical Efficacy of Continuous Care with Improved Insulin Injection Techniques on DM Patients: A Randomized Controlled Trial	• Randomized Controlled Trial • The control group received regular nursing care • The observation group received specialized insulin injection education and care.	To examine the clinical impact of consistent care involving enhanced insulin administration methods on patients with diabetes mellitus.	• 96 diabetic patients (48 per group) participated in the study • The group receiving continuous care and optimized insulin injection techniques showed significant improvements in health, including reduced blood glucose levels and HbA1c, and reported fewer insulin-related issues and lower pain scores compared to the control group
Liang et al. (2021)	Study on the effect of education for insulin injection in diabetic patients with new simulation tools	• Quasi-Experimental • 120 diabetes mellitus patients who required insulin therapy but had not been trained in insulin injection before • Intervention group (60 patients) and a control group (60 patients) • The control group was trained using traditional methods • The intervention group was trained using an improved simulation tool	To examine the impact of standard training on the self-administration of insulin among diabetic patients.	• The intervention group had a shorter training time and a higher success rate for the first subcutaneous injection • Higher scores for injection skills and pre-discharge scores in the intervention group • Lower incidence of subcutaneous fat hyperplasia in the intervention group • The control group had a higher incidence of hypoglycemia, but the difference was not statistically signifi
Chen et al. (2021)	Injection Technique Education in Patients with Diabetes Injecting Insulin into Areas of Lipohypertrophy : A Randomized Controlled Trial	• Randomized Controlled Trial • The intervention (IT-education group) received comprehensive IT education, with a strong emphasis on injection techniques and insulin dose management, ensuring thorough patient care. • The control group received their usual care.	To evaluate the effects of offering intensive education on injection techniques (IT) to patients who regularly inject insulin into areas affected by lipo hypertrophy (LH).	• A study compared the effects of IT education on diabetes management in two groups. • Both groups had similar demographics and baseline IT behaviour. • HbA1c reduction was similar in both groups in the intention-to-treat analysis but significant in the per-protocol analysis. • Total daily dose (TDD) insulin changes were more significant in the IT education group • Some control patients showed "contamination" of IT education behaviours, decreasing HbA1c.

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Louzolo-Kimbembe et al. (2021)	Insulin Injection A Non-Trivial Act with Sometimes Serious Consequences: Major Role of Therapeutic Education	Case Report, 2 cases	To report case involving infectious cellulitis of the abdominal wall and necrotizing fasciitis of the thigh after an insulin injection	• Negligent insulin administration can have serious consequences, and documented errors have led to complications. • Proper injection techniques and education on insulin storage, injection sites, and complications are essential to prevent skin complications and infectious complications. • Patients often lack knowledge of proper insulin injection procedures, leading to errors such as injecting in the same site, reusing needles, and not mixing cloudy insulins. • Healthcare providers must continuously assess patients' understanding of insulin administration and use techniques like the teach-back method to confirm comprehension. • Active patient engagement in insulin therapy education and ongoing support from healthcare providers can help prevent complications and ensure successful diabetes management.
Adhi et al. (2023)	Effectiveness of Rotation Scheme for Insulin Injection on Blood Sugar Control of Diabetes Mellitus Patients in the Polyclinic of North Lombok District Hospital	• Pre-experimental design with a static-group comparison • 52 participants were selected (26 in the intervention group, 26 in the control group) using accidental sampling	To assess the efficacy of insulin injection rotation scheme for managing blood sugar levels among Diabetes Mellitus (DM) patients	• Most participants in both groups were aged between 46 and 55. • The intervention group consisted of well-educated individuals, while the control group had more participants with no formal education and mostly unemployed. • Both groups had a substantial history of insulin use, with all participants having used insulin for at least two years. • The control group showed an average decrease of 36 mg/dl in blood sugar levels with a rotation scheme of 128 mg/dl. • The research findings revealed a p-value of 0.003 ($p < 0.05$), indicating that the rotation scheme for insulin injection effectively controlled blood sugar levels.
Lukman et al. (2023)	Implementation Of Nutrition Management In Nursing Care For Type II Diabetes Mellitus With Nutrition Deficit Nursing Problems	• Case Study of nursing care for Type II Diabetes Mellitus patients focused on nutritional management	To conduct a comparative analysis of nursing care approaches for patients with type II diabetes mellitus, focusing on nutritional management and the issue of nutritional deficit as primary interventions	• The study evaluated two patients, aged 39 and 67 years, with body weights of 47 kg and 48 kg and BMIs of 18.3 and 18.7, respectively. • Nutritional deficiencies were addressed through nutritional status evaluation, oral hygiene interventions, and education on a diabetes-specific diet. • Patients experienced an improvement in body weight and BMI as a result of the intervention.
Pangaribuan & Wahyu, (2023)	The Effect Of Diet Compliance Education On Blood Sugar Levels In Type Ii Diabetes Mellitus Patients In The 7th Floor Inpatient Care,	• Quasi-Experimental design with a single-group pre-post test.	To assess the impact of dietary education on blood glucose levels in individuals with Type II Diabetes Mellitus.	• 70.5% of patients had poor blood sugar levels before the educational session. • 47.7% showed improvement after the session, indicating a shift to moderate levels. • A significant association between dietary adherence and blood

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	Murni Teguh Hospital, Medan			sugar levels in type II DM patients, supported by a p-value of 0.001, demonstrating an educational impact.
Sitorus et al. (2023)	Knowledge and Compliance of Type 2 Diabetes Mellitus Patients with Diabetic Nutrition Management.	Descriptive Analysis	To assess knowledge and adherence to nutritional management among type 2 diabetes mellitus patients.	• 75.91% demonstrated good knowledge of diabetic nutrition management • 81.48% exhibited compliance with diabetic nutrition management
Momongan et al. (2021)	Diet Education With Booklet Media In Improving Diet Compliance And Blood Sugar Levels In Type II DM Patients	• Pre-Experimental design with one group pre-test-post-test approach.	To assess the impact of diet education using booklet media on adherence to dietary guidelines and blood glucose levels in patients with type II diabetes mellitus	• Significant differences in adherence to dietary guidelines and blood glucose levels were observed before and after the implementation of diet education. • The statistical analysis using the Paired t-test demonstrated a significance level 0.000 ($p < 0.05$).
Isaksson et al. (2021)	Effects of nutrition education using a food-based approach, carbohydrate counting or routine care in type 1 diabetes: 12 months prospective randomized trial.	• Randomized controlled study • 3 parallel: food-based approach (FBA), carbohydrate counting (CC), and routine care (RC) • Primary endpoint: variance in glycated hemoglobin A1c (HbA1c) over 12 months	To evaluate the effects of different nutritional education initiatives on glycemic control, cardiovascular risk markers, quality of life, dietary habits, and food preferences among people with type 1 diabetes.	The study included 159 patients with varying distribution in three groups • After three months, FBA and CC groups improved HbA1c compared to the RC group • No significant differences in HbA1c at 12 months between FBA and RC, CC and RC, and FBA and CC • At 12 months, FBA showed better intake of legumes, nuts, and vegetables than CC and RC • FBA reported a higher intake of certain fats and dietary fibre than RC and CC No significant differences were observed in blood pressure levels, lipids, body weight, or quality of life
Hashim et al. (2021)	Effectiveness of simplified diabetes nutrition education on glycemic control and other diabetes-related outcomes in patients with type 2 diabetes mellitus	• Randomized controlled trial. • The intervention group received weekly diabetes nutrition modules and usual care • The control group received only usual care. • HbA1c and diabetes-related outcomes were rigorously measured at baseline, 12 weeks, and 22 weeks, demonstrating the rigour of our study.	To assess the impact of Simplified Diabetes Nutrition Education (SDNE) on glycemic control and other diabetes-related outcomes in individuals with type 2 diabetes mellitus (T2DM).	• After 22 weeks, the intervention group showed significant improvement in HbA1c levels (-1.7%) compared to the control group (+0.01%) ($p < 0.001$). • The intervention group significantly improved metabolic parameters more than the control group ($p < 0.05$). • Significant enhancement in dietary intake and physical activity levels was observed in the intervention group compared to the control group ($p < 0.05$). • Health beliefs, diabetes knowledge, and health literacy experienced significant enhancements in the intervention group compared to the control group ($p < 0.05$).

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Bross et al. (2022)	Barriers to Healthy Eating and Diabetes Diet Education: Divergent Perspectives of Patients and Their Providers	• A survey of diet self-management	To examine perceived barriers to diet self-management among low-income minority patients with type 2 diabetes and their health care providers within a single ecosystem, to test whether providers understood patient barriers	• Providers have divergent perceptions of patients' barriers to healthy eating • Patients show positive indicators for self-management, such as regular blood glucose monitoring and interest in diet education • Providers cited a lack of time for diet discussions and preferred others to handle teaching
Mehrabbeik et al. (2022)	Investigation of Association Between Insulin Injection Technique and Blood Glucose Control in Patients with Type 2 Diabetes	• A survey of insulin injection technique	To explain the correlation between proper insulin use with glycemic control in type 2 diabetes patients.	• Injective pain, needle reuse, and improper injection site rotation were common issues. • Participants with lower injection scores had higher fasting blood sugar and HbA1c levels. • A strong negative correlation between insulin injection scores and glycemic control markers.
Abujbara et al. (2022)	Effect of Insulin Injection Techniques on Glycemic Control Among Patients with Diabetes	• A survey of insulin injection practices	To evaluate insulin injection practices among diabetes patients and their impact on glycemic control. .	• Rotation of insulin injection sites, absence of lipohypertrophy, and a total daily insulin dose of ≤50 units were associated with improved glycemic control. • Proper insulin injection techniques are essential for managing diabetes and improving glycemic control
Bari et al. (2023)	Addressing Insulin Injection Technique: A Follow-up Study of Canadian Patients with Diabetes	• A survey on patients with diabetes who used insulin pens and pen needles; and physicians without support from diabetes educators	To assess the current insulin injection technique employed by patients and investigate the impact of feedback and education on enhancing their proficiency.	• Physicians need help educating and providing patient feedback due to limited time and resources. • Patients improved their injection technique during follow-up visits, addressing factors such as injection force, needle retention time, needle reuse, injection area size, and injection angle. • Common initial errors included selecting a smaller injection area than recommended and not paying attention to injection force. • On their second visit, patients, on average, reduced one error in their injection technique.
Klarskov et al. (2021)	A New Medical Device for Improved Rotation of Insulin Injections in Type 1 Diabetes Mellitus: A Proof-of-Concept Study	• 12-week trial testing a new device for rotating insulin injections • 1-week baseline data collection followed by 12 weeks of device-guided insulin rotation	To evaluate the effectiveness of the medical device in reducing the frequency of insulin injections within the same subcutaneous area compared to standard insulin injection techniques without assistance.	• A new automatic insulin injection log device with an algorithm improved most users' injection rotation in the abdominal area. • The device showed potential in reducing lipo hypertrophy lesions and promoting better glucose control through enhanced rotation. • Although no significant changes in HbA1c levels or hypoglycemic incidents were noted, the device helped reduce glycemic variability for better diabetes management. • The device is designed to streamline insulin injections, especially for newly diagnosed T1DM or type 2 diabetes patients.