

**Nursing Roles in Prevention of Diabetes Mellitus
Type 2 Complications among Young Adults**

A Systematic Literature Review

Mary Yetunde Ogunyemi

Degree Thesis in Health Care and Social Welfare

Education: Bachelor of Health Care, Nursing

Vaasa

2024

BACHELOR'S THESIS

Author: Mary Yetunde Ogunyemi

Degree Programme: Nurse, Vaasa

Supervisor(s): Sjöberg-Ehn Yvonne

Title: Nursing roles in Prevention of Diabetes Type 2 Complications among Young Adults-
A Systematic Literature Review

Date: 03.12.2024

Number of pages: 67

Appendix: 1

Abstract/Summary

Type 2 diabetes is a chronic metabolic disorder increasingly affecting young adults, posing significant health risks and potentially leading to severe complications or death if left uncontrolled. The challenge of preventing these complications in younger populations is exacerbated by physical and mental disabilities, as well as inadequate self-care management. This study aims to bring new knowledge about the roles of nurses in the prevention of diabetes type 2 complications among young adults, guided by Orem's self-care deficit nursing theory. A systematic literature review was conducted to address the clinical research question. Applying the inclusion and exclusion criteria 14 studies from a total of 563 studies vetted were selected from databases like Academic Search Elite (EBSCO), CINAHL Complete, and MEDLINE following the PRISMA guidelines.

The findings revealed four major themes critical for managing type 2 diabetes in young adults: physical activities, healthy diet, counselling, and pharmacological assistance. The study underscores the vital importance of self-care and the role of nurses in preventing diabetes complications. The research highlights the necessity for further empirical studies focusing on younger patients with type 2 diabetes, due to a scarcity of studies exclusively addressing this demographic.

Language: English Key words: type 2 diabetes, complications, nurses' role, young adults, management, self-care.

Table of content

1	Introduction.....	1
2	Study Background.....	2
2.1	The Concept of Diabetes.....	3
2.2	Types 2 Diabestes in Young Adults.....	5
2.3	Diagnosis of Type 2 Diabetes.....	6
2.4	Risk Factors of Diabetes Type 2.....	6
2.5	Symptoms of Diabetes Type 2.....	7
2.6	Prevention of Diabetes Type 2.....	8
2.7	Complications of Diabetes Type 2.....	9
2.8	Management of Type 2 Diabetes in young Adults.....	10
3	Aim of Study.....	11
3.1	Research Question.....	11
4	Theoretical Framework.....	11
4.1	Dorothea Orem’s Self-Care Deficit Theory of Nursing.....	11
4.1.1	Nursing System Theory.....	12
4.1.2	Self-Care Theory.....	13
4.1.3	Self-Care Deficit theory.....	14
5	Methodology.....	14
5.1	Qualitative Research.....	15

5.2	Systematic Literature.....	15
5.3	Data collection.....	16
5.4	Data collection Prisma Chart.....	16
5.5	Content Analysis.....	18
5.6	Ethical Consideration.....	19
6	Result.....	20
6.1	Physical activities.....	20
6.1.1	Investing in physical excercises.....	21
6.1.2	Making excercise an habitual element.....	22
6.2	Healthy dieting.....	23
6.2.1	Dietary modifications.....	23
6.2.2	Balanced diet awareness.....	24
6.3	Counseling.....	25
6.3.1	Psychological management.....	25
6.3.2	Psychosocial assesment.....	26
6.4	Pharmacological assistance.....	27
6.4.1	Medicine adherence education.....	28
6.4.2	Applying telemedicine to management.....	29
7	Discussion.....	30
7.1	Discussion of results.....	30

7.2	Discussion of methodology.....	36
8	Conclusion.....	37
9	References.....	39

Appendix

1 Introduction

Diabetes mellitus encompasses a range of metabolic disorders defined by persistently elevated blood sugar levels. It disrupts the metabolism of carbohydrates, proteins, and fats, arising from issues in insulin production, its effectiveness, or a combination of these factors. Prolonged elevated blood sugar levels in diabetes can cause significant damage, impaired function, and eventual failure of key organs, including the eyes, kidneys, nerves, heart, and blood vessels. Diabetes is widely recognized as one of the foremost health, medical, and socio-economic challenges globally (Onu *et al.*, 2022). Diabetes is the sixth cause of death worldwide, with type-2 diabetes accounting for large portion of diabetic patients, approximately 85 - 90%. Diabetes is the most prevalent disease caused by metabolic disorders, it manifests with an increase in blood sugar and causes damage to the vital organs of the affected person, bringing about kidney failure, retinopathy, neuropathy, and ultimately shortens the life span of the affected patients (Brunner, 2018). Globally, approximately 240 million people are believed to have undiagnosed diabetes, with nearly half of all adults with the condition unaware that they are affected (Magliano, 2021). The World Health Organization (WHO) has identified diabetes as a hidden epidemic based on global statistics. Similarly, the International Diabetes Federation (IDF) estimated that about 387 million people in the world are suffering from diabetes.

The ongoing consistent decline in the age of onset for type 2 diabetes exacerbates the situation further (Li *et al.*, 2020). Also, there are growing evidences indicating that the younger a person is when they develop diabetes, the higher their risk of experiencing diabetes-related comorbidities, e.g., cardiovascular diseases, diabetic kidney disease (Khoo *et al.*, 2021), dementia (Barbiellini *et al.*, 2021) and premature mortality (Magliano *et al.*, 2020). The incidence of diabetes diagnosed in young individuals continues to increase

(Mayer-Davis *et al.*, 2017). The global increase in the prevalence of type 2 diabetes in young adults (< 40 years), with its associated considerable morbidity and mortality, is a burgeoning public health concern (Lake *et al.*, 2018). The existence of “metabolic memory”, in which the influence of an early glycemic exposure environment is imprinted in target cells and organs can leads to prolonged impairments even after optimal glucose control, thereby overemphasizing the need for the clinical priority of early identification and intervention against risk factors for young onset type 2 diabetes (Kato and Natarajan, 2019).

The successful control of diabetes mainly depends on the patient’s self-care, while the treatment team has little control over the patient in the intervals between visits (Samadzadeh *et al.*, 2019). For instance, type 2 diabetes prevention requires the individual to navigate emotional challenges and dysfunction, beliefs and attitudes (Yates *et al.*, 2019).

Type 2 diabetes can be prevented in young adults with the use of the BPS intervention, which is brief, flexible, and evidenced across various context (Heekerens and Eid, 2020). The BPS intervention is a disclosive writing exercise designed to help recipients set goals for a positive, imagined future (Loveday *et al.*, 2018) and are also associations between the BPS intervention and reductions in depressive symptoms, pain, and other physical illness symptoms (Gibson *et al.*, 2018) indicating benefits for physical and mental health among clinical.

2 Study Background

The background section of a thesis provides the essential context needed to understand the research problem and its significance. This section aims to clarify the rationale behind the research, drawing on existing literature to identify gaps, unresolved issues, and the

importance of the current investigation. By doing so, it sets the stage for the subsequent research questions and objectives, ensuring that the relevance of the study is appreciated focusing on gaining a wider understanding of type 2 diabetes concept, particularly its prevalence among young adults, and exploring the preventive roles and measures implemented by nurses to reduce complications within this population.

2.1 The Concept of Diabetes

Diabetes, often referred to as diabetes mellitus is a chronic metabolic disorder, it is defined by increased blood glucose levels, resulting in long-term harm to vital organs such as the heart, blood vessels, eyes, kidneys, and nerves. In a simpler term, diabetes is a chronic persistent condition that arises from the body's inability to process and regulate blood glucose, either due to the pancreas' over-secretion of insulin or the body's inability to effectively use insulin to control blood glucose levels (CDCP, 2022). Insulin is a polypeptide hormone secreted by the beta cells of the islets of Langerhans in the pancreas. It regulates blood glucose levels, facilitating the assimilation and utilization of glucose (Thota & Akbbar, 2020). In individuals with diabetes, a phenomenon called "insulin resistance" occurs, where the body's cells resist the hormone insulin, leading to a lack of response. Insulin resistance is characterized by a decline in sensitivity to insulin's biochemical actions and insulin-mediated glucose disposal, causing a buildup of glucose in the bloodstream and eventually leading to type 2 diabetes (Hill *et al.*, 2021). Diabetes can be divided into four major types: type 1, type 2, gestational, and secondary or other specific types of diabetes (American Diabetes Association, 2022). Type 1 diabetes is an autoimmune condition under which the body's immune system attacks and destroys the insulin-producing beta cells (β -cells) in the pancreas, resulting in a lack of insulin and consequently accounts for around 5% of all diabetes cases (CDCP, 2020). Noteworthy, unlike type 2 diabetes, which is more prevalent

in older adults, type 1 diabetes is less common in adults and occurs more frequently in younger individuals and its management necessitates lifelong insulin therapy to replace the hormone that the body can no longer produce (Holt *et al.*, 2021).

Gestational diabetes mellitus (GDM) is a form of high blood sugar that develops during pregnancy and poses potential health risks to both mother and fetus which usually resolves after childbirth. Nonetheless, women who experienced gestational diabetes and their children are at a higher risk of developing type 2 diabetes later in life (International Diabetes Federation, 2022).

Type 2 diabetes, the predominant type, makes up 90% to 95% of diabetes cases both in the United States and globally (CDCP, 2020). Type 2 diabetes mellitus (T2D) is considered a multiorgan metabolic disease hallmarked by impaired beta cell function and insulin signaling, dyslipidemia, inflammation, and incretin resistance (Chung *et al.*, 2020). Diabetes mellitus type 2 is an expensive condition that affects people, businesses, healthcare systems, and entire society globally. Type 2 diabetes is a progressive condition, initially managed through lifestyle changes and oral medications. As the disease progresses, patients may eventually require insulin therapy. Around the world, 8% of people have diabetes and 7% have prediabetes, the condition that precedes diabetes (Karla, Felipe, & Weber, 2018). During the prediabetes stage, there is the possibility to delay or prevent the onset of type 2 diabetes through lifestyle modifications, including healthy eating habits, regular exercise, and weight loss, potentially without the need for medication (Centers for Disease Control and Prevention, 2023). Type 2 diabetes, is characterized by insufficient insulin production by the pancreatic islet cells, tissue resistance to insulin (IR), and an insufficient compensatory insulin release (WHO, 2024).

2. 2 Type 2 Diabetes in Young Adults

Youth-onset type 2 diabetes occurs during puberty when plasma insulin levels rise from pre-pubertal baselines and peak during puberty (Wong *et al.*, 2015). There is a significant difference between adult-onset and youth-onset type 2 diabetes. In adults, hyperglycemia progresses slowly over years, whereas in youth, it develops rapidly and aggressively, increasing the risk of diabetes-related complications (Amutha & Mohan, 2016; Unnikrishnan *et al.*, 2016). In recent years, there has been a concerning rise in diabetes cases worldwide. The World Health Organization (WHO) (2016), reports that from 1980 to 2014, the global prevalence of diabetes among adults more than doubled, increasing from 4.7% (108 million adults) to 8.5% (422 million adults). By 2021, this prevalence had climbed to 10.5% (536.6 million adults aged 20 and over) (Magliano, 2021). If effective interventions are not implemented, the number of diabetes cases is projected to reach 570.9 million by 2025, with over 1.59 million related deaths (Lin *et al.*, 2020). With type 2 diabetes becoming much more common among teenagers and young people and obesity, sedentary lifestyle, and genetic predisposition being the main risk factors, like type 2 diabetes with an older onset. Diabetes that develops before the age of 40 is linked to a longer duration of disease exposure and a higher chance of chronic complications. More people in their working years are afflicted by type 2 diabetes with early onset, which highlights the disease's detrimental impact on society. Also, there is mounting evidence that type 2 diabetes with a young onset has a more aggressive disease phenotype, which can hasten the onset of challenges, negatively impact quality of life, and have unfavorable long-term consequences. All of these factors increase the risk of a public health emergency in the future (Nadia Lascar *et al.*, 2017).

2.3 Diagnosis of Type 2 Diabetes

It is estimated that a significant percentage of cases of type 2 diabetes (30% to 80%, depending on the country) are undiagnosed (WHO, 2020). The diagnosis of type 2 diabetes is based on a few factors. The (World Health Organization, 2023) states that the following methods are typically used to diagnose type 2 diabetes:

- i. Glycated hemoglobin (HbA1c) blood test: Diabetes is diagnosed when there is a blood glucose level of 6.5% or over.
- ii. Fasting blood sugar test: For this test, the patient must go without food for eight to fourteen hours the night before a blood sample is drawn. Diabetes is diagnosed if the results is 7.0 mm or greater.
- iii. Two-hour post-load blood sugar test: This test is primarily used to diagnose diabetes or prediabetes, with a blood sugar level of 11.1 mmol/L or higher after two hours indicating diabetes.

2.4 Risk Factors of Type 2 Diabetes among Young Adults

The global prevalence of type 2 diabetes among adolescents and young adults has surged significantly over recent decades, primarily due to lifestyle changes and the rising rates of obesity (Lascar *et al.*, 2018). Similarly, the incidence of early-onset type 2 diabetes with related microvascular and macrovascular complications now emerging at younger ages is on the rise (Arslanian *et al.*, 2018). These trends may be due to insufficient screening, diagnosis, and treatment in younger populations. Additional factors include prolonged exposure to obesity, poor glycemic control, dyslipidemia, hypertension, and chronic infections, which are more pronounced in young adults with type 2 diabetes compared to both older adults with the condition and young adults with type 1 diabetes (Dabelea *et al.*,

2017). Young adult-onset of type 2 diabetes has a rippling effect on the individuals and by extension the society at large as it affects younger individuals who are of working age, potentially predisposing them to lifelong treatment and thereby increasing the risk of complications (Lascaz *et al.*, 2018). The risk factors for type 2 diabetes mellitus typically involve genetic, metabolic, and environmental factors. These factors interact with one another collectively resulting in the increased occurrence of the condition. Overweight and obesity are also significant risk factors for type 2 diabetes (Colditz *et al.*, 2014). At risk are those who are overweight with a body mass index (BMI) greater than or equal to the 85th percentile or who are obese (greater than or equal to the 95th percentile) (ADA, 2019). Although individual predisposition to type 2 diabetes mellitus due to non-modifiable risk factors (ethnicity and family history/genetic predisposition) has a strong genetic basis, evidence from epidemiological studies suggests that many cases of type 2 diabetes mellitus can be prevented by improving the main modifiable risk factors (obesity, low physical activity and an unhealthy diet) (Schellenberg, 2013).

2.5 Symptoms of Type 2 Diabetes

Owing to the slow pace at which the hyperglycaemia is worsening, the symptoms of type 2 diabetes are usually not serious. As a result, in the absence of biochemical testing, hyperglycaemia sufficient to cause pathological and functional changes may be present for a long time before a diagnosis is made, resulting in the presence of complications at diagnosis (WHO, 2020). Blood glucose levels in young people with diabetes are not as well controlled as in older individuals (Nam *et al.*, 2019). Type 2 diabetes symptoms are either not very severe or not present at all in the beginning with people of young age. The symptoms to type 2 diabetes at the onset tends to be slower, with tingling nerves and slow-healing sores most commonly observed. The gradual development of type 2 diabetes signs and symptoms might aggravate hyperglycemia, which can cause consequences before

diagnosis. According to the (World Health Organization, 2023), the symptoms of type 2 diabetes can develop gradually, and may but not limited to the following: increased thirst (polydipsia), frequent urination (polyuria), increased hunger (polyphagia), numbness or tingling in the hands or feet, inadvertent weight loss, fatigue, darkened skin (acanthosis nigricans), dehydration, kidney disease. Many people with type 2 diabetes may not experience these noticeable symptoms, especially in the early stages.

2.6 Prevention of Type 2 Diabetes

The foundation for managing diabetes effectively is early diagnosis, as prolonged undiagnosed and untreated diabetes can lead to poorer health outcomes (WHO, 2021). Clinical trials have demonstrated the effectiveness of lifestyle interventions in preventing type 2 diabetes across various populations, with the benefits of the interventions largely hinges on the adoption of healthier lifestyle changes, underscoring the importance of health behaviour modification in preventing type 2 diabetes (Lindström *et al.*, 2013). While certain risk factors for type 2 diabetes, like genetics, ethnicity, and age, cannot be altered, preventive measures can still be taken through behavioural and environmental modifications. These include changes to diet, exercise, weight management, and other health behaviours, such as cessation of smoking, which can significantly contribute to prevention efforts (Hunter, 2016). While a cure for the disease remains elusive, treatment options typically involve lifestyle changes and the utilization of insulin sensitizers such as metformin. Metformin, a biguanide, effectively reduces insulin resistance, thereby lowering blood glucose levels, enhancing insulin sensitivity, and decreasing cardiovascular risks and hypoglycemia risks (Collier *et al.*, 2006) and is the only hypoglycemic agent to improve macrovascular outcomes and to reduce mortality rates in type 2 diabetes mellitus patients (Erlich *et al.*, 2013). Meanwhile, efforts to prevent type 2 diabetes in younger

populations face challenges due to difficulties in identifying individuals at highest risk, low participation rates in lifestyle interventions aimed at prevention, and reduced weight loss effectiveness among those who do participate. (Misra *et al.*, 2022).

2.7 Complications of Type 2 Diabetes

Complications evolve sooner and more rapidly in youth than in adults diagnosed with type 2 diabetes mellitus and may be a result of long-term untreated asymptomatic high blood glucose, leading to the dysfunctionality and eventual failure of various organs (NIDDK, 2020). Long-term or irreversible complications of diabetes mellitus include vision abnormalities and complete vision loss, impaired kidney function, peripheral nerve damage leading to end organ damage, and autonomic nervous system abnormalities affecting the gastrointestinal tract, urinary tract, and cardiovascular system (Banday *et al.*, 2020). Diabetic patients are also at a higher risk of developing atherosclerotic cardiovascular, peripheral arterial, and cerebrovascular diseases. Hypertension and lipoprotein metabolism abnormalities are also often present in individuals with diabetes (Banday *et al.*, 2020).

According to WHO (2020), acute complications of diabetes type 2 are hypoglycaemia and hyperglycaemic emergencies. Hypoglycaemia (abnormally low blood glucose) is a frequent iatrogenic complication in diabetic patients, occurring particularly in patients receiving sulfonylurea or insulin. It causes loss of consciousness and coma and potentially can be life-threatening. With the age of diagnosis, the lifetime risk of developing complications remains high, therefore, it is recommended that blood pressure readings, a fasting lipid panel, a urine screen, and a dilated eye examination be performed during the initial diagnosis (ADA, 2019). Hence, complications can be minimized and managed if detected and treated early, but if left untreated or treated in a poorly manner it can lead to severe

life-threatening complications. Uncontrolled type 2 diabetes can result in several consequences, according to Molinaro & Dauscher (2017), these consequences fall into two categories: macrovascular (cardiovascular disorders like heart attack and stroke) and microvascular (nephropathy, retinopathy, and neuropathy).

2.8 Management of type 2 Diabetes in Young Adults

The issue of diabetes mellitus is on the rise globally, affecting both young and old adults. The primary contributors to this worldwide problem include genetic disorders, as well as behavioural and environmental risk factors. Notably modifiable risk factors, such as obesity and physical inactivity are the main non-genetic determinants of diabetes (Aftab *et al.*, 2017). The management of type 2 diabetes in young adults' population therefore, must be multidisciplinary, family-centered, and culturally appropriate (ADA, 2019).

In the management of diabetes, self-management is principal to achieve optimal glycemic control. Diabetes self-management is simply put as the various daily routines that patients adopt to help control it blood glucose level in order to scientifically and reasonably reduce the impact of diabetes on their health, such as proper diet, regular exercise, taking oral antidiabetic drugs or insulin injections according to their doctor's prescription, blood glucose monitoring, foot care etc, (Powers *et al.*, 2020). Therefore, effective diabetes self-management can improve outcomes and reduce costs for people with diabetes (American Diabetes Association, 2021).

Similarly, nurses' management of type 2 diabetes mellitus in youth is primarily to normalize glucose levels through medication adherence, creating lifestyle changes through proper food choices and exercise, managing diabetes-related complications, and making appropriate referrals when necessary (ADA, 2019). Glycemic control is essential in the prevention of comorbidities, such as retinopathy, neuropathy, nephropathy, and

cardiovascular complications with type 2 diabetes mellitus, and serve as the main focus in youth with type 2 diabetes mellitus. Management involves referring the patient to a pediatric endocrinologist for medication, which may include metformin and, if symptoms are severe, possibly insulin. Other oral antidiabetic medications are not recommended for children younger than 18 years either due to not being approved or still under investigation (Unnikrishnan *et al.*, 2016).

3 Aim of Study

This study is to bring new knowledge about the roles of nurses in the prevention of diabetes type 2 complications among young adults.

3.1 Research Question

What are the measures adopted by nurses in preventing diabetes type 2 complications among young adults?

4 Theoretical Framework

Polit & Beck, (2017) explicated that choosing an appropriate theoretical framework that aligns with the research question and the objectives of the study is crucial. It provides a structured foundation for understanding the phenomena under investigation, guiding the research process and helping to interpret findings in a meaningful way. Therefore, Dorothea Orem's self-care deficit theory of Nursing has been chosen as the appropriate theory for this research.

4.1 Dorothea Orem's Self-Care Deficit Theory of Nursing

This theory highlights the importance of individuals' capacity to care for themselves and emphasizes the nurse's role in assisting individuals to meet their self-care needs. The term "self-care" is widely used and valued across various fields around the world (Walker, 2020).

According to the World Health Organization (WHO) (2020), self-care refers to the capacity of individuals, families, and communities to enhance health, prevent illness, sustain well-being, and manage illness or disability, either independently or with assistance from healthcare providers. The theory posits that each individual possesses the capacity to acquire self-care skills and to cultivate abilities for maintaining his/her health. Certain factors however may limit their self-care performance to obtain the needs. Imperatively, nurses play an important role in assisting these individuals to meet their self-care needs (Isik & Fredland, 2023). The Orem self-care deficit theory of nursing compose of three interconnected theories: the self-care theory, the self-care deficit theory, and the nursing system theory, which is further divided into wholly compensatory, partially compensatory, and supportive-educative systems (Kharb & Sachdeva, 2022).

4.1.1 Nursing System Theory

Nursing systems theory suggests that nursing practices should define and maintain essential relationships, including those within the fully compensatory, partially compensatory, and educational support systems (Bezerra *et al.*, 2018). This specialized nursing knowledge is utilized within a complex landscape of interprofessional and interdisciplinary collaboration. With the explosion of knowledge in basic sciences, technology, and other healthcare disciplines, nursing's theoretical contributions include concepts and outcomes fully understood and valued by all members of the healthcare team (Meleis, 2018). On the basis of the relationship between the nurses' and the patients care demand, the following are the categories of nursing system theory.

- i. **Wholly Compensatory System:** Under this system, nurses take on full responsibility for assisting patients in meeting their self-care needs. Patients are passive participants, relying entirely on nurses to perform necessary activities.

- ii. **Partly Compensatory System:** Under this approach, patients attempt to engage in independent activities while nurses assess their abilities and offer assistance when needed. This encourages individuals to participate in self-care activities.
- iii. **Supportive Educative System:** Herein, nurses play a vital role in assisting patients in gaining the necessary knowledge to manage their health conditions and carry out self-care practices (Alligood, 2018).

The nursing system theory ultimately offers appropriate and adequate support, assistance, education, and intervention to nurses in promoting individual's health and achieving optimal health status.

4.1.2 Self-Care Theory

This theory, outline the activities individuals engage in within a specific timeframe to maintain their life, health, well-being, personal growth, and overall functioning. These self-care practices which are essential for sustaining health and promoting optimal life quality highlights the purpose, methods, and outcomes of self-care. The theory is categorized into three levels as thus:

- i. **Universal requirements:** According to Orem, certain requirements such as (water, activity and rest, and social interaction, food etc) are associated with life processes, with human integrity maintenance, as well as human structure and functioning. Orem lists universal self-care requisites to be: air, water, food, elimination, activity and rest, solitude and social interaction, prevention of hazards, and promotion of normalcy.
- ii. **Development requirements:** This refers to new events and situations that occur in the human environment for the purpose of development. To fulfill the requirements, man needs biological, psychological and social

development, in addition to universal self-care requirements. Self-care requirements in health deviation refer to care or decision making in relation to the health problem identified or diagnosed for the purpose of recovery, rehabilitation and control.

- iii. Health deviation requirements: These requirements involve activities aimed at managing and addressing the health deviation, such as following medical treatments, taking prescribed medications, monitoring symptoms, and seeking professional care.

4.1.3 Self-Care Deficit Theory

Self-care deficit theory reveals the role of nurses in moments of patient limitations in developing their self-care according to the identification of individuals' self-care needs. In simpler terms, individuals may be unable to fully or partially take care of themselves due to physical, mental, or developmental limitations. In such cases, nurses step in to help them with their self-care needs. The self-care deficit theory highlights the importance of nurses' role and intervention in supporting people who lack the ability to care for themselves, ensuring their continued life, health, and well-being. Nurses foster essential care skills based on a person's self-care deficits by accessing information regarding everyday self-care actions and capabilities to help determine the cause of problems and change activities to improve one's self-care ability.

5 Methodology

Research methodology, a scientific approach includes primarily two methods (qualitative and quantitative). It involves the collection of data and analysis, and identifying suitable samples. Hence, this research work employs the qualitative methodology and the qualitative systematic literature review mechanisms to answer the research question.

5.1 Qualitative Research

In essence, qualitative investigations involve the collection of narrative descriptions by researchers as their primary source of qualitative data. Conversations with participants, notes about their behaviour in naturalistic settings, or the acquisition of narrative recordings, such as diaries, and all narrative data. Over the past few decades, qualitative research has become increasingly common in nursing research due to its potent approach. Qualitative research has become an important instrument in nursing practice and academics as attention moves to integrated patient care and comprehending the complexities of human experiences. (Polit & Beck, 2010, p. 259).

5.2 Systematic Literature

Many of the guidelines for systematic reviews are similar to those for primary investigations. The foundation of evidence-based practice in nursing research is a systematic literature evaluation, which incorporates a wide range of studies (Polit & Beck, 2010, p. 59). A systematic review combines findings and conclusions from several publications on the same subject to locate, evaluate, and synthesize all empirical evidence to respond to particular clinical research questions. We may learn more about evidence-based practice by comprehending the importance and ramifications of a systematic literature review in the nursing field (Gerrish, Lacey, & Cormack, 2010, p. 287). Additionally, stress that the conclusions of systematic reviews are regarded as being more accurate and reliable than those of other study types because so many various kinds of evidence-based studies are gathered in them (Polit & Beck, 2010).

So, in this study, systematic literature review will be adopted because its approach incorporates a process that guarantees the results being validated, accurate, dependable,

and free from bias, it has been chosen for this work to report research outcomes in accordance with (Polit & Beck, 2010, p. 37).

5.3 Data Collection

Data collection involves systematically collecting data from various sources using appropriate methods and techniques. It is a rigorous process that lays the groundwork for research analysis and interpretation, and it is crucial for producing meaningful and valid results. In order to collect data for a systematic literature review research work, certain key principles must be adhered to as stated by Gerrish & Lacey (2010, p. 291). The principles are as stated below:

- a. Creating a thorough search strategy using databases, journal sources, keywords, and search terms to find relevant studies.
- b. Establishing inclusion and exclusion criteria based on language, publication year, population, peer review, and full text ensures accuracy, followed by screening titles and abstracts against the research question and reviewing full texts to meet the inclusion criteria.
- c. Assessing the quality of included studies by evaluating the study design, methodology, data collection method, and source's reliability.

5.4 Data Collection Prisma Chart

In a systematic review, inclusion and exclusion criteria play crucial roles in ensuring that the collected data is pertinent, dependable, and applicable to the intended population. Inclusion criteria specify the necessary characteristics a study participant must possess to be eligible for inclusion. These criteria identify the target population and ensure the gathered data accurately represents it. Conversely, exclusion criteria outline characteristics that render a study participant ineligible for inclusion. These criteria are designed to

exclude factors or variables that do not meet the inclusion criteria or might be influenced by factors potentially affecting the study's validity.

Inclusion criteria are: full text, availability of abstract, Peer reviewed articles, academic journals, articles in English language, publication year between (2018-2024) and studies in younger age group (18-40 years) while the exclusion criteria used are: articles that are not in full text, irrelevant topic & duplicate studies, not peer review articles, articles not in English language, publications older than year 2018 and studies of older age group (41 and above).

A total of 563 records were initially identified from the selected databases. Of these, 532 were excluded for not meeting the inclusion criteria. Subsequently, 31 records were screened for eligibility. After further evaluation, 18 records were excluded as they were not relevant to this paper, leaving 14 reports that were ultimately selected for this study. The details are illustrated in the chart below.

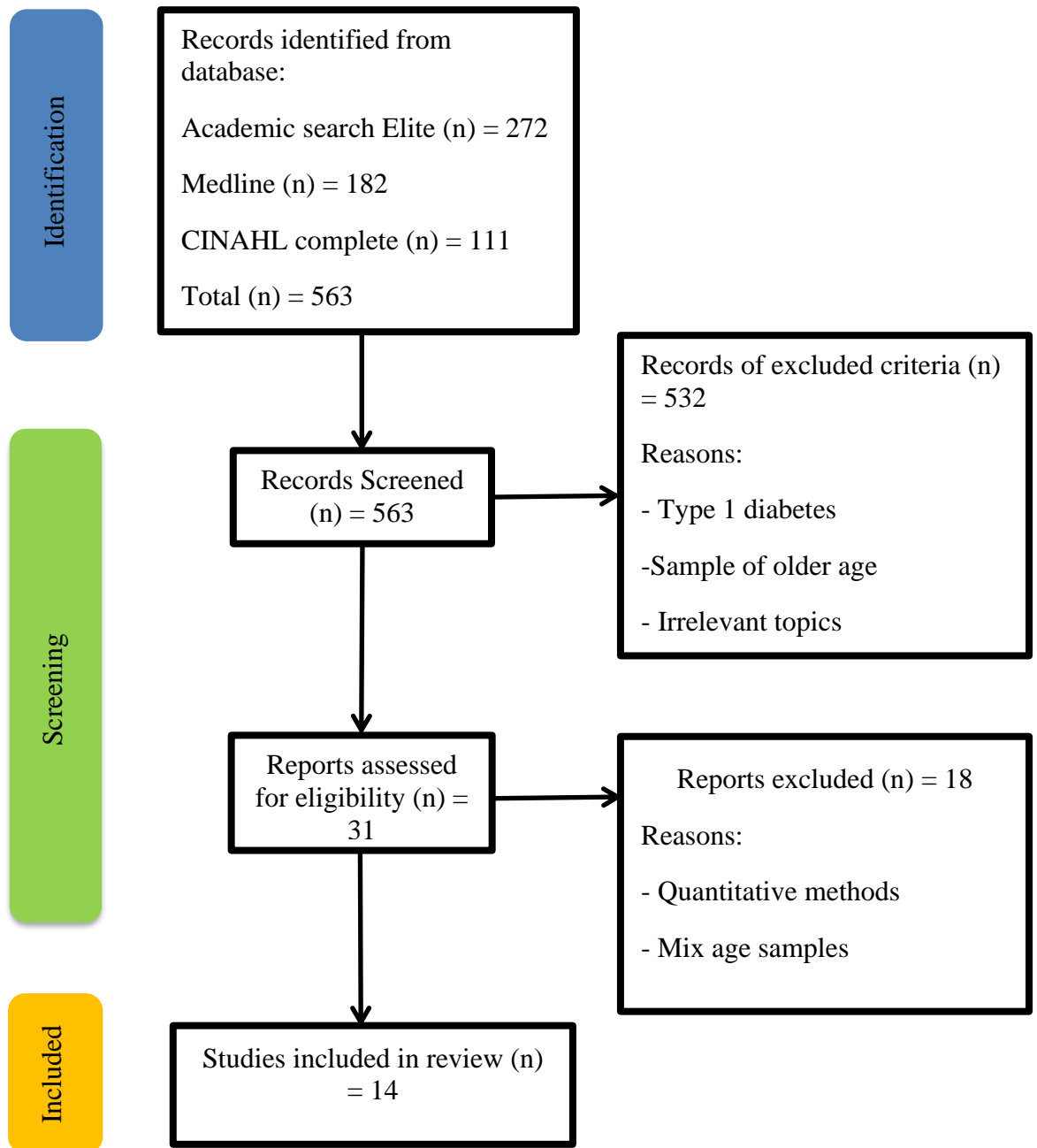


Figure 1. PRISMA flow diagram

5.5 Content Analysis

The process of evaluating and understanding research is called content analysis. Gerrish & Lacey (2010, p. 184) state that content analysis necessitates a "reading" method that involves switching back and forth between the study's expression or specifics and the overall meaning of the text. It provides a text of the entire context, elucidating the study's meaning inside the text. According to Gerrish & Lacey (2010, p. 184), content analysis can be done systematically by following these steps. Firstly, to understand the significance, one must read the entire passage, the method of programming which involves classifying and labeling certain retrieved data segments, breaking up text into small understandable units, creating classifications of the themes that reflect recurrent notions, subjects, or themes that surface in the chosen research, then interpretation of themes and categories in respect to the research issue, and lastly relative evaluation, focusing on thematic patterns, variations, and connections among the chosen research.

The analysis resulted in the identification of four main themes and eight subthemes, providing deeper insights into the role of nurses in the prevention and management of type 2 diabetes and by extension in younger type 2 diabetes patients.

5.6 Ethical Consideration

Ethical consideration refers to the principles and practices that ensure honesty, integrity, and professionalism throughout the research process. It involves adhering to guidelines that promote objectivity, confidentiality, and accuracy while avoiding misrepresentation or errors in the study. Ethical practices include using credible and high-quality academic sources, properly citing all materials to avoid plagiarism, and refraining from fabricating or falsifying data. Consequently, the researcher will follow the institutional guidelines to maintain the trustworthiness of this work, safeguarding its reputation while also ensuring

that the research findings are reliable, unbiased, and contribute meaningfully to the field of study.

6

RESULTS

From the analysis four main themes along with eight sub-themes were listed as outlined below:

Table 2: Nurses role in type 2 diabetes management among young adults

S/N	Themes	Sub-themes
1	Physical activities	<ul style="list-style-type: none"> • Investing in physical activities (n) = 3 • Making exercise a habitual element (n) = 1
2	Healthy diet	<ul style="list-style-type: none"> • Dietary modification (n) = 1 • Balanced diet awareness (n) = 2
3	Counselling	<ul style="list-style-type: none"> • Psychological management (n) = 2 • Psychosocial assessment (n) = 1
4	Pharmacological assistance	<ul style="list-style-type: none"> • Medicine adherence education (n) = 3 • Applying telemedicine to diabetes management (n) = 2

n = Number of article studied for the theme and sub-themes

6.1 Physical Activities

Managing type 2 diabetes mellitus requires a combination of physical exercise, a balanced diet, and medication (Yeh *et al.*, 2023). Physical exercise plays a crucial role in this management strategy by reducing insulin resistance, improving muscle glucose utilization, enhancing insulin sensitivity, and increasing quality adjusted life years (QALY) (Barbosa *et al.*, 2022). Moreover, exercise offers numerous health benefits, including a lowered risk of cardiovascular disease, improved physical fitness, maintenance of a healthy weight, and better mental well-being, ultimately enhancing the overall quality of life for individuals with diabetes (Sigal *et al.*, 2018). From the selected studies, another theme emerges, consisting of the following two sub-themes.

6.1.1 Investing in Physical Exercises

Barbosa *et al.* (2022) highlighted the importance of investing in physical exercises for individuals living with type 2 diabetes, emphasizing that these interventions are cost-effective for managing the condition. Compared to standard glycemic control, physical activities are particularly effective for controlling diabetic risk factors and early detection of complications. Intensive lifestyle interventions, including physical activities, also play a significant role in preventing type 2 diabetes among young adults.

Studies have demonstrated the significant benefits of regular exercise in effectively managing blood glucose levels, particularly in young adults with type 2 diabetes. As Barbosa *et al.* (2022) earlier stated, physical exercise helps reduce insulin resistance, improves muscle glucose utilization, enhances insulin sensitivity, and increases quality adjusted life years (Barbosa *et al.*, 2022). Also, according to Sigal *et al.* (2018), exercise provides multiple

health benefits that can significantly improve the quality of life for individuals with diabetes and therefore advise that *"both aerobic and resistance exercises offer significant benefits, and it is ideal to incorporate both types of exercise into a routine. It is recommended to engage in at least 150 minutes of aerobic exercise per week and participate in at least two resistance training sessions per week. However, even smaller amounts of physical activity can still provide health benefits."* These benefits include a reduced risk of cardiovascular disease, enhanced physical fitness, healthy weight management, and improved mental well-being (Sigal *et al.*, 2018). Nurses play a crucial role in designing and instructing exercise programs for these patients. Based on these assessments, nurses set realistic and individualized exercise goals aimed at controlling blood glucose levels, enhancing muscular strength, and maximizing cardiovascular fitness. They develop customized exercise programs tailored to the needs, health status, preferences, and capabilities of each individual. Ensuring the safety of these exercise programs, nurses teach and instruct proper techniques while providing clear and detailed guidance. This approach not only helps manage blood glucose levels but also promotes overall health and well-being for young adults with type 2 diabetes.

6.1.2 Making Exercise a Habitual Element

Syeda *et al.* (2023) underscore the importance of physical activity as a key therapeutic intervention for patients with type 2 diabetes. The research points out that *"physical activity and exercise are crucial for improving glucose levels and other cardiometabolic risk factors in patients with type 2 diabetes, particularly in young adults that engage in regular exercise, as a routine consisting of aerobic, resistance or a combination of both fostering improved short and long-term glycemic control."* The study further emphasized that certain activities can effectively lower glucose levels, such as taking breaks during

prolonged sitting, scheduling workouts after meals to prevent hyperglycemia, and including both aerobic and high-intensity resistance exercises in the weekly routine. Various studies reveal that young individuals with type 2 diabetes tend to engage in inadequate physical activity, and sometimes none at all. To better manage this condition in young adults, innovative strategies are required to assess and overcome the barriers to regular physical activity.

Nurses are essential in this process, providing personalized lifestyle modification programs and encouraging adherence to exercise routines tailored to diabetes management. They should educate young adults on the advantages of regular physical activity for blood glucose control, identify and address obstacles to exercise, and offer emotional support to cultivate positive attitudes toward physical activity. By promoting consistent exercise habits, nurses can help young adults with type 2 diabetes significantly enhance their health and effectively manage their condition.

6.2 Healthy Dieting

In preventing type 2 diabetes among young adults, maintaining a healthy, balanced diet is crucial for managing blood glucose levels. A healthy diet includes a variety of whole grains, vegetables, fruits, dairy products, nuts, and seeds while limiting fats, oils, and sugary foods (White *et al.*, 2024). From the selected studies, the theme "healthy dieting" emerges, supported by two sub-themes: dietary modifications and balanced diet awareness.

6.2.1 Dietary Modifications

For young people living with type 2 diabetes to help prevent the complications of the disease it is pertinent that their diet is modified. According to White *et al.* (2024), they premised that for young adults living with type 2 diabetes, carbohydrates should make-up

about 40–50% of energy requirements, fat being less than 35% and protein accounting for about 15–25% of their dietary make-up. In furtherance to this, the ratio of carbohydrates-to-fat is advised to be “persons-centered” as some individuals may experience benefits from a lower carbohydrate intake and higher fat consumption, while others may find the opposite approach more beneficial. Therefore, *"Families should be encouraged to adopt a healthy, balanced diet that includes whole grains, vegetables, fruits, low-fat dairy, nuts, seeds, and meals that are well-balanced with complex carbohydrates, protein, and vegetables. This approach helps regulate appetite, enhances satiety, and limits the intake of fats, oils, and sugary foods."*

In this context, nurses play an essential role in providing dietary recommendations and modifications to manage the glucose levels in young patients, explaining the importance of proper nutritional diets in managing blood glucose levels and ultimately preventing diabetes complications. Nurses interventions in interpreting foods that contain healthy or unhealthy compounds or substance is expressly important in understanding the relationship between healthy diet and blood glucose control for young patients with diabetes.

6.2.2 Balanced Diet Awareness

Balanced diet awareness is particularly vital for young adults living with type 2 diabetes, as proper nutrition plays a crucial role in managing blood glucose levels and overall health. This demographic often faces unique challenges in maintaining a balanced diet due to lifestyle, social influences, and a lack of nutritional education. Raising awareness about the importance of a balanced diet among young adults with diabetes involves educating them on the types of foods that can help stabilize blood sugar levels, the benefits of a varied and nutrient-rich diet, and practical strategies for making healthier food choices. For instance,

in a study by Iqbal *et al.* (2023), the sampled populations knowledge and awareness of balanced diet was reported not to be in-depth as most of the young population sampled were unaware of the consequences attached with the consumption of certain food. The analysis of the younger generation showed that when diabetes symptoms first appeared, they struggled to identify which foods were suitable to eat at home, unlike foods with clear and understandable labels. According to one of the sampled young generation participant, *"As someone with diabetes, I prioritize foods like fish and avoid certain cooking oils. I also look for low-fat and no-added-sugar options at the supermarket, such as low-fat yogurt. However, it can be more difficult to control portion sizes and make the healthiest choices with home-cooked meals, so I occasionally skip meals or try to eat smaller portions."* Similarly, Alloh *et al.* (2019), stated that evolution experienced by immigrants living with type 2 diabetes in the united kingdom are primarily attributed to differences in their knowledge and perceptions of healthy dietary habits compared to those in obtainable in sub-sahara west Africa. For example, participants mentioned that although they were advised to avoid sugar, their diets continued to be high in carbohydrates. *One participant shared, "In Nigeria, we only use sugar in teas and coffees, but not in anything else. When I arrived in the United Kingdom, I was surprised to find sugar in everything, except in teas."*

Therefore, empowering young adults with balanced diet knowledge is essential for improving their quality of life, preventing complications, and promoting long-term health and well-being. Nurses therefore play a vital role in helping young adults with diabetes to understand the critical importance of a balanced diet in managing their condition.

6.3 Counseling

Under this theme, the critical role of nurses in supporting and guiding young adults with type 2 diabetes will be examined, focusing on their functions as counselors and facilitators

in managing blood glucose levels in young patients. This theme includes a sub-theme titled "psychological management," which addresses the psychological aspects of diabetes care.

6.3.1 Psychological Management

White *et al.* (2024), explicated that young adults with type 2 diabetes are more exposed to moderate or severe depression than those with type 1 diabetes. For young diabetic patients, managing diabetes, addressing family conflicts related to its care, and coping with the emotional aspects of the condition frequently cause significant stress, which is often marked by feelings of mental, emotional, and physical exhaustion from living with diabetes often resulting in neglect of self-management responsibilities (de Wit *et al.*, 2022). *"It is essential to use validated psychological questionnaires to screen and assess relevant psychological needs during routine consultations with individuals with diabetes and their families. Incorporating these assessments into the clinical encounter is feasible and well-accepted by children, youth, families, and healthcare professionals, as it helps shift the focus toward psychological and psychosocial factors, facilitates shared decision-making, and guides care decisions, rather than solely concentrating on outcome like HbA1c"* (de Wit *et al.*, 2022). Consequently, nurses are tasked with providing essential psychological counseling by listening to patients' emotions and concerns, to address symptoms of depression and anxiety, and delivering emotional support to alleviate the psychological burden of the disease. Additionally, nurses can teach mechanisms that helps to manage the stress accompanied diabetes, empower both patients and their families with knowledge about the condition, reduce anxiety and uncertainty, and address any negative feelings or frustrations patients may experience.

6.3.2 Psychosocial Assessment

Sumartini and Putri (2021), stated that diabetes mellitus type 2 disease significantly impacts adolescents on psychosocial aspects such as stress and anxiety. In the social aspect, participants tend to have lower self esteem but have good social support. For instance, according to participants from the study,

“Yes right, so now I feel embarrassed when I meet people, because my gums like to bleed, so I’m embarrassed to talk to others...” another participant stated

“Because I’m embarrassed when I go out, so I rarely interact with neighbours and friends.”

However, all participants said that *“my parent always give support, motivation, and encouragement.”*, *“family always motivates them to go to the hospital for regular check-ups and take medication regularly.”*, *“The neighbours like to visit when I am sick”*.

This assessment evaluates the individual’s mental health, support systems, lifestyle, and coping mechanisms, all of which play a significant role in managing a chronic condition like diabetes type 2 in young adults patients who are often faced with unique challenges, including stress from lifestyle changes, stigma, and the pressures of balancing diabetes management with their social lives.

Hence, nurses play a crucial role in this process by conducting comprehensive psychosocial assessments and developing individualized care plans. Through their involvement, nurses help bridge the gap between medical and psychosocial needs, ultimately contributing to improved outcomes and quality of life for young adults with type 2 diabetes. This evidence underscores the importance of integrated care that addresses psychosocial aspects, encouraging nurses and behavioral health professionals to support one another in order reduce barriers in diabetes care.

6.4 Pharmacological Assistance

Medication is a crucial factor in mitigating symptoms and preventing complications of diabetes mellitus in young patients. However, adherence to medication can be challenging

for this demographic, often due to a fear of pills or hypoglycemia. After a thorough review of relevant articles the theme emerged and subsequently other sub-themes to help emphasize the significant role of nurses in providing pharmacological related assistance to patients.

6.4.1 Medicine Adherence Education

Reports on medication adherence among patients with type 2 diabetes, particularly young individuals, are generally concerning. For example, Gatwood *et al.* (2021) found that poor adherence to medications such as antihypertensives and lipid-lowering drugs in both adults and younger individuals with diabetes is linked to increased cardiovascular events and higher mortality rates. Similarly, Denicolò *et al.* (2021), found that non-adherence to pharmacotherapy by diabetic patients leads to chronic conditions such as cardiovascular risks and can serve as a barrier to successful management of the disease. Therefore, maintaining consistent medication adherence strongly linked to patients' health literacy is crucial for achieving effective diabetes management. Similarly, the importance of emotional, financial and psychosocial factors from family members and healthcare professionals help develop effective behaviour toward improve medication adherence in type 2 diabetic patients (Onwuchuluba, Oyetunde, and Soremekun, 2021). For instance, Many patients expressed dissatisfaction with healthcare providers' poor attitudes and lack of effective communication, noting that clinicians often provided instructions without ensuring patients' understanding. One participant stated, *"The truth is that nobody cares for you. They're only giving medicine if you understand, fine; if you don't, that's your business."* Patients anticipated support from healthcare providers but felt it was lacking. As another participant shared, *"Buying the medication is not a problem, but one needs support*

from your doctor, pharmacist, the nurse, but it's not so." (Onwuchuluba, Oyetunde, and Soremekun, 2021).

Hence, nurses play a pivotal role in addressing concern beliefs among low-adherent patients with low health literacy, help improve self-efficacy, and address perceived barriers to medication adherence among all low-adherent patients to optimally support patients' diabetes care. Nurses can also help by develop readable diabetes educational materials and providing education about diabetes for knowledge enhancement of the patients.

6.4.2 Applying Telemedicine to Diabetes Management

Telemedicine can be defined as the use of electronic communication technologies to facilitate interactions between healthcare providers and patients. One application of telemedicine in diabetes management is Flash Glucose Monitoring (FGM), which involves a sensor that continuously displays blood glucose levels with a simple scan. This technology has effectively improved glycemic control in patients with type 2 diabetes by providing real-time data and facilitating timely adjustments in treatment.

The emergence of new technologies, such as mobile apps, has proven to be a valuable tool for managing type 2 diabetes in both young and elderly individuals (Jeffrey *et al.*, 2019). These apps facilitate monitoring of blood glucose levels, adherence to medication or insulin therapy, dietary tracking, setting realistic goals, managing medication doses, and receiving reminders via text messages. Research indicates that the use of these technologies positively influences self-management outcomes among patients with type 2 diabetes (Bults *et al.*, 2023). However, mobile apps are particularly advantageous for younger patients, who often have greater familiarity and proficiency with technology.

Thus, the role of nurses in instructing patients on the use of technology cannot be underestimated, as it involves equipping patients with the knowledge and skills paramount to effective use technology to manage their diabetic status, encouraging and convincing patients through educational sessions and training programs. By doing so, nurses empower patients to leverage technology for their well-being, helping them interpret blood glucose trends and instructing them on appropriate responses, including medication management.

7 Discussion

The increasing prevalence of type 2 diabetes among young adults necessitates effective management strategies to prevent complications. This discussion section examines the critical role of nurses in preventing complications in young adults with type 2 diabetes, drawing on insights from a systematic literature review. It highlights the diverse responsibilities of nurses, including patient education, lifestyle modification, mental counseling, psychological management or support, and pharmacological assistance. By exploring these essential areas, this chapter emphasizes the significant impact of nursing interventions on health outcomes and the quality of life for young adults with type 2 diabetes. Additionally, it considers the application of Orem's self-care theory in guiding these nursing interventions, underscoring the importance of empowering patients to take an active role in their self-care management.

7.1 Discussion of Results

This study identified four themes that highlight potential areas for nurses' roles in glycemic control among young patients with type 2 diabetes. The first theme revolves around the physical activities practiced by these patients. Unlike standard glycemic control methods, physical activities are particularly effective in managing diabetic risk factors by facilitating early detection and addressing complications in young patients. The study emphasizes the

importance of intensive lifestyle interventions, including regular physical activity, in preventing type 2 diabetes among young adults and effectively managing their blood glucose levels. This is consistent with findings by Mukherji *et al.* (2022), which tested the effectiveness of varying frequencies of weekly structured exercise sessions to improve diabetes control in young adults. Their study suggests a three time-weekly structured exercise, with close monitoring and support for adherence, is necessary to achieve significant clinical improvements in diabetes severity. Similarly, the study supports offering structured exercise sessions to meet the ADA exercise guidelines for individuals with type 2 diabetes including young adults. Additionally, incorporating physical exercise as a habitual lifestyle offers numerous health advantages, maintenance of a healthy weight, and enhanced mental well-being, ultimately leading to a better overall quality of life for individuals with diabetes. This is corroborated by Gabrys *et al.* (2020), where it was found that not engaging in regular sports activities was associated with higher rates of type 2 diabetes in patients. This comprehensive approach by nurses from personalized exercise plans to education, motivation, and support enables young patients to effectively manage their type 2 diabetes and improve their overall health and well-being through physical activities.

The second theme focuses on healthy dietary behaviour, which is a crucial aspect of lifestyle management for individuals with type 2 diabetes, especially young adults. The study emphasizes the importance of modifying the nutritional intake of young people with type 2 diabetes to help them mitigate the complications associated with the condition. It suggests incorporating a specific percentage of dietary supplements into their diet, aligning with Bradley (2018) findings that recommend an overall healthy dietary pattern, including 30–40% of calories from low glycemic index carbohydrates, to improve glycemic control. The study also highlights the significance of individualizing the carbohydrate-to-fat ratio in

the diets of young adults with type 2 diabetes, as some may be more tolerant to fats while others to carbohydrates. This underscores the need to tailor carbohydrate intake and composition, considering the strong link between dietary carbohydrates and glycemic control (Bonsembiante, Targher, and Maffei, 2021).

Furthermore, for instance the consumption of meat has been linked with diabetes type 2 risk (Sanders, Wilcox & Maki, 2023). This finding highlights the critical need for young patients to have accurate information regarding their dietary choices. The current study found that young patients often lack this crucial information, influenced by social factors or inadequate nutritional education. This observation is consistent with Hasbullah *et al.* (2021), who noted that while young adults may be knowledgeable about diabetes, they often do not adhere to healthy dietary and lifestyle practices. Similarly, poor eating behaviours were reported among individuals with type 2 diabetes in North Ethiopia, underscoring the need for enhanced nutritional education (Gebreyesus *et al.*, 2021).

Nurses play a pivotal role as nutritional educators, planners, and motivators in guiding young people with type 2 diabetes toward healthier food choices. They educate patients on the benefits of a healthy diet for blood glucose control, the prevention of complications, and the distinction between healthy and unhealthy foods. They then provide tailored options, such as meal plans, nutrition tracking, meal schedules, alternative food choices, and dietary supplements, to help stabilize blood glucose levels and prevent diabetes-related complications.

The third theme centers on counseling, which is essential for managing the occurrence of type 2 diabetes among young adults through psychological support. The current study underscores the heightened severity of depression in young adults with type 2 diabetes compared to those with type 1 diabetes, with symptoms such as obesity, disordered eating, and skipping insulin being prevalent. A previous study by Hu, Li, and Zhang (2020),

demonstrated that diabetes distress is commonly experienced among young adult patients, largely due to the burden of managing family, social, and work responsibilities. This distress is often exacerbated by complications related to diabetes. Additionally, the study highlighted that diabetic smokers among the young adult population experience more significant psychological distress and are more prone to depression than their non-smoking counterparts.

Patients experiencing psychological distress due to diabetes require emotional and psychological support. Despite having relatively sufficient knowledge about self-care management, such as medication adherence, physical activity, and healthy eating behaviors, young patients still need motivation and reinforcement of their knowledge and attitudes. Therefore, the role of nurses in providing essential information and support to strengthen patients' psychological resilience in managing type 2 diabetes distress is crucial. Nurses play a key role in understanding and addressing patients' feelings, emotions, and anxieties. They offer emotional and psychological support, consulting with patients and their families to ensure comprehensive som. Nurses also tackle issues related to stigma and social support, encouraging young diabetic patients to seek help from family, friends, and support groups. This support network is vital in helping patients manage their condition and maintain a positive outlook, thereby improving their overall mental health and quality of life.

The final theme discussed in the study concerns pharmacological assistance for young adults living with type 2 diabetes. The study found that medication non-compliance is a common issue among this demographic, often due to factors such as fear, health literacy deficits, and other reasons. Previous research has highlighted that low medication adherence is associated with factors including lack of formal education and alcohol

consumption (Doya *et al.*, 2024). Another study identified that younger patients, those on insulin therapy, and individuals who consume alcohol are particularly prone to poor adherence to antidiabetic medications (Aminde *et al.*, 2019). Additional reasons for non-adherence include financial constraints, symptom disappearance, and busy lifestyles.

The study also highlighted the potential of digital technology in managing type 2 diabetes among young patients. The deployment of digital tools has been shown to effectively improve glycemic control by providing real-time data and enabling timely adjustments in treatment. This technological approach is particularly suitable for young people, as it supports self-management by providing information and enhancing communication with healthcare providers and parents (Griffiths *et al.*, 2017; Wu *et al.*, 2018). However, concerns remain regarding the long-term sustainability of app usage, as some studies have indicated low uptake among patients with type 2 diabetes, often due to a lack of awareness about the apps' benefits, inadequate internet access, perceptions of current diabetes management adequacy, costs, and technological literacy (Baptista *et al.*, 2019; Jeffrey *et al.*, 2019).

The findings underscore the crucial role of nurses in ensuring medication adherence and educating patients about the importance and outcomes of their medications. Nurses also play a pivotal role in introducing and encouraging the use of technology, guiding young patients on the effective use of digital tools for monitoring blood glucose levels and facilitating better diabetes management. By providing this support, nurses can significantly enhance the self-care capabilities of young adults with type 2 diabetes, promoting better health outcomes and quality of life.

Dorothea Orem's self-care deficit theory of nursing is central to this research, highlighting the vital role of self-care in maintaining health and the ways in which nurses can assist individuals when they cannot meet their self-care needs independently. According to

Orem's theory, self-care is essential for achieving optimal health. When individuals are impeded by physical or mental impairments, illnesses, or disabilities, nurses provide crucial support tailored to each patient's specific needs, which aligns closely with the objectives of this study. The research underscores the importance of self-care management in controlling type 2 diabetes among young individuals and delineates the diverse roles that nurse's play in aiding these patients to attain and sustain their health and well-being.

The research identifies the potential roles of nurses as educators, motivators, instructors, and counselors, focusing on evaluating patients' limitations, needs, and goals to ensure the provision of appropriate care levels. Orem's theory also empowers patients to take an active role in their self-care and offers a structured approach for nurses to assess, plan, and deliver care, helping to determine the appropriate times and methods for supporting patients in developing their self-care skills. This theoretical framework is essential for guiding nurses in making informed treatment decisions.

Furthermore, the paper notes that young patients with type 2 diabetes often encounter difficulties in adhering to self-care activities such as medication compliance, healthy eating, and regular physical activity. By assessing patients' abilities to manage self-care tasks, such as monitoring blood glucose levels, managing medications, making dietary choices, and maintaining a consistent exercise routine, nurses can provide targeted support that enhances patients' overall health and well-being. Thus, Orem's theory serves as a valuable framework for nursing practice, facilitating effective management of type 2 diabetes in young adults.

The findings from this study can inform actions and reactions from various healthcare providers whom work with young patients diagnosed with type 2 diabetes. Healthcare professionals, such as clinicians, medical laboratory scientists and caregivers can use these insights to develop new supportive interventions aimed at managing type 2 diabetes in

young individuals. Specifically, nurses, may seek to understand the barriers to adopting dietary changes, engaging in physical activities, and adhering to medication among younger patients. By identifying these barriers, they can tailor their interventions to effectively manage type 2 diabetes and reduce its complications within young adults' patients.

One significant limitation of this research was the predominance of studies involving mixed-age groups. This highlights the need for more empirical studies focusing specifically on younger populations with type 2 diabetes in future research. Additionally, the scarcity of studies exclusively dedicated to younger patients with type 2 diabetes posed another constraint in this research.

7.2 Discussion of Methodology

This study is a systematic literature review utilizing qualitative research methods and content analysis to explore the roles of nurses in preventing complications of type 2 diabetes among young adults. A systematic literature review is a comprehensive method that integrates numerous evidence-based studies, offering a structured approach to synthesize empirical data and address specific research questions (Polit & Beck, 2010). Systematic literature review as a level (one) 1 review in the evidence hierarchy, ensures the collection of a broad range of evidence, leading to accurate, reliable, and less biased results. To perform the review, content analysis was employed, which involves a thorough reading of texts to identify and categorize themes and subthemes into 'meaning units' (Gerrish, Lacey & Cormack, 2010). The research began with the development of a protocol grounded in the author's background knowledge and interest in the field. This led to the formulation of the research aim and methodology. The primary goal was to advance understanding of how nurses can prevent complications associated with type 2 diabetes in young adults.

A comprehensive search strategy was implemented across various academic databases, including Academic Search Elite (EBSCO), CINAHL Complete, and MEDLINE. The search

utilized a range of keywords related to the study's focus, such as "management or managing," "type 2 diabetes," "young adults," "self-care," "physical activities or exercise," and "healthy eating or dieting." Out of 563 initial articles, thirteen (13) were selected based on their relevance to the research question. The selection process adhered to inclusion and exclusion criteria detailed in the PRISMA chart (Figure 1) and followed ethical guidelines, emphasizing the importance of ethical considerations in research.

A researcher must establish the trustworthiness of the collected data, which includes demonstrating credibility, confirmability, dependability, and transferability. The core principle of trustworthiness is to ensure that the findings accurately reflect the participants' experiences and perceptions rather than the researcher's interpretations. Credibility refers to the confidence in the truth of the data (Polit & Beck, 2014). Dependability pertains to the consistency of the data across time and varying conditions, with credibility inherently linked to dependability. On the other hand, confirmability emphasizes objectivity, ensuring that the data represent the participants' perceptions without being influenced by the researcher's bias or perspective while transferability is the application of the findings to other settings, allowing others to draw conclusions in similar contexts (Polit & Beck, 2012). The authors have confidence in the validity of the results, as all data were sourced from scientifically evidence-based studies in adherence to all the criteria of trustworthiness as outlined by Polit & Beck. Therefore, if future researchers wish to explore this topic, "nursing roles in prevention of diabetes type 2 complications among young adults," the information provided in the current study offers sufficient detail to replicate the study and achieve similar outcomes. Finally, the findings were presented from the participants' perspectives without any bias or personal influence from the researchers, ensuring that the results can be appropriately transferred to other studies within the same context.

8 Conclusion

Type 2 diabetes is a prevalent and severe chronic condition affecting younger individuals, marked by elevated blood sugar levels resulting from either insufficient insulin production or insulin resistance. The incidence of type 2 diabetes among the youth has surged globally, primarily due to sedentary lifestyles, unhealthy dietary habits, obesity and genetic make-up. These factors contribute to the development of diabetes-related complications and an increased risk of mortality. Uncontrolled blood glucose levels can lead to serious, life-threatening complications such as nephropathy, retinopathy, neuropathy, and cardiovascular diseases. Effectively managing blood glucose can significantly lower the risk of these complications. Therefore, it is crucial to manage type 2 diabetes to alleviate symptoms and prevent complications. However, managing type 2 diabetes in young people presents challenges, including physical and mental impairments, insufficient knowledge and motivation, and psychological issues such as depression and fear. The findings of this study underscore the critical role that nurses play in supporting young individuals with type 2 diabetes. They are essential in helping manage blood glucose levels to prevent complications, facilitate early detection, and enhance overall well-being. The study highlights that effective self-care management; comprising medication adherence, counseling, healthy eating, and regular physical activity are fundamental in managing type 2 diabetes among young adults. Nurses are pivotal in this process; they remind patients to adhere to their medication regimen, provide information about medications, design and oversee exercise programs, motivate patients to engage in physical activity, offer dietary guidance, plan nutritional meals, and deliver psychological support. This support must be tailored to meet individual needs, goals, preferences, and both physical and mental limitations. Furthermore, there is a need for more empirical research and participatory studies focusing exclusively on younger populations with type 2 diabetes, given the current lack of such studies.

9 References

- Aftab, A. J., Alamgir, K., Salahuddin, K., & Manzoor, K. (2017). Causes, Complications and Management of Diabetes Mellitus. *Chronicle Publishers of Food and Nutrition*, 1(1): 002.
- Alligood, M. R. (2017). Nursing Theorists and Their Work-E-Book: *Nursing Theorists and Their Work-E-Book*. Elsevier Health Sciences.
- Alloh, F., Hemingway, A., & Turner-Wilson, A. (2019). Exploring the experiences of west african immigrants living with type 2 diabetes in the UK. *International Journal of Environmental Research and Public Health*, 16(19), 3516. <https://doi.org/10.3390/ijerph16193516>
- American Diabetes Association (ADA). (2019). Children and adolescents: Standards of medical care in diabetes- 2019. *Diabetes Care*, 42(Suppl. 1), S148-S164. doi:10.2337/dc19-S013.
- American Diabetes Association (ADA) (2021). Facilitating behavior change and well-being to improve health outcomes: Standards of medical Care in Diabetes-2021. *Diabetes Care*, 44(Suppl. 1), S53–S72. <https://doi.org/10.2337/dc21-S005>
- American Diabetes Association Professional Practice Committee (2022). Classification and Diagnosis of Diabetes: Standards of Medical Care in Diabetes—2022. *Diabetes Care*, 1 January 2022; 45 (Supplement_1): S17–S38. <https://doi.org/10.2337/dc22-S002>

- Aminde, L. N., Tindong, M., Ngwasiri, C. A., Aminde, J. A., Njim, T., Fondong, A. A., & Takah, N. F. (2019). Adherence to antidiabetic medication and factors associated with non-adherence among patients with type-2 diabetes mellitus in two regional hospitals in Cameroon. *BMC endocrine disorders*, 19(1), 35. <https://doi.org/10.1186/s12902-019-0360-9>.
- Amutha, A., & Mohan, V. (2016). Diabetes complications in childhood and adolescent onset type 2 diabetes – A review. *Journal of Diabetes and Its Complications*, 30(5), 951-957. doi:10.1016/j.jdiacomp.2016.02.009.
- Arslanian, S., Bacha, F., Grey, M., Marcus, M.D., White, N.H., & Zeitler, P. (2018). Evaluation and management of youth-onset type 2 diabetes: a position statement by the American Diabetes Association. *Diabetes Care*, 41 (12) 2648–2668.
- Bahat, G., Ozkok, S., & Petrovic, M. (2023). Management of Type 2 Diabetes in Frail Older Adults. *Drugs & Aging*, 40(9), 751–761. <https://doi.org.ezproxy.novia.fi/10.1007/s40266-023-01049-x>.
- Banday, M. Z., Sameer, A. S., & Nissar, S. (2020). Pathophysiology of diabetes: An overview. *Avicenna Journal of Medicine*, 10(4), 174–188.
- Baptista, S., Trawley, S., Pouwer, F., Oldenburg, B., Wadley, G., & Speight, J. (2019). What do adults with Type 2 diabetes Want from the "Perfect" App?. Results from the Second Diabetes MILES: Australia (MILES-2) Study. *Diabetes technology & therapeutics*, 21(7), 393–399. <https://doi.org/10.1089/dia.2019.0086>.

- Barbiellini, A. C., Fayosse, A., Dumurgier, J., Machado-Fragua, M. D., Tabak, A. G., Van Sloten, T., Kivimäki, M., Dugravot, A., Sabia, S., & Singh-Manoux, A. (2021). Association between Age at Diabetes Onset and Subsequent Risk of Dementia. *Journal of the American Medical Association*, *16*(325), 1640-1649. <https://doi.org/10.1001/jama.2021.4001>.
- Barbosa, A., Whiting, S., Ding, D., Brito, J., & Mendes, R. (2022). Economic evaluation of physical activity interventions for type 2 diabetes management: a systematic review. *European Journal of Public Health*, *32*(1), 56–66. <https://doi.org/10.1093/eurpub/ckac074>.
- Bezerra, M. L. R., Faria, R. P. R., Jesus, C. A. C., Reis, P. E. D., Pinho, D. L. M., Kamada, I. (2018). Aplicabilidade da teoria do déficit do autocuidado de Orem no Brasil: uma revisão integrativa. *J Manag Prim Health Care*, *9*(16):01-19. <http://www.jmphc.com.br/jmphc/article/view/538/741>.
- Bonsembiante L, Targher G, Maffei C. (2021). Type 2 diabetes and dietary carbohydrate intake of adolescents and young adults: What is the impact of different choices?. *Nutrients*, *13*(10), 3344. <https://doi.org/10.3390/nu13103344>.
- Bradley, B.H.R (2018). Dietary fat and risk for type 2 diabetes: A review of recent research. *Current Nutrition Reports*, *7*:214–226. <https://doi.org/10.1007/s13668-018-0244-z>.
- Brunner, L.B. (2018). *Suddarth's textbook of medical-surgical nursing*. Philadelphia, USA: Lippincott Williams & Wilkins; 2018.

Bults, M., van Leersum, C. M., Olthuis, T. J. J., Bekhuis, R. E. M., & den Ouden, M. E. M. (2023). Mobile Health Apps for the Control and Self-management of Type 2 Diabetes Mellitus: Qualitative Study on Users' Acceptability and Acceptance. *JMIR diabetes, 8*, e41076. <https://doi.org/10.2196/41076>.

Centers for Disease Control and Prevention (CDCP) (2020). Estimates of Diabetes and Its Burden in the United States. National Diabetes Statistics Report, 2020.

Centers for Disease Control and Prevention (CDCP) (2022). National Diabetes Statistics Report. November 11, 2022. <https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf>.

Centers for Disease Control and Prevention (CDCP) (2023). Prediabetes and type 2 diabetes. Retrieved 2024, May 12 from <https://www.cdc.gov/diabetes/prevention/aboutprediabetes.html>

Chung, W. K., Erion, K., Florez, J. C., Hattersley, A. T., Hivert, M. F., Lee, C. G. (2020). Precision Medicine in Diabetes: A Consensus Report from the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). *Diabetes Care, 43*(7):1617–35. <https://doi.org/10.2337/dci20-0022>.

Colditz, G. A., Willett, W. C., Rotnitzky, A., & Manson, J. E. (2014). Weight gain as a risk factor for clinical diabetes. *Ann Intern Med., 122*:481–6.

- Dabelea, D., Stafford, J.M., Mayer-Davis, E.J., D'Agostino Jr, R., Dolan, L., & Imperatore, G. (2017). Association of type 1 diabetes vs type 2 diabetes diagnosed during childhood and adolescence with complications during teenage years and young adulthood. *Jama*, 317 (8) 825–835.
- Denicolò, S., Perco, P., Thöni, S., & Mayer, G. (2021). Non-adherence to antidiabetic and cardiovascular drugs in type 2 diabetes mellitus and its association with renal and cardiovascular outcomes: A narrative review. *Journal of diabetes and its complications*, 35(7), 107931. <https://doi.org/10.1016/j.jdiacomp.2021.107931>.
- de Wit, M., Gajewska, K. A., Goethals, E. R., McDarby, V., Zhao, X., Hapunda, G., Delamater, A. M., & DiMeglio, L. A. (2022). ISPAD clinical practice consensus guidelines 2022: Psychological care of children, adolescents and young adults with diabetes. *Pediatric diabetes*, 23(8), 1373–1389. <https://doi.org/10.1111/pedi.13428>.
- Doya, I. F., Yahaya, J. J., Ngaiza, A. I., & Bintabara, D. (2024). Low medication adherence and its associated factors among patients with type 2 diabetes mellitus attending Amana Hospital in Dar es Salaam, Tanzania: a cross-sectional study. *International health*, 16(2), 200–207. <https://doi.org/10.1093/inthealth/ihad042>.
- Dunkley, A. J., Danielle, H. B., Colin, J. G., Claire, R., Thomas, Y., Melanie, J. D., & Kanlesh, K. (2014). Diabetes Prevention in the Real World: Effectiveness of Pragmatic Lifestyle Interventions for the Prevention of Type 2 Diabetes and of the Impact of Adherence to Guideline Recommendations: A Systematic Review and Meta-analysis. *Diabetes Care*, 37, 922-933. doi.org/10.2337/dc14-er06.
- Erlich, D. R., Slawson, D. C., & Shaughnessy, A. (2013). Diabetes update: new drugs to manage type 2 diabetes. *FP essentials*, 408, 20–24.

- Gabrys, L., Baumert, J., Heidemann, C., Busch, M., & Finger, J. D. (2021). Sports activity patterns and cardio-metabolic health over time among adults in Germany: Results of a nationwide 12-year follow-up study. *Journal of sport and health science*, *10*(4), 439–446. <https://doi.org/10.1016/j.jshs.2020.07.007>.
- Galaviz, K. I, Narayan, K. M. V., Lobelo, F., Weber, M. B. (2018). Lifestyle and the Prevention of Type 2 Diabetes: A Status Report. *Am J Lifestyle Med.*, *24*; 12(1):4-20. doi: 10.1177/1559827615619159. PMID: 30202378; PMCID: PMC6125024.
- Gatwood, J., Hohmeier, K. C., Shuvo, S., Mikael, D., & Kovesdy, C. P. (2021). Alignment of diagnosis and pharmacy claims data coding of medication adherence among patients with diabetes or hypertension. *Journal of Managed Care & Specialty Pharmacy*, *27*(4), 497–506. <https://doi.org/10.18553/jmcp.2021.27.4.497>.

- Gebreyesus, H. A., Abreha, G. F., Besherae, S. D., Abera, M. A., Weldegerima, A. H., Kidane, E. G., Bezabih, A. M., Lemma, T. B., & Nigatu, T. G. (2021). Eating behavior among persons with type 2 diabetes mellitus in North Ethiopia: a cross-sectional study. *BMC endocrine disorders*, *21*(1), 99. <https://doi.org/10.1186/s12902-021-00750-5>.
- Gerrish, K., Lacey, A., & Cormack, D. (2010). *The Research Process in Nursing* (6th uppl.). John Wiley & Sons, Incorporated. doi:docID=1166315.
- Gibson, B., Umeh, K. F., Newson, L., & Davies, I. (2021). Efficacy of the Best Possible Self protocol in diabetes self-management: A mixed-methods approach. *Journal of health psychology*, *26*(3), 332–344. <https://doi.org/10.1177/1359105318814148>.
- Griffiths, F., Bryce, C., Cave, J., Dritsaki, M., Fraser, J., Hamilton, K., Huxley, C., Ignatowicz, A., Kim, S. W., Kimani, P. K., Madan, J., Slowther, A. M., Sujan, M., & Sturt, J. (2017). Timely digital patient-clinician communication in specialist clinical services for young people: A mixed-methods study (The LYNC Study). *Journal of medical Internet research*, *19*(4), e102. <https://doi.org/10.2196/jmir.7154>
- Hasbullah, F. Y., Fong, K. Y., Ismail, A., Mitri, J., & Mohd Yusof, B. N. (2021). A comparison of nutritional status, knowledge and type 2 diabetes risk among Malaysian young adults with and without family history of diabetes. *The Malaysian Journal of Medical Sciences: MJMS*, *28*(1), 75–86. <https://doi.org/10.21315/mjms2021.28.1.10>.
- Heekerens, J., & Eid, M. (2021). Meta-Analyses: Inducing Positive Affect and Positive Future Expectations through Writing about One's Desired Future. [10.13140/RG.2.2.23024.17926](https://doi.org/10.13140/RG.2.2.23024.17926).

- Hill, M. A., Yang, Y., Zhang, L., Sun, Z., Jia, G. & Parrish, A.R., (2021). Insulin resistance, cardiovascular stiffening and cardiovascular disease. *Metabolism*, 119(0026-0495):154766. <https://doi.org/10.1016/j.metabol.2021.154766>.
- Holt, R. I. G., DeVries, J. H., Hess-Fischl, A., Hirsch, I. B., Kirkman, M. S, Klupa, T., Ludwig, B., Nørgaard, K., Pettus, J., Renard, E., Skyler, J. S., Snoek, F. J., Weinstock, R. S., & Peters, A. L. (2021). The Management of Type 1 Diabetes in Adults. A Consensus Report by the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). *Diabetes Care*, 44(11):2589-2625.
- Hu, Y., Li, L., & Zhang, J. (2020). Diabetes distress in young adults with type 2 diabetes: A cross-sectional survey in China. *Journal of diabetes research*, 4814378. <https://doi.org/10.1155/2020/4814378>.
- Hunter, C. M. (2016). Understanding diabetes and the role of psychology in its prevention and treatment. *71(7)*, 515-525. doi:doi: 10.1037/a0040344.
- Hussain, A., Claussen, B., Ramachandran, A., & Williams, R. (2007). Prevention of type 2 diabetes: A review. *Diabetes Research and Clinical Practice*, 7(3), 317-326.
- International Diabetes Federation (IDF, 2022). *Diabetes Atlas, Tenth Edition*. Accessed 2024, May 16 from <https://diabetesatlas.org/>
- International Diabetes Federation (IDF, 2022). *Diabetes Atlas, Tenth Edition*. Accessed 2024, May 16 from <https://diabetesatlas.org/>

- Isik, E., & Fredland, N. M. (2023). Orem's Self-Care Deficit Nursing Theory to Improve Children's Self-Care: An Integrative Review. *Journal of School Nursing*, 39(1), 6–17. <https://web-p.ebscohostcom.ezproxy.novia.fi/ehost/pdfviewer/pdfviewer?vid=0&sid=470cb9d4-1f4e-4a03-99f4-3e15d5a41a02%40redis>.
- Iqbal, S., Iqbal, H., & Kagan, C. (2024). Intergenerational differences in healthy eating beliefs among British Pakistanis with type 2 diabetes. *Diabetic Medicine: a journal of the British Diabetic Association*, 41(4). e15222. <https://doi.org/10.1111/dme.15222>.
- Jeffrey, B., Bagala, M., Creighton, A., Leavey, T., Nicholls, S., Wood, C., Longman, J., Barker, J., & Pit, S. (2019). Mobile phone applications and their use in the self-management of Type 2 Diabetes Mellitus: a qualitative study among app users and non-app users. *Diabetology & metabolic syndrome*, 11, 84. <https://doi.org/10.1186/s13098-019-0480-4>
- Karla, I. G., Felipe, L., & Weber, M. W. (2018). Lifestyle and the Prevention of Type 2 Diabetes: A Status Report. *American Journal of Lifestyle Medicine*, 12(1), 4-20. doi:doi/epub/10.1177/1559827615619159.
- Kato, M., & Natarajan, R. (2019). Epigenetics and epigenomics in diabetic kidney disease and metabolic memory. *Nature reviews. Nephrology*, 15(6), 327–345. <https://doi.org/10.1038/s41581-019-0135-6>
- Kharb, A. & Sachdeva, B. (2022). Effectiveness of Orem's Theory in Improving Patient Outcome-An integrated review. *Bulletin of Environment, Pharmacology and Life Sciences*, 475-479.

- Khoo, C. M., Deerochanawong, C., Chan, S. P., Matawaran, B., Sheu, W. H., Chan, J., Mithal, A., Luk, A., Suastika, K., Yoon, K. H., Ji, L., Man, N. H., & Pollock, C. (2021). Use of sodium-glucose co-transporter-2 inhibitors in Asian patients with type 2 diabetes and kidney disease: An Asian perspective and expert recommendations. *Diabetes, obesity & metabolism*, 23(2), 299–317. <https://doi.org/10.1111/dom.14251>.
- Lake, A. J., Browne, J. L., Abraham, C., Tumino, D., Hines, C., Rees, G., & Speight, J. (2018). *BMC Health Services Research*, 18:396. <https://doi.org/10.1186/s12913-018-3188-5>.
- Lascar, N., Brown, J., Pattison, H., Barnett, A. H., Bailey, C. J., & Bellary, S. (2018). Type 2 diabetes in adolescents and young adults. *Lancet Diabetes Endocrinology*, 6(1):69–80. [https://doi.org/10.1016/S2213-8587\(17\)30186-9](https://doi.org/10.1016/S2213-8587(17)30186-9).
- Li, Y., Teng, D., Shi, X., Qin, G., Qin, Y., Quan, H., Shi, B., Sun, H., Ba, J., Chen, B., Du, J., He, L., Lai, X., Li, Y., Chi, H., Liao, E., Liu, C., Liu, L., Tang, X., Tong, N., & Shan, Z. (2020). Prevalence of diabetes recorded in mainland China using 2018 diagnostic criteria from the American Diabetes Association: national cross-sectional study. *BMJ (Clinical research ed.)*, 369-997. <https://doi.org/10.1136/bmj.m997>.
- Lin, X., Xu, Y., & Pan, X., (2020). Global, regional, and national burden and trend of diabetes in 195 countries and territories: an analysis from 1990 to 2025. *Scientific Report*, 10:14790.
- Lindström, J., Peltonen, M., Eriksson, J.G., Ilanne-Parikka, P., Aunola, S., & Keinänen, K. S. (2013). Improved lifestyle and decreased diabetes risk over 13 years: long-term follow-up of the randomised Finnish diabetes prevention study (DPS). *Diabetologia*, 56(2):284–93.

- Loveday, Paula & Lovell, Geoff & Jones, Christian. (2018). The Best Possible Selves Intervention: A Review of the Literature to Evaluate Efficacy and Guide Future Research. *Journal of Happiness Studies*, 19. 10.1007/s10902-016-9824-z.
- Magliano, D.J. (2021). IDF Diabetes Atlas. 10th edition. Brussels, Belgium: International Diabetes Federation; 2021.
- Magliano, D. J., Sacre, J. W., Harding, J. L., Gregg, E. W., Zimmet, P. Z., & Shaw, J. E. (2020). Young-onset type 2 diabetes mellitus - implications for morbidity and mortality. *Nature reviews. Endocrinology*, 16(6), 321–331. <https://doi.org/10.1038/s41574-020-0334-z>.
- Mayer-Davis, E. J., Jean, M. L., Dana, D., Jasmin, D., Scott, I. M., & Lawrence, D. M. (2017). Incidence Trends of Type 1 and Type 2 Diabetes among Youths, 2002–2012. *New England Journal of Medicine*, 376, 1419-1429. doi:doi/full/10.1056/nejmoa1610187.
- Meleis A. I. (2018). Theoretical nursing: Development and progress (6th Ed.). Wolters Kluwe.
- Misra, S., Gable, D., Khunti, K., Barron, E., Young, B., Kar, P., & Valabhji, J. (2022). Developing services to support the delivery of care to people with early-onset type 2 diabetes. *Diabetic medicine: a journal of the British Diabetic Association*, 39(10), e14927. <https://doi.org/10.1111/dme.14927>.
- Molinaro, R., & Dauscher, C. (2017). Complications resulting from uncontrolled diabetes. *MLO. Medical Laboratory Observer*, 49(2), 20-22.

- Mukherji, A. B., Lu, D., Qin, F., Hedlin, H., Johannsen, N. M., Chung, S., Kobayashi, Y., Haddad, F., Lamendola, C., Basina, M., Talamoa, R., Myers, J., & Palaniappan, L. (2022). Effectiveness of a community-based structured physical activity program for adults with type 2 diabetes: A randomized clinical trial. *JAMA network open*, 5(12), e2247858. <https://doi.org/10.1001/jamanetworkopen.2022.47858>.
- Nadia Lascar, L. M., James, B., Hellen, P., Anthony, H. B., Clifford, J. B., & Srikanth, B. (2017). Type 2 Diabetes in adolescents and young adults. *The Lancet Diabetes and Endocrinology*, 6(1), 69-80. doi:[https://doi.org/10.1016/S2213-8587\(17\)30186-9](https://doi.org/10.1016/S2213-8587(17)30186-9).
- Nam, G. E., Han, B., Joo, C. L., Kang, S. Y., Lim, J., Kim, Y. H., & Park, H. S. (2019). Poor control of blood glucose, lifestyle, and cardiometabolic parameters in younger adult patients with type 2 diabetes mellitus. *Journal of Clinical Medicine*, 8, 1405. <https://doi.org/10.3390/jcm8091405>.
- National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) (2020). Serious complications from youth-onset type 2 diabetes arise by young adulthood. Accessed 2024, May 18 from <https://www.niddk.nih.gov/>.
- Onu, D. U., Ifeagwazi, C. M., & Prince, O. A. (2022). Social support buffers the impacts of Diabetes distress on health-related quality of life among type 2 diabetic patients. *Journal of health psychology*, 27(10), 2305–2317. <https://doi.org/10.1177/1359105320980821>.
- Onwuchuluba, E. E., Oyetunde, O. O., & Soremekun, R.O. (2021). Medication adherence in type 2 diabetes mellitus: A qualitative exploration of barriers and facilitators from socioecological perspectives. *Journal of Patient Experience*, 8: 1-8. DOI: 10.1177/23743735211034338.

Polit, F. D., & Beck, T. C. (2010). *Essentials of Nursing Research* (7th appl.). Lippincott Williams & Wilkins. Hämtat den 29th February 2024.

Polit, F. D., & Beck, T. C. (2014). *Essentials of Nursing Research: appraising evidence for nursing practice* (8th appl.). Lippincott Williams & Wilkins. Retrieved on 20th April, 2024.

Powers, M. A., Bardsley, J. K., Cypress, M., Funnell, M. M., Harms, D., Hess-Fischl, A., Hooks, B., Isaacs, D., Ellen, D. M., Maryniuk, M. D., Norton, A., Rinker, J., Siminerio, L. M., & Uelman, S. (2020). Diabetes self-management education and support in adults with type 2 diabetes: A consensus report of the American Diabetes Association, the Association of Diabetes Care & education specialists, the academy of nutrition and dietetics, the American Academy of family physicians, the American Academy of PAs, the American Association of Nurse Practitioners, and the American Pharmacists Association. *Diabetes Care*, 43(7), 1636–1649. <https://doi.org/10.2337/dci20-0023>.

Samadzadeh, A., Salehi, M., Banijamali, S., & Ahadi, H. (2019). The comparison of the effectiveness of cognitive behavioral therapy with mindfulness training on psychological self-care behavior in patients with type 2 diabetes. *Journal of Psychological Science*, 18(73):45–54.

Sanders, L.M., Wilcox, M.L. & Maki, K.C. (2023). Red meat consumption and risk factors for type 2 diabetes: a systematic review and meta-analysis of randomized controlled trials. *European Journal of Clinical Nutrition*, 77, 156–165. <https://doi.org/10.1038/s41430-022-01150-1>.

- Schellenberg, E. S., Dryden, D. M., Vandermeer, B., Ha, C., & Korownyk, C. (2013). Lifestyle interventions for patients with and at risk for type 2 diabetes: a systematic review and meta-analysis. *Annals of Internal Medicine*, *159*(8), 543–551. <https://doi.org/10.7326/0003-4819-159-8-201310150-00007>.
- Sigal, R. J., Diabetes Canada Clinical Practice Guidelines Expert Committee, Armstrong, M. J., Bacon, S. L., Boulé, N. G., Dasgupta, K., Kenny, G. P., & Riddell, M. C. (2018). Physical Activity and Diabetes. *Canadian Journal of diabetes*, *42 Suppl 1*, S54–S63. <https://doi.org/10.1016/j.jcjd.2017.10.008>.
- Sumartini, S. & Putri, S.T. (2021). Physical activity and psychosocial of adolescents with diabetes mellitus type 2: A qualitative study. *Malaysian Journal of Medicine and Health Sciences*, *17*(14): 146-152.
- Syeda, U. S. A., Battillo, D., Visaria, A., & Malin, S. K. (2023). The importance of exercise for glycemic control in type 2 diabetes. *American journal of medicine open*, *9*, 100031. <https://doi.org/10.1016/j.ajmo.2023.100031>.

Thota, S., & Akbar, A. (2020). Insulin. *PubMed*. StatPearls Publishing. <https://www.ncbi.nlm.nih.gov/books/NBK560688>.

Unnikrishnan, R., Shah, V.N., & Mohan, V. (2016). Challenges in diagnosis and management of diabetes in the young. *Clinical Diabetes and Endocrinology*, 2(18). doi:10.1186/s40842-016-0036-6.

Walker L. O. (2020). Gifts of wise women: A reflection on enduring ideas in nursing that transcend time. *Nursing Outlook*, 68(3), 355-364. <https://doi.org/10.1016/j.outlook.2020.01.004>.

White, B., Ng, S. M., Agwu, J. C., Barrett, T. G., Birchmore, N., Kershaw, M., Drew, J., Kavvoura, F., Law, J., Moudiotis, C., Procter, E., Paul, P., Regan, F., Reilly, P., Sachdev, P., Sakremath, R., Semple, C., Sharples, K., Skae, M., Timmis, A., Williams, N. W & Soni, A. (2024). A practical evidence-based approach to management of type 2 diabetes in children and young people (CYP): UK consensus. *BMC Medicine*, 22(1), 144. <https://doi.org/10.1186/s12916-024-03349-4>.

Wong, J., Constantino, M., & Yue, D.K. (2015). Morbidity and mortality in young-onset type 2 diabetes in comparison to type 1 diabetes: Where are we now? . *Current Diabetes Reports*, 15(1), 566. doi:10.1007/s11892-014-0566-1.

World Health Organization (WHO) (2016). Global Report on Diabetes 2016. Pdf. 2016.

World Health Organization (WHO) (2024). *Diabetes*. Hämtat från https://www.who.int/health-topics/diabetes#tab=tab_1 den 10th March 2024.

World Health Organization (WHO) (2020). Diagnosis and management of type 2 diabetes (HEARTS-D). Geneva: (WHO/UCN/NCD/20.1). Licence: CC BY-NC-SA 3.0 IGO.

World Health Organization (WHO) (2020). What do we mean by self-care? Sexual and reproductive health. <https://www.who.int/reproductivehealth/self-care-interventions/definitions/en/>.

World Health Organization (WHO) (2021). Diabetes type 1 and type 2. https://www.who.int/health-topics/diabetes?gad_source=1&gclid=CjwKCAjwgdAyBhBQEiwAXhMxtnHvVSFJOX1iJN JmR1GcJVCWTiUOiQplo7dBafME8Z0cD3cY3p0HhBoCYFwQAvD_BwE#tab=tab_1

World Health Organization (WHO) (2023). Diabetes. Hämtat från <https://www.who.int/news-room/fact-sheets/detail/diabetes> den 1st March 2024.

Wu, I. X. Y., Kee, J. C. Y., Threapleton, D. E., Ma, R. C. W., Lam, V. C. K., Lee, E. K. P., Wong, S. Y. S., & Chung, V. C. H. (2018). Effectiveness of smartphone technologies on glycaemic control in patients with type 2 diabetes: systematic review with meta-analysis of 17 trials. *Obesity reviews an official journal of the International Association for the Study of Obesity*, 19(6), 825–838. <https://doi.org/10.1111/obr.12669>.

Yates, T., Gray, L. J., Henson, J., Edwardson, C. L., Khunti, K., & Davies, M. J. (2019). Impact of depression and anxiety on change to physical activity following a pragmatic diabetes prevention program within primary care: pooled analysis from two randomized controlled trials. *Diabetes Care*, 42(10):1847-1853.

Yeh, Y. K., Yen, F. S., & Hwu, C. M. (2023). Diet and exercise are a fundamental part of comprehensive care for type 2 diabetes. *Journal of diabetes investigation*, 14(8), 936–939. <https://doi.org/10.1111/jdi.14043>.

Appendix 1: Selected studies for this paper

No of articles	Author, tittle, and publication year	Purpose	Method	Result
1	Alloh, F., Hemingway, A., & Turner-Wilson, A. (2019). Exploring the Experiences of West African Immigrants Living with Type 2 Diabetes in the UK. <i>International Journal of Environmental Research and Public Health</i> , 16(19), 3516. https://doi.org/10.3390/ijerph16193516 .	To explore the experiences of West African immigrants in the management of Type 2 diabetes in the UK	Qualittativ e method	The complex interplay of factors affect the level of physical activity amongst black and ethnic minorities in the UK
2	Barbosa, A., Whiting, S., Ding, D., Brito, J., & Mendes, R. (2022). Economic evaluation of physical activity interventions for type 2 diabetes management: a systematic review. <i>European Journal of Public Health</i> , 32(1), 56–66. https://doi:10.1093/eurpub/ckac074 .	To synthesize economic evaluation studies of physical activity interventions for type 2 diabetes management	Qualitative method	The study demonstrated that physical activity interventions were cost-saving and is worth investment for type 2 diabetes management.

3	<p>Gatwood, J., Hohmeier, K. C., Shuvo, S., Mikaiel, D., & Kovesdy, C. P. (2021). Alignment of diagnosis and pharmacy claims data coding of medication adherence among patients with diabetes or hypertension. <i>Journal of Managed Care & Specialty Pharmacy</i>, 27(4), 497–506. https://doi.org/10.18553/jmcp.2021.27.4.497</p>	<p>To determine the extent to which patients are accurately coded for and have calculated rates of nonadherence to medication.</p>	<p>Qualitative method</p>	<p>The study established the need to align with provider interpretation of patient medication use</p>
4	<p>Onwuchuluba, E. E., Oyetunde, O. O., & Soremekun, R.O. (2021). Medication adherence in type 2 diabetes mellitus: A qualitative exploration of barriers and facilitators from socioecological perspectives. <i>Journal of Patient Experience</i>, 8: 1-8. DOI: 10.1177/23743735211034338.</p>	<p>To identify barriers and facilitators unique to Nigerian T2DM patients. that would improve medication adherence.</p>	<p>Qualitative method</p>	<p>This study demonstrated that the community within which patients live plays a significant role in defining adherence to medication.</p>

5	<p>Iqbal, S., Iqbal, H., & Kagan, C. (2024). Intergenerational differences in healthy eating beliefs among British Pakistanis with type 2 diabetes. <i>Diabetic Medicine: a journal of the British Diabetic Association</i>, 41(4). e15222. https://doi.org/10.1111/dme.15222.</p>	<p>To explore beliefs about healthy eating and food practices related to type 2 diabetes among British Pakistanis to understand the challenges they face in implementing healthy diets.</p>	<p>Qualitative method</p>	<p>The study indicated that difficult family relationships can affect food habits, with parents and other family members playing a crucial role in promoting changes in dietary practices.</p>
6	<p>Jeffrey, B., Bagala, M., Creighton, A., Leavey, T., Nicholls, S., Wood, C., Longman, J., Barker, J., & Pit, S. (2019). Mobile phone applications and their use in the self-management of Type 2 Diabetes Mellitus: a qualitative study among app users and non-app users. <i>Diabetology & metabolic syndrome</i>, 11, 84. https://doi.org/10.1186/s13098-019-0480-4</p>	<p>To assess the experiences, obstacles, and factors that encourage the use of apps among individuals with type 2 diabetes mellitus, and to develop recommendation</p>	<p>Qualitative method</p>	<p>The study found that barriers to app usage included participants' lack of knowledge and awareness of apps as healthcare tools, their perceptions of the severity of the disease, issues with technological</p>

		s to enhance the usage of diabetes management apps.		and health literacy, and practical limitations like poor rural connectivity.
7	de Wit, M., Gajewska, K. A., Goethals, E. R., McDarby, V., Zhao, X., Hapunda, G., Delamater, A. M., & DiMeglio, L. A. (2022). ISPAD clinical practice consensus guidelines 2022: Psychological care of children, adolescents and young adults with diabetes. <i>Pediatric diabetes, 23</i> (8), 1373–1389. https://doi.org/10.1111/pedi.13428	This study examines the psychological care of youth with type 1 diabetes and type 2 diabetes as well as the psychological impact of technology on its management.	Qualitative method	The results showed promising effects with respect to psychosocial outcomes and inconsistent glycemic outcomes among adolescents and young adults with diabetes.

8	Bults, M., van Leersum, C. M., Olthuis, T. J. J., Bekhuis, R. E. M., & den Ouden, M. E. M. (2023). Mobile Health Apps for the Control and Self-management of Type 2 Diabetes Mellitus: Qualitative Study on Users' Acceptability and Acceptance. <i>JMIR diabetes</i> , 8, e41076. https://doi.org/10.2196/41076 .	To provide an in-depth understanding of the perceptions of patients with T2DM before use and after use of mobile health apps for diabetes control and self-management	Qualitative method	The study found that Smartphones can facilitate communications between patients and caregivers and customize health monitoring for individual patients
9	Syeda, U. S. A., Battillo, D., Visaria, A., & Malin, S. K. (2023). The importance of exercise for glycemic control in type 2 diabetes. <i>American journal of medicine open</i> , 9, 100031. https://doi.org/10.1016/j.ajmo.2023.100031 .	To study the importance of exercise in the prevention and management of type 2 diabetes.	Qualitative method	The study found that exercise offers unique opportunities to type 2 diabetic patients by inducing gains in glycemic control.
10	Yeh, Y. K., Yen, F. S., & Hwu, C. M. (2023). Diet and exercise are a fundamental part of comprehensive	To determine the importance of diet and exercise	Qualitative method	Engaging in physical activity prevent significant

	care for type 2 diabetes. <i>Journal of diabetes investigation</i> , 14(8), 936–939. https://doi.org/10.1111/jdi.14043	in managing type 2 diabetes among patients		health loss in individuals with type 2 diabetes mellitus.
11	Denicolò, S., Perco, P., Thöni, S., & Mayer, G. (2021). Non-adherence to antidiabetic and cardiovascular drugs in type 2 diabetes mellitus and its association with renal and cardiovascular outcomes: A narrative review. <i>Journal of diabetes and its complications</i> , 35(7), 107931. https://doi.org/10.1016/j.jdiacomp.2021.107931	To examine the prevalence of non-adherence to antidiabetic and cardiovascular drugs in type 2 diabetes.	Qualitative method	The study indicates that poor medication adherence is common in type 2 diabetes and associated with worse cardiovascular and renal outcomes.
12	White, B., Ng, S. M., Agwu, J. C., Barrett, T. G., Birchmore, N., Kershaw, M., Drew, J., Kavvoura, F., Law, J., Moudiotis, C., Procter, E., Paul, P., Regan, F., Reilly, P., Sachdev, P., Sakremath, R., Semple, C., Sharples, K., Skae, M., Timmis, A., Williams, N. W & Soni, A. (2024). A practical evidence-based approach to management of type 2 diabetes in children and young people	To improve the care of children and young people (CYP) in the UK with type 2 diabetes	Qualitative method	Young people with type 2 diabetes should be managed within a paediatric diabetes team with close working with adult diabetes specialists, primary care and other

	(CYP): UK consensus. <i>BMC Medicine</i> , 22(1), 144. https://doi.org/10.1186/s12916-024-03349-4			paediatric specialties
13	Sigal, R. J., Diabetes Canada Clinical Practice Guidelines Expert Committee, Armstrong, M. J., Bacon, S. L., Boulé, N. G., Dasgupta, K., Kenny, G. P., & Riddell, M. C. (2018). Physical Activity and Diabetes. <i>Canadian Journal of diabetes</i> , 42 Suppl 1, S54–S63. https://doi.org/10.1016/j.jcjd.2017.10.008	Aim to discover the benefits of physical activities on the well-being of diabetic patients	Qualitative method	Moderate to high levels of physical activity and cardiorespiratory fitness are associated with substantially lower morbidity and mortality in people with diabetes.
14	Sumartini, S. & Putri, S.T. (2021). Physical activity and psychosocial of adolescents with diabetes mellitus type 2: A qualitative study. <i>Malaysian Journal of Medicine and Health Sciences</i> , 17(14): 146-152.	To describe the physical activity levels and psychosocial aspects of adolescents with	Qualitative method	Effective management of type 2 diabetes in adolescents requires support for both physical and psychosocial

		Type 2 Diabetes Mellitus .		aspects to enhance overall health and well-being.
--	--	----------------------------	--	---