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Nursing Interventions for Diabetes Prevention in Individuals at Risk or with Prediabetes: A Literature Review

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ABSTRACT

Background: Nurses play a crucial role in supporting patients at risk for diabetes or prediabetes in changing their lifestyles and halting the progression of prediabetes to diabetes. **Objective:** This literature review aims to explain nursing interventions for preventing diabetes in prediabetes or high-risk individuals. **Methods:** Four databases were utilised to look for pertinent peer-reviewed papers written in English: Scopus, PubMed, CINAHL, and Web of Science. Studies examining nursing interventions in diabetes prevention in adults older than 18 years at risk of diabetes or prediabetes met the inclusion criteria for this review. The literature search was restricted to open-access publications published between 2019 and 2024. The instrument used in the article screening stage uses screening software, namely Rayyan. **Results:** A total of 1,005 articles, all retrieved from four databases, were included in the study. Nineteen publications that met the inclusion criteria were included in this review. Based on the results of a synthesis analysis of 19 literature reviews, nursing interventions to prevent diabetes in individuals at risk of prediabetes include prediabetes screening and diabetes risk (3 articles), lifestyle intervention (9 articles), diabetes prevention education (5 articles), and stress management (3 articles). Nursing interventions have proven effective in improving diabetes risk factors such as diet, physical activity, reducing HbA1c, body weight, BMI, fasting blood sugar, waist circumference, stress, anxiety, and quality of life, and preventing the development of type 2 diabetes. **Conclusion:** Nursing interventions are successful in reducing risk factors for type 2 diabetes in those with prediabetes or those at risk.

Keywords: Diabetes; Diabetes Prevention; Nursing Intervention; Prediabetes

INTRODUCTION

The prevalence of diabetes mellitus (DM), a chronic illness, has dramatically increased globally during the past three decades (WHO, 2024). It is projected that the number of adults (20–79 years old) with diabetes will rise from 537 million in 2021 to 643 million in 2030 and 783 million in 2045 (International Diabetes Federation, 2021). Prediabetes is one disorder that can accelerate the onset of DM (Venkataramani *et al*., 2019). Increased blood glucose levels that fall short of the standard for a diabetes diagnosis are indicative of prediabetes, a condition that raises the risk of getting the disease (Rooney *et al*., 2023). An estimated 97.6 million adults over the age of 18 or older have prediabetes (CDC, 2024). Individuals with prediabetes face up to a 50% risk of progressing to diabetes mellitus (DM) within five years (Rooney *et al*., 2023).

The Diabetes Prevention Program (DPP) helps adult and adolescent individuals at risk of diabetes avoid DM through lifestyle modification interventions (Peña *et al*., 2022). Diabetes Mellitus negatively affects individuals by reducing life expectancy, increasing the risk of illness, and diminishing overall quality of life (Amelia & Kurniawati, 2018). Randomised controlled trial studies on DPP have demonstrated the efficacy of basic lifestyle interventions in preventing diabetes mellitus (DM) in adults with prediabetes or type 2 diabetes who are at high risk of developing the disease (Ford *et al*., 2019; Vargas-Ortiz *et al*., 2020). It is strongly recommended in clinical practice to implement lifestyle prevention treatments; nevertheless, most persons

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with prediabetes remain untreated because healthcare professionals lack the necessary expertise, time, and resources (Abbate *et al*., 2021).

Nurses are one of the health service providers whose role is to provide nursing care to individuals with prediabetes. This can be done by nurses by implementing evidence-based interventions to overcome risk factors for the development of prediabetes into DM (Moore-Harper, Shubrook & Clavo-Hall, 2023). Nursing professionals can help people with prediabetes or who are at risk of diabetes to reduce risk factors and change their diets to help prevent type 2 diabetes based on research findings (O'Flynn, 2022). Nurses can help individuals with prediabetes improve their diabetes prevention behaviours through screening, diabetes prevention education, promotion of dietary and lifestyle modifications, stress management, and training (Böhme *et al*., 2020; Woods-Giscombe *et al*., 2019). They can also involve family members and use digital health technology to support nursing interventions (Andreae *et al*., 2024; Nguyen *et al*., 2024).

A review of the literature has been done on interventions to prevent type 2 diabetes mellitus in people with prediabetes. However, it only addresses pharmacological, dietary, and lifestyle changes and does not focus on nursing interventions (Thipsawat, 2023). A study shows that primary care providers, including nurses, rarely provide screenings and counselling to individuals with prediabetes regarding lifestyle modifications that are beneficial for preventing DM. This is caused by the lack of knowledge among nurses regarding evidence-based lifestyle modification interventions for preventing DM (Kandula *et al*., 2018). This shows that there is a significant knowledge gap among health service providers, especially nurses, regarding prediabetes management, which means nurses do not have the opportunity to carry out effective nursing interventions to help individuals with prediabetes prevent diabetes. Therefore, a literature review is needed that can increase nurses' knowledge regarding effective nursing interventions to prevent diabetes in individuals with prediabetes. The literature review aims to explain nursing interventions for preventing diabetes in prediabetes or high-risk individuals.

METHODOLOGY

Design of Research

The design of this research is a literature review. The research question in this study is: What nursing interventions are carried out by nurses to help prevent DM in individuals at risk of diabetes or prediabetes? To identify research questions, researchers used the PICO shown in Table 1.

Table 1: Description of PICO

Population	Adults over the age of 18 who are at risk of developing diabetes or prediabetes
Intervention	Nursing interventions in diabetes prevention
Comparison	Usual care
Outcomes	diabetes risk factors, the prevention of DM onset

Search Methods

Scopus, PubMed, CINAHL, and Web of Science are the four databases searched for pertinent peer-reviewed articles published in English as part of a literature review methodology. The chosen keywords “nursing intervention” OR “nurse-led" AND “diabetes prevention" AND "diabetes risk" OR "prediabetes" was paired with the Boolean operators "AND" and "OR" in the literature search, which was restricted to open access papers from 2019 to 2024. The PRISMA flow diagram is used to identify, screen, and finalise the selection of articles to be reviewed according to the inclusion criteria (Page *et al*., 2021).

Selection Methods

A search of the literature was conducted, and the articles that would be reviewed were found. Two authors (OSN and FE), who are also reviewers, screened titles and abstracts that met the inclusion criteria. Conflicts were resolved through discussion between three reviewers (OSN, FE and YSD). The full text was reviewed by both reviewers (OSN and FE), and disagreements were resolved through discussion between the three reviewers (OSN, FE and YSD). The final 19 articles were included in this review.

Data Extraction

The data extraction process for articles that meet the inclusion criteria is carried out by the author (OSN) independently using a data extraction format. Data extraction components include authors, publication years, methods (research design, subjects, data analysis), nursing interventions, and research results.

Criteria for Research

The inclusion criteria of this review are 1) studies that examined the nursing intervention of diabetes prevention in individuals at risk of diabetes or prediabetes; 2) all research designs, but they must be original research, not systematic reviews or other types of reviews. 3) Adults over the age of 18 who are at risk of developing diabetes or prediabetes; 4) The goal of diabetes prevention nursing interventions is to prevent the onset of diabetes by addressing risk factors for the disease.

Exclusion criteria include individuals with type 1 diabetes mellitus, type 2 diabetes mellitus, and gestational diabetes; articles that are not open access; books, documents, reviews, conference proceedings, theses, or dissertations.

RESULTS

The authors obtained 1,005 articles from four databases: CINAHL (300 articles), PubMed (606 articles), Scopus (49 articles), and Web of Science (50 articles). Some articles were identified as duplicates by Rayyan (n = 325), ineligible by the automation tool (n = 214), and manually removed by the researcher because they did not meet the inclusion criteria (n = 242). The article filtering process used Rayyan, resulting in 224 articles that passed the screening stage. A total of nineteen articles that met the inclusion criteria were reviewed.

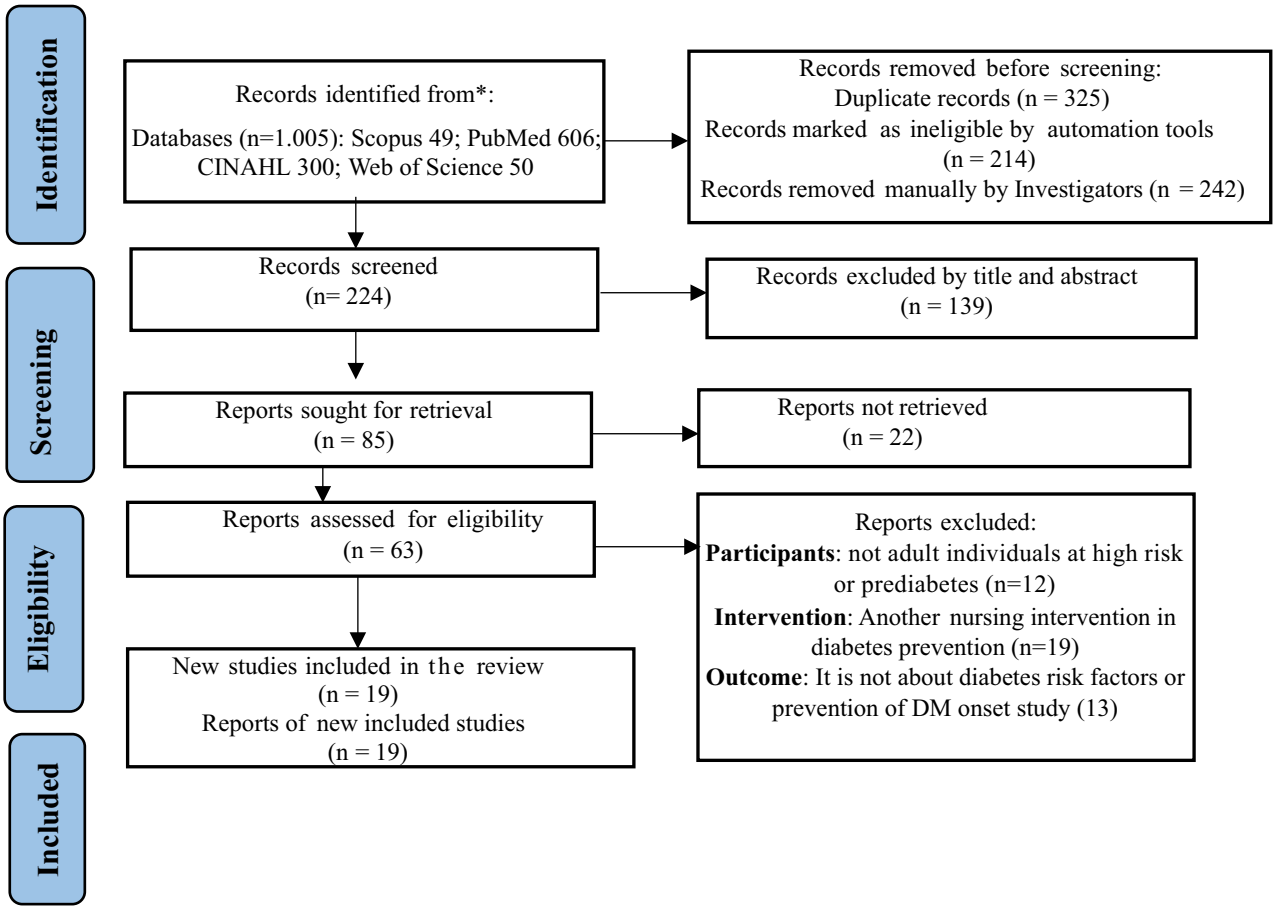

Figure 1: A Flow Chart for PRISMA

Table 2: Overview of the Examined Study

No	Authors and Years	Methods	Results
1.	Vargas-Ortiz*et al*. (2020)	**Design:** Randomised Clinical Trial (RCT) **Subjects:** 122 (prediabetes), 101 (family members) **Analysis:** Independent *t*-test, ANOVA	Lifestyle interventions for individuals with prediabetes, involving family members and inter-professional collaboration, have been proven effective in improving glucose levels, insulin sensitivity, and lipid profiles.
2.	Böhme *et al*. (2020)	**Design:** Cross-sectional survey **Subjects:** 19,951 respondents **Analysis**: Wilcoxon	The diabetes prevention program, which incorporates telephone coaching and type 2 DM risk assessment, improves dietary behaviour, quality of life, and physical activity in those who are at risk of type 2 DM.
3.	Arnardóttir *et al*. (2023)	**Design:** Cross sectional study **Subjects:** 220 respondents **Analysis:** Descriptive statistics, Chi-square tests, t-tests,	FINDRISC is a simple, non-invasive tool for prediabetes screening in primary care settings.
4.	Bean *et al*. (2021)	**Design:** Pragmatic trials **Subjects:** 431 respondents **Analysis:** Pearson chi-square analyses, analyses of variance (ANOVAs), Paired-sample t-tests	Diabetes prevention behaviour change interventions are effective in reducing body weight, abdominal circumference, physical activity, and eating frequency.
5.	Sampson *et al*. (2020)	**Design:** Randomised clinical trial **Subjects:** 1028 respondents **Analysis:** Binary logistic regression, t-test, linear regression	The primary outcome (HbA1c, fasting blood glucose) did not significantly differ across the intervention groups; however, the chance of developing type 2 diabetes was significantly lower in each group.
6.	Washirasaksiri *et al*. (2024)	**Design:** Cohort study **Subjects:** 190 respondents **Analysis:** Kaplan–Meier and Cox regression models	Cognitive behavioural therapy was significantly effective in reducing fasting blood glucose levels, HbA1c, triglycerides, and body weight after 12 months of intervention.
7.	Liu *et al*. (2022)	**Design:** Quasi-experiment **Subjects:** 2005 respondents **Analysis:** T-test, logistic regression, and Chi-square	Comparing the intervention group to the control group revealed that the intervention group's waist circumference and fasting plasma glucose levels were lower.
8.	Ford *et al*. (2019)	**Design:** Randomised study of clinical trials **Subjects:** 578 respondents **Analysis:** Chi-square analysis, t-test, and regression analysis	Dietary changes that prevent diabetes can cut the incidence of the disease in half in a year by boosting the consumption of fruits and vegetables and decreasing calorie intake.
9.	Koirala *et al*. (2024)	**Design:** Quasi experiment one group pre-test–post-test **Subjects:** 60 respondents **Analysis:** A paired t-test	Enhanced awareness and improved diabetes prevention habits in adults can be achieved through comprehensive nursing intervention strategies.
10.	Motlagh *et al*. (2022)	**Design:** Cluster Randomised controlled trial **Subjects:** 71 pre-diabetic women **Analysis:** Wilcoxon and paired t-tests, Mann–Whitney and independent t-tests	Education based on the theory of planned behaviour is effective in improving healthy lifestyles for women with prediabetes.
11.	Iglesies-Grau *et al*. (2023)	**Design:** Retrospective study **Subjects:** 117 respondents **Analysis:** ANOVAs, multivariate logistic model	A 12-month lifestyle intervention that included educational and nutritional counselling combined with physical activity significantly improved the metabolic profile and reduced the risk of prediabetes.
12.	Fauzi *et al*. (2023)	**Design:** Randomised study of clinical trials **Subjects:** 100 respondents **Analysis:** ANOVA and independent t-test"	Compared to the control group, the intervention group experienced changes in food consumption, exercise level, body weight, HbA1c, and quality of life.
13.	Abbate *et al*. (2021)	**Design:** Randomised controlled trial **Subjects:** 428 respondents **Analysis:** ANCOVA	Nurse-led telephone-based lifestyle interventions may be able to help people with prediabetes reduce their risk factors for developing diabetes.
14.	Shakya *et al*. (2023)	**Design:** Qualitative study **Subjects:** 20 participants **Analysis:** Thematic analysis**.**	Four themes emerge from the experiences of participants in diabetes prevention education programs: How to prevent diabetes: lifestyle modifications, challenges to overcome, and advantages experienced
15.	Shamizadeh *et al*. (2019)	**Design:** Randomised study of clinical trials **Subject:** 272 respondents **Analysis:** Kolmogorov-Smirnov test, intention-to-treat (ITT) analyses	Social cognitive theory-based intervention has been shown to significantly reduce fasting blood sugar, body weight, BMI, and diastolic blood pressure

16.	Xu *et al*. (2020)	**Design:** Cluster Randomised controlled trial **Subject:** 1236 respondents **Analysis:** Intention-to-treat (ITT) analyses	Nurse-led continuum of care ability to enhance clinical outcomes for people with diabetes and prediabetes.
17	Woods-Giscombe *et al*. (2019)	**Design:** Randomised clinical trial **Subject:** 68 respondents **Analysis:** Quantitative analysis and qualitative analysis	The HbA1c decreased in prediabetes patients who received stress management treatments.
18	Xia *et al*. (2022)	**Design:** Mixed methods **Subject:** 19 respondents **Analysis:** Wilcoxon signed-rank test	Mindfulness interventions to reduce stress have been proven to be effective in reducing depression, increasing physical activity, and reducing HbA1c.
19	Amer *et al*. (2020)	**Design:** Randomised, multicentre trial **Subject:** 180 respondents **Analysis:** Chi-square test, ANOVA	Lifestyle interventions are effective in restoring normoglycemia in individuals with prediabetes in Saudi Arabia.

Several study results in Table 2 show that nursing interventions, which include lifestyle interventions, education, cognitive behavioural therapy, stress management, and mindfulness, are effective in improving metabolic profiles in individuals with prediabetes, such as reducing HbA1c, fasting blood sugar, body weight, and waist circumference (Abbate *et al*., 2021; Iglesies-Grau *et al*., 2023; Vargas-ortiz *et al*., 2020; Woods-Giscombe *et al*., 2019; Xia *et al.*, 2022). Nursing interventions involving prediabetes screening, nutritional counselling, physical activity, and theory-based education have a positive impact on behavioural changes that can prevent the development of type 2 DM in individuals with prediabetes (Bean *et al*., 2021; Böhme *et al*., 2020; Iglesies-Grau *et al*., 2023; Koirala *et al*., 2024; Motlagh *et al.*, 2022).

Table 3: Data Analysis Used for Synthesis of Literature Review

Research Question What nursing interventions are carried out by nurses to help prevent DM in individuals at risk of diabetes or prediabetes?	
Nursing Interventions	**Study**
Prediabetes Screening and Diabetes Risk	Böhme *et al*. (2020)
	Arnardóttir *et al*. (2023)
	Xu *et al*. (2020)
Lifestyle Interventions	Sampson *et al*. (2020)
	Liu *et al*. (2022)
	Ford *et al*. (2019)
	Fauzi *et al*. (2023)
	Abbate *et al*. (2021)
	Bean *et al*. (2021)
	Iglesies-Grau *et al*. (2023)
	Amer *et al*. (2020)
	Vargas-ortiz *et al*. (2020)
Diabetes Prevention Education	Motlagh *et al*. (2022)
	Shamizadeh *et al*. (2019)
	Koirala *et al*. (2024)
	Iglesies-Grau *et al*. (2023)
	Shakya *et al*. (2023)
Stress Management	Woods-Giscombe *et al*. (2019)
	Xia *et al*. (2022)
	Washirasaksiri *et al*. (2024)

Based on the analysis and synthesis in Table 3, it shows that from the 19 literature reviews, three studies discuss nursing interventions for individuals at risk of diabetes or prediabetes with prediabetes screening and diabetes risk, nine studies with lifestyle interventions, five studies with diabetes prevention education and three studies with stress management.

DISCUSSION

The research aims to identify nursing interventions that can be implemented to prevent diabetes in individuals at risk of prediabetes. The review highlights four types of nursing interventions that support individuals at risk of prediabetes in preventing developing type 2 diabetes mellitus: prediabetes screening, lifestyle interventions, diabetes prevention education, and stress management. Prediabetes screening and

diabetes risk. Nurses have an important role in screening individuals for prediabetes and diabetes risk (Arnardóttir *et al*., 2023; Böhme *et al*., 2020). The Finnish Diabetes Risk Score (FINDRISC) is a screening tool that nurses can use in primary care to identify patients who are not yet diagnosed with diabetes and those who are at risk for the disease. To determine prediabetes with the best degree of sensitivity and specificity, use a FINDRISC cut point of ≥11 (Arnardóttir *et al*., 2023). Nurses can also conduct screenings using the Diabetes Risk Questionnaire (Woods-Giscombe *et al*., 2019).

Lifestyle Interventions

Large, randomised trials have demonstrated the effectiveness of lifestyle interventions in delaying the onset of type 2 diabetes mellitus (Amer *et al*., 2020; Ford *et al*., 2019; Liu *et al*., 2022; Sampson *et al*., 2020). Nurses are expected to possess adequate competence in implementing lifestyle interventions, including nutrition and physical activity, through inter-professional collaboration with nutritionists, psychologists, and general practitioners. Involving families is also essential to developing comprehensive care strategies that support individuals with prediabetes in making lifestyle changes to prevent diabetes (Iglesies-Grau *et al*., 2023; Vargas-Ortiz *et al*., 2020).

Nutrients

Nurses can implement dietary interventions by offering support, motivation, and counselling on a healthy, culturally appropriate diet, as well as assisting individuals with prediabetes in reducing fat intake (to less than 30% of total energy) and total calorie consumption (Ford *et al*., 2019). Dietary interventions provided by nurses include a low-calorie diet, a diet with a low glycaemic index, high fibre (vegetables and fruit), whole grains, nuts, fish as a source of protein, and olive oil as a source of fat because it has been proven to reduce the risk of developing type 2 DM in individuals with prediabetes. Nurses also teach how to read food labels (Bean *et al*., 2021; Ford *et al*., 2019; Iglesies-Grau *et al*., 2023). Nurses can provide nutritional interventions using teleconsultation and group SMS 4–5 times per week (Abbate *et al*., 2021; Fauzi *et al*., 2023).

Physical Activity

Nurses can provide advice and teach concrete and relevant skills to assist at-risk individuals in increasing physical activity (Abbate *et al*., 2021; Sampson *et al*., 2020). People with prediabetes benefit from 150 minutes a week of moderate-intensity physical activity. A randomised, controlled trial study showed that at least 150 minutes of moderate-intensity physical activity per week were proven to be effective in reducing fasting blood sugar, BMI, and diastolic blood pressure (Amer *et al*., 2020; Shamizadeh *et al*., 2019).

Diabetes Prevention Education

Diabetes prevention education is an intervention nurses can implement to help individuals with prediabetes or at risk of diabetes adopt healthier lifestyle behaviours (Woods-Giscombe *et al*., 2019). Key topics include prediabetes and diabetes concepts, insulin resistance, diet, physical activity, and lifestyle changes such as stress reduction and smoking cessation (Iglesies-Grau *et al.*, 2023; Koirala *et al*., 2024).

Stress Management

Nurses have an important role in helping individuals at risk of diabetes or prediabetes manage stress. Based on many evaluations of the research, glycaemic control measures, such as glycosylated haemoglobin (HbA1c) levels, can be somewhat improved in individuals with diabetes and prediabetes by treatments that target stress-reducing variables (Woods-Giscombe *et al.*, 2019; Xia *et al*., 2022). Stress management interventions that can be carried out by nurses are mindfulness-based stress reduction (MBSR) interventions and cognitive behavioural therapy (Washirasaksiri *et al*., 2024; Woods-Giscombe *et al*., 2019; Xia *et al*., 2022).

Research Implications

The results of the literature review on nursing interventions for preventing diabetes in individuals with prediabetes have implications for nursing practice, policy, and future research.

Nursing Practice

Nursing interventions should prioritise encouraging lifestyle changes, including diet, physical activity,

and stress management (Iglesias-Grau *et al*., 2023; Vargas-Ortiz *et al*., 2020). Nurses play a crucial role as educators, providing education and counselling on diabetes prevention for individuals with prediabetes (Amer *et al*., 2020; Ford *et al*., 2019; Liu *et al*., 2022; Sampson *et al*., 2020).

Policy

Establishing clear standard guidelines for prediabetes screening in primary health care can improve early detection and intervention to prevent the development of type 2 DM in individuals with prediabetes (Arnardóttir *et al*., 2023; Böhme *et al*., 2020).

Research

More research is required to determine the most effective components of nursing interventions and their long-term effects on the development of type 2 diabetes mellitus (DM) in larger populations with prediabetes.

Limitation

The limitation of this research is that not all the articles reviewed used randomised controlled trials, and the intervention focusses only on adults. Future research will be able to develop or examine nursing interventions to prevent diabetes in children and adolescents, considering that the prevalence of type 2 DM in adolescents has increased in the last two decades.

CONCLUSION

Nursing interventions that include prediabetes screening, lifestyle modification, diabetes prevention education, and stress management are effective in preventing the development of diabetes in individuals with prediabetes or who are at risk for developing diabetes. This study emphasises the important role of nurses in preventing the onset of type 2 diabetes in individuals with prediabetes or at risk for diabetes. By addressing knowledge gaps in evidence-based nursing practice, this review highlights effective interventions, including lifestyle modification, prediabetes screening, stress management, and diabetes prevention education. These interventions improve clinical outcomes and empower health professionals to provide holistic and sustainable care, ultimately reducing the global burden of diabetes.

Conflict of Interest

The authors declare that they have no competing interests.

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