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Nurses' role in management of type 2 diabetes in elderly

A Systematic Literature Review

By Balkrishna Pandey

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Author: Balkrishna Pandey
Degree Programme: Nurse, Vaasa
Supervisor: Camilla Mattjus

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Abstract

Type 2 diabetes is a chronic disease common in elderly people. Uncontrolled diabetes can lead to severe diabetic complications and, eventually, death. Managing diabetes in the older population is challenging due to age-related physical and mental disabilities, comorbidities, and a lack of self-care management. The main aim of this paper was to enhance and understand the deeper knowledge of the nurses' role in the management of type 2 diabetes in elderly people, guided by Orem's self-care deficit nursing theory.

A systematic literature review using thematic synthesis was conducted to address the clinical research question. Academic Search Elite (EBSCO), CINAHL Complete, and MEDLINE databases were employed, applying inclusion and exclusion criteria to identify relevant studies, and 10 out of 612 studies were selected in accordance with the PRISMA chart.

Findings outline four major themes: pharmacological support, physical activities, healthy eating, and counseling, which are essential components to manage type 2 diabetes in elderly people. Ten sub-themes are derived from data on nurses' roles, which are reminding to take medicine, giving medicine knowledge, introducing technology, designing, and instructing exercise intervention, encouraging patients to exercise, motivating patients to walk, presenting dietary advice, planning nutritional meals, offering psychological support, and providing education. The findings of this paper highlight the importance of self-care and the nurses' role in managing diabetes. Furthermore, future research in empirical data from older patients with type 2 diabetes is recommended due to the lack of studies exclusively on the older population with type 2 diabetes.

Language: English Keywords: type 2 diabetes, management, nurses' role, elderly people,

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Appendix

1 Introduction

Diabetes is a chronic condition that occurs due to either insufficient insulin production by the pancreas or inefficient insulin utilization by the body. The greatest public health challenge of the century is diabetes (Barbosa, Whiting, Ding, Brito & Mendes, 2022). There are two types of diabetes: type 1 diabetes and type 2 diabetes. It is estimated that more than 95% of diabetes patients have type 2 diabetes. The main causes of this form of diabetes are being overweight and physically inactive. The frequency of diabetes has rapidly climbed worldwide during the past 20 years due to the aging population, economic development and urbanization, sedentary lifestyle, consumption of unhealthy food, and obesity (Bahat, Ozkok & Petrovic, 2023). About 537 million persons between the ages of 20 and 79 were predicted to have diabetes in 2021, and it is estimated to rise to 643 million by 2030 and 783 million by 2045. There were recorded 6.7 million deaths due to diabetes in 2021, translating to one death every 5 seconds from diabetes. Health expenditure was United States Dollar (USD) 966 billion in 2021 for the treatment of diabetes (International Diabetes Federation, 2022).

Finland has a population of 5.5 million, where approximately 50,000 people have type 1 diabetes and about 400,000 people have type 2 diabetes, which means one out of ten people in Finland has diabetes. About 4,000 children under the age of 15 have diabetes. The number of undiagnosed cases of type 2 diabetes is estimated at 50,000. The prevalence of the actual number of people with type 2 diabetes has been increasing in Finland during the past decades, parallel to an increase in overweight and obesity. Besides obesity, population aging is one of the main drivers of an increasing number of diabetic patients (Diabetesliitto, 2022).

The development of type 2 diabetes and its complications can be prevented by lifestyle measures. Lifestyle management is essential in diabetes care, involving physical activities, a healthy diet and nutrition, health care counseling, self-management education, and support (Singh et al., 2018). The Diabetes Prevention Program (DPP) shows that a rigorous lifestyle intervention might reduce the incidence of type 2 diabetes by 58% over three years (American Diabetes Association, 2016). In addition, effective blood sugar management can reduce the risk of diabetes complications by 40% (Centers for Disease Control and Prevention, 2023). Therefore, the author of this paper has an interest in understanding deeper knowledge about type 2 diabetes and reducing the risk of diabetes complications for the overall health and well-being of the older population.

2 Background

Diabetes is a serious chronic disease that occurs if our body does not produce any or enough insulin, or our body does not use insulin properly (Bahat, Ozkok & Petrovic, 2023). Insulin is the hormone that is produced by beta cells in the pancreas, which plays an essential role in carrying glucose from the bloodstream to other parts of the body's cells where glucose is converted into energy (Galicia-Garcia et al., 2020). When we eat food, it digests in our stomach and turns into glucose; that glucose is taken by blood and travels to all parts of the body's cells that are carried by insulin. If our body is lacking in insulin production or becoming insulin resistant (the body's cell does not use insulin properly), then glucose cannot reach the body's cells, and it makes a high level of glucose in the blood that is known as hyperglycemia or diabetes (käypähoito, 2022). There is another term also called pre-diabetes, which is known when the glucose level in the blood is above normal but not high enough yet to be called diabetes. In the stage of prediabetes, we can delay or prevent type 2 diabetes by lifestyle modification such as healthy eating habits, exercise, and weight loss, possibly without taking any medications (Centers for Disease Control and Prevention, 2023). There are mainly three main kinds of diabetes, which are: type 1 diabetes, type 2 diabetes, and gestational diabetes (International Diabetes Federation, 2022). However, this paper focuses only on type 2 diabetes.

Type 1 diabetes is known as insulin-dependent or childhood-onset, which is caused by an autoimmune process. In our body, the immune system attracts or destroys the beta cells in the pancreas which make insulin. As a result, the pancreas produces less insulin or no insulin. Type 1 diabetes can be developed most often in childhood; however, it can occur in any age group (International Diabetes Federation, 2022).

Gestational diabetes is a temporary form of diabetes that develops in women during pregnancy, and most often it goes away after the baby is born. However, women who had gestational diabetes during pregnancy and babies who were born from mothers with gestational diabetes are more prone to develop type 2 diabetes later in life (International Diabetes Federation, 2022).

Type 2 diabetes is a chronic metabolic disorder characterized by high sugar levels in the blood due to insufficient insulin production or insulin resistance (Galicia-Garcia et al., 2020). Type 2 diabetes has been a major concern in the health system since it has affected millions of individuals in the world. It is also called adult-onset diabetes because it can be developed most often in middle-aged and older people, but it can happen in children as well. In type 2

diabetes, initially, body cells do not respond to the insulin which is called insulin resistance. Insulin resistance leads to elevated glucose levels in the blood, triggering the production of more insulin as added demand. Over time, pancreatic beta cells cannot produce adequate insulin. As a result, a combination of insulin resistance and impaired insulin secretion leads to elevated glucose levels in the blood, which is known as type 2 diabetes (International Diabetes Federation, 2022). Unlike type 1 diabetes, which is known as insulin-dependent or childhood-onset, caused by autoimmune disease, type 2 diabetes is significantly developed by lifestyle factors such as a poor diet, sedentary lifestyle, obesity, smoking, stress as well as ethnicity, age, and family history, and it is manageable and preventable (Finnish Institute for Health and Welfare, 2022). This condition leads to individual health risks, a burden on public health, and an increase in the cost of the health system. It is significantly crucial to understand the causes, risks, and symptoms of type 2 diabetes in order to prevent complications, prompt early detection, effective management as well as the overall well-being of individuals who are affected by this condition. Moreover, regular screening and an effective lifestyle will allow for the prevention of diabetic complications, and people with type 2 diabetes can live healthy and long life (Hailu, Moen & Hjortdahl, 2019).

2.1 Diagnosis of type 2 diabetes

There are some criteria that represent the diagnosis of type 2 diabetes. According to the World Health Organization (2020), type 2 diabetes is usually diagnosed in the following ways:

a. Glycated hemoglobin (HbA1c) - this blood test indicates the average blood glucose level. If the glucose level in the blood is indicated as 6.5% or over, it is considered diabetes.

b. Fasting blood sugar test - in this test, the patient should not eat overnight for 8-14 hours before the blood sample is taken. If the result shows 7.0 mmol/L or higher, it is considered diabetes.

c. Two-hour post-load blood sugar test - a blood sample is taken two hours after the food is eaten, and diabetes is diagnosed if the blood sugar level is 11.1 mmol/L or over.

According to Diabetesliitto (2023), in Finland, the following are the criteria to meet the diagnosis of diabetes:

a. Fasting blood sugar – if the blood glucose value is 7 mmol/L or higher.

b. Two hours after the meal – if the blood test indicates higher than 10 mmol/L.

c. HbA1c laboratory test – if the value is more than 7%.

2.2 Risk factors of type 2 diabetes

There are various factors that increase the chance of developing type 2 diabetes, which usually occurs as a combination of genetics and lifestyle factors (Bahat, Ozkok & Petrovic, 2023). Generally, the risk factors for type 2 diabetes are modifiable lifestyle factors such as obesity or overweight, unhealthy diets, physical inactivity, stress, and smoking habits, whereas the non-modifiable factors are genetic or family predisposition and age. However, lifestyle factors are easier to modify in the quest to manage type 2 diabetes, whereas genetic factors and age, being inherent, are not modifiable (Roglic, 2016).

2.3 Symptoms of type 2 diabetes

Symptoms of type 2 diabetes are not severe, or they could be absent. Signs and symptoms of type 2 diabetes develop at a slow pace, which can trigger worsened hyperglycemia; as a result, it may lead to complications before diagnosis. According to the World Health Organization (2023), symptoms of type 2 diabetes include thirst, frequent urination, fatigue, blurred vision, unintentional weight loss, dehydration, vomiting, and clinical signs of chronic complications (acute coronary disease, stroke, kidney disease, vision loss, and diabetic foot).

2.4 Complications of type 2 diabetes

The severe burden of type 2 diabetes is recognized globally. Type 2 diabetes can be successfully managed, and its associated complications prevented, especially if detected and treated early. When not treated in a timely and effective manner, poorly managed type 2 diabetes is associated with life-threatening complications, including chronic kidney disease, amputations, blindness, and cardiovascular disease. The presence of multimorbidity is the reality for most patients with type 2 diabetes. Cardiovascular disease affects about 30% of all people with type 2 diabetes and is a major cause of morbidity and mortality. Thus, a comprehensive diabetes management plan for both primary and secondary prevention of cardiovascular diseases is important for educating patients to make informed decisions that will help them succeed in reaching their glycemic target goals and prevent the number and complexity of serious complications (Seidu et al., 2020). According to Molinaro & Dauscher (2017), there are several complications that can happen due to uncontrolled type 2 diabetes.

These complications are microvascular (nephropathy, retinopathy, and neuropathy) and macrovascular (cardiovascular diseases such as heart attack and stroke) complications.

2.5 Type 2 diabetes in elderly

One of the commonest and most prevalent chronic diseases in older people is type 2 diabetes, which has been a major concern and challenge in the public health system due to the demographic increase in the older population and life expectancy (Christiaens et al., 2021). Elderly people with type 2 diabetes are more prone to a higher risk of hypoglycemia due to comorbidities, consumption of different medications, age-related physiological and neurological changes, dietary changes, and complex treatment patterns. That's why the prevalence of hypoglycemia-related complications is higher in the elderly population than in younger age. The adverse effect of hypoglycemia in elderly patients is frailty, often falling and fracturing, neurological decline, and cognitive dysfunction which impair their daily life activities and limit their abilities to perform self-care such as adjustment of insulin, monitoring blood glucose, self-taking medicine, and diet (Almomani, Pascual, Grassby & Ahmadi, 2023). Therefore, managing glycemia in elderly patients is challenging and essential to prevent the risk of complications and ensure the quality of life in the elderly population. Moreover, the presence of cognitive dysfunction, functional limitation, frailty, and sarcopenia in elderly people with type 2 diabetes requires urgent cooperation with carers and social support to avoid hypoglycemia, complications, and harmful effects (Bellary, Kyrou, Brown & Bailey, 2021).

Type 2 diabetes is a chronic disease, and unmanaged and untreated diabetes may bring microvascular (retinopathy, nephropathy, neuropathy) and macrovascular complications (coronary heart disease, cerebrovascular disease, peripheral artery disease) in older patients, as well as geriatric conditions such as frailty, cognitive decline, functional impairment, and unintentional weight loss. Uncontrolled hyperglycemia and autonomic nervous system lead to dangerous situations for older patients; it can trigger falling, fainting, fractures, and trauma. Physical impairment and mental impairment due to long-term diabetes disease in the elderly limit their individual and social activities. The quality of life in the older population is significantly affected by diabetes and its complications. On the other hand, the increased level of dependence and disabilities of older people with type 2 diabetes increases the long-term care and cost of therapy in the public health system (Rymkiewicz, Rękas-Wójcik, Milaniuk, Mosiewicz, & Dzida, 2015).

There are not only physical impairments in older people with type 2 diabetes but also a higher prevalence of mental impairment caused by diabetes. According to Guerrero-Berroa et al. (2018), cognitive impairment and dementia are most common to occur in diabetes patients. Moreover, diabetes is a risk factor for depression in elderly people. Depression with diabetes patients is known to affect functional abilities and quality of life. They are more prone to decrease physical activities, not show interest in medical care, and increase their susceptibility to disease.

2.6 Management of type 2 diabetes in elderly

Management of type 2 diabetes in the elderly is a comprehensive strategy and intervention that aims to optimize glycemic control, reduce the risk of complications, and ensure the quality of life and overall well-being in elderly people with type 2 diabetes (Sanz-Canovas et al., 2022). However, managing type 2 diabetes in the elderly is challenging due to age-related physiological changes and a higher prevalence of comorbidities. Therefore, the management of type 2 diabetes in the elderly requires comprehensive approaches which include:

i. Lifestyle modification such as dietary plan and regular exercise - Lifestyle modification is considered as a cornerstone in the management of type 2 diabetes in the elderly. Meal plans and healthy eating habits play an essential role in glycemic control. Individualized meal plans should be prioritized which emphasize whole grain, lean protein foods, vegetables, and fruits and avoid saturated fat and added sugar (Sinclair, Abdelhafiz & Rodriguez-Manas, 2017). In addition, another important component is regular activities such as walking, aerobic exercise, and strength training which helps for the effectiveness of insulin sensitivity and cardiovascular health. It is important to consider functional limitations and individual preferences when designing meal and exercise plans (Valencia, Botros, Vera-Nunez & Dang, 2018).

ii. Pharmacotherapy – is often required to achieve targeted blood glucose levels in elderly people with type 2 diabetes. Oral medicine such as Metformin is a front-line medicine for type 2 diabetes due to its safety, efficiency, and cardiovascular benefits. Other medications such as Sulfonylureas, Dipeptidyl peptidase -4 (DPD-4) inhibitors, and Sodium Glucose Cotransporter -2 (SLGLT-2) also can be considered based on individual needs and preferences. Moreover, insulin might be required in some cases with a combination of oral medication to achieve optimal glycemic control (Valencia, Botros, Vera-Nunez & Dang,

2018). However, medication selection should be personalized based on individual characteristics such as renal function, comorbidities, risk of hypoglycemia, and adverse effects (Ghazi, Hegazy & Nowara, 2023).

iii. Multidisciplinary care teams - These consist of Geriatricians, endocrinologists, pharmacists, dietitians, and nurses who collaborate and develop the individual care plan and ensure monitoring of regular blood glucose levels and the possibility risk of complications, treatment regimens, patient education, and self-care support which are necessities for the management of diabetes for the overall well-being of older adults with type 2 diabetes (Sinclair, Abdelhafiz & Rodriguez-Manas, 2017).

3 Aim of study

Main aim of this research is to enhance and understand the deeper knowledge of nurses' role in the management of type 2 diabetes in elderly.

3.1 Research question

Considering the aim of research, the author has formulated the following research question.

- What is the nurses' role in managing type 2 diabetes in elderly patients?

4 Theoretical framework

The theoretical framework is an important component in research as it helps to stimulate research and the extension of knowledge by providing direction. Theoretical framework in research serves as a lens through which researchers can interpret their findings thoroughly in order to make meaningful results. It is important that the researcher select an appropriate theoretical framework that can align with a research question and the aim of the research (Polit & Beck, 2017, p. 195). Researcher of this paper has chosen Dorothea Orem's Self-Care Deficit Theory of Nursing which is explained in detail as follows.

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

Orem's self-care theory is viewed as a grand theory of nursing that outlines the importance of individuals in their performance to take care of themselves and highlights the nurse's role

in the nursing process in supporting individuals to meet their needs. Self-management is usually used in self-care, which applies to activities that individuals deliberately perform to manage existing health conditions to maintain a quality life, prevent complications, and hospital visits, and establish overall well-being of life. Self-care is depicted as a human regularity function that must be performed by individuals for themselves or have performed by other dependent or nursing care (Hartweg & Pickens, 2016). This theory has emphasized that every individual is a self-care agent with their ability to perform self-care duties to protect life, health, and well-being (Yildiz & Kasikci, 2020). This theory expects that every individual has their ability to learn self-care activities and get the motivation to develop skills to maintain their health. However, some circumstances such as age, illness, injury, and physical or mental impairment limit their self-care performance to obtain needs. In that case, nurses play an essential role in the nursing process to assist them to meet self-care needs (Isik & Fredland, 2023). Orem's self-care deficit theory of nursing is composed of three interrelated theories: self-care theory, self-care deficit theory, and nursing system theory (Alligood, 2018, p. 205).

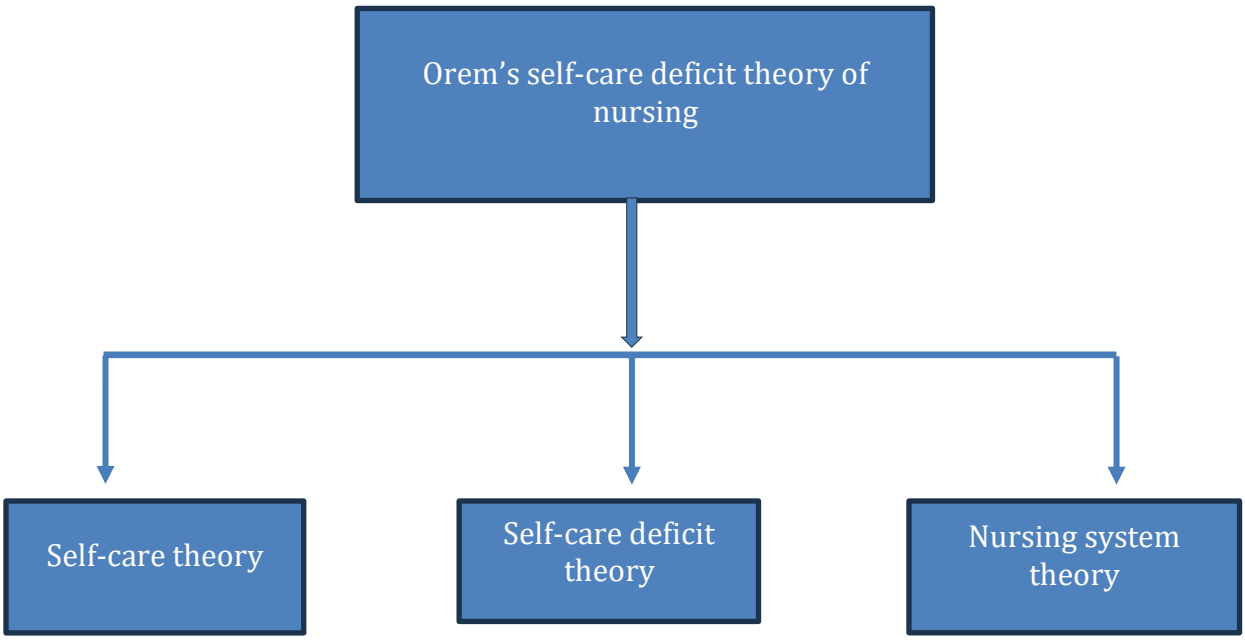

Figure 1, Orem's self-care deficit theory of nursing

4.1.1 Self–care theory

It emphasizes the purpose, method, and outcome of taking care of oneself. This theory explains that self-care is an action that an individual must learn, and it must be performed

deliberately and continuously over time based on individual requirements, which are associated with the individual's age, growth and development, state of health condition, and environment (Alligood, 2018, p. 205). This theory outlines the practice of activities that every individual engages in self-care activities within a time frame for themselves to maintain their life, health, well-being, personal development, and healthful functioning by meeting requisites. According to Alligood (2018, p. 201), Orem has categorized self-care into three levels:

a. Universal self-care requisites – These are essential needs that every individual has to maintain their health and well-being. Orem mentions eight universal self-care requisites which are: air, water, food, elimination, activity and rest, solitude and social interaction, prevention of hazards, and promotion of normalcy.

b. Development self-care requisites - it is different than universal self-care requisites, which consist of a provision for development, engagement in self-development, and prevention from a situation that can affect human development.

c. Health deviation self-care requisites - it is specific self-care needs that can occur from an individual's health condition, illness, or injuries (Alligood, 2018, p. 201).

4.1.2 Self-care deficit theory

It is known as the relationship between individual capacity for performance and their demand for care. Self-care deficit is a term that is described as an individual's action limitation for self-care and the requirement of a person for nursing (Alligood, 2018, p. 205). In other words, individuals are completely or partially unable to perform self-care needs independently due to physical or mental impairments or developmental limitations. In that case, nurses are required to assist them to meet self-care needs. Self-care deficit theory emphasizes the nurse's role and intervention to assist and support people when they become self-care deficit to maintain their life, health, and well-being. Nurses use all helping methods with health-related action limitations and individual demand for self-care to overcome the self-care deficit as follows (Alligood, 2018, p. 203):

- Acting for or doing for another
- Guiding and directing
- Providing physical and psychological support

- Providing and maintaining an environment that supports personal development
- Teaching

4.1.3 Nursing system theory

The theory of the nursing system explains that nursing is human action, nursing action is an approach designed by nurses for persons with health-associated limitations in order to overcome self-care deficits. A nursing system can be formed for individuals, for groups of people who have the same kind of disabilities or limitations for self-care, for family, or other multiperson units (Alligood, 2018, p. 205). Orem has categorized the nursing system based on the relationship between the patient's demand for self-care and the actions of nurses. These are:

i. Wholly compensatory system - this system is implemented when a patient is completely unable to perform his or her self-care actions. At this level, nurses assume their full responsibility to assist patients to meet self-care requirements. Patients are fully passive, and nurses are fully active to perform activities.

ii. Partly compensatory system - this system is utilized when an individual partially can perform activities but requires some assistance from a nurse to meet self-care needs. In this system, patients try to perform independent activities where nurses assess their abilities and provide necessary assistance when it is required. It motivates individuals to engage in the performance of self-care.

iii. Supportive educative system – this system is applied when an individual has the potential to perform activities but requires some sort of guidance, knowledge, skills, and education to enhance their self-care abilities. Nurses help patients to acquire knowledge and skills to manage their health condition and perform self-care effectively (Alligood, 2018, p. 202).

This nursing system theory helps nurses in offering appropriate and adequate support, assistance, education, and intervention to prompt individual's health and achieve optimal health potential.

5 Methodology

Research methodology is a scientific approach that includes selecting of appropriate methodology (qualitative or quantitative), methods of data collection and analysis, and identifying suitable samples. It is essential that research methodology should address the research question regarding the aim of the study. (Gerrish & Lacey 2010, p.160). This paper has conducted a qualitative systematic literature review to be able to answer the research question.

5.1 Qualitative research

Qualitative research is a research design that seeks to understand human experiences and the social world through in-depth exploration and interpretation of data. Unlike quantitative research, which relies on numerical data and statistical analysis, qualitative research uses methods such as interviews, observations, focus groups, and document analysis to gather rich and detailed information from participants (Gerrish & Lacey 2010, p.160). It aims to capture the essence of human experiences, allowing researchers to gain a holistic understanding of the studied phenomena. As a methodology that embraces subjectivity and context, qualitative research provides valuable insights into the social, cultural, and psychological dimensions of phenomena, making it an essential tool in various disciplines, including nursing.

Qualitative research in nursing, according to Polit & Beck (2010, p. 259), is an indispensable methodology that allows nurses to explore the essence of human care by understanding human experiences, behaviors, and experiences in the context of health care. Qualitative research enriches nursing practice, evidence-based knowledge, and a deeper understanding of human care due to the depth exploration of subjective aspects of health, illness, and treatment. Qualitative research is a powerful methodology that has been gaining popularity in nursing research over the past few decades. As the focus shifts towards holistic patient care and understanding the intricacies of human experiences, qualitative research has emerged as a valuable tool in nursing practice and academia.

Qualitative research in systematic literature reviews, as outlined by Polit and Beck (2010, p. 515), involves a rigorous and structured approach to identifying, synthesizing, and analyzing qualitative studies to answer specific research questions. Systematic reviews are essential in evidence-based practice as they provide a comprehensive and unbiased overview of existing qualitative research in a particular field.

5.2 Systematic literature review

In nursing research, a systematic literature review stands as a cornerstone for evidence-based practice, which involves the integration of a large number of studies (Polit & Beck, 2010, p. 59). A systematic literature review provides a structured and thorough approach to synthesizing existing literature, thus promoting evidence-based practice and continuous development in the nursing profession. According to Gerrish & Lacey (2010, p. 287), a systematic review involves the synthesis of results and conclusions from different publications on the same topic, striving to identify, appraise, and synthesize all empirical data to answer specific chosen clinical research questions. Understanding the significance and implications of a systematic literature review in nursing allows us to gain deeper knowledge in evidence-based practice. Gerrish & Lacey (2010, p. 287) outline the advantages of synthesized evidence, such as assisting in the decision-making process, limiting biased studies, ensuring consistency of results, and deriving reliable and accurate conclusions. Polit & Beck (2010, p. 37) position systematic reviews at 'level 1' at the top level in the evidence hierarchy regarding the effectiveness of intervention, as outcomes from systematic literature reviews are considered more reliable and accurate than other study types due to the wide range of collection of evidence-based studies. Therefore, the systematic literature review method has been opted for this paper to present research outcomes, as it involves a process that ensures the results are verified, accurate, reliable, and free from bias. There are six stages of conducting a systematic literature review, as follows (Gerrish & Lacey 2010, p. 288):

- Making a research protocol, writing the purpose and method of research.
- Conducting a comprehensive systematic literature search.
- Selecting appropriate and relevant studies.
- Critically appraising the quality of studies.
- Interpreting and presenting the summary of findings.
- Writing the research in a structured way.

5.3 Data collection

Data collection is a crucial stage in the methodology process, serving as the foundation of a systematic review. The data collection process ensures the synthesis of a diverse range of findings from studies. Gerrish & Lacey (2010, p. 291) state the key principles in their book

'The Research Process in Nursing' for collecting data for a systematic literature review, which include:

- Comprehensive search strategy that outlines databases, journal sources, and keywords, and search terms that can identify relevant studies.
- Inclusion and exclusion criteria, where the researcher selects the language, publication year, population, peer review, and full text to get exact results.
- Study selection, where the researcher screens the title and abstract regarding the research question and then reads the full text of the study to meet inclusive criteria.
- Data extraction involves systematically gathering information from selected studies.
- Quality appraisal, which ensures the reliability of included studies, determined by assessing study design, methodology, data collection method, and reliable sources.

To conduct a thorough and comprehensive literature review for the current study, the author followed the above-mentioned principles through Tritonia Finna/Novia, which is Novia e-resources and the printed library collection. Electronic databases such as Academic Search Elite (EBSCO), CINAHL Complete, MEDLINE, and keywords like 'management or managing,' 'type 2 diabetes,' elderly or older or aged or elderly people or old people,' 'self-care,' 'physical activities or exercise,' healthy eating, healthy diet, or healthy food' were used to search in the database's search function. Inclusion and exclusion criteria were used in this paper, as shown in the following table.

Table 1. Inclusion and exclusion criteria

Inclusions	**Exclusion**
Full text	Articles that are not in full text
Abstract available	Irrelevant topic & duplicate studies
Peer review	Not peer review
Academic journal	Not academic journal
Article in English	Articles which are not in English
Publication year (2018-2023)	Older than 2018
Studies in older age	Studies which are in mix aged group

A total of 612 records were identified from selected databases where 564 records were excluded due to not meeting the selection criteria. After that 48 records were screened for

eligibility. Again 38 records were excluded which were not relevant for this paper and finally, 10 reports were selected for this study which can be seen details in the following PRISMA chart.

PRISMA flow diagram of databases searches for systematic review.

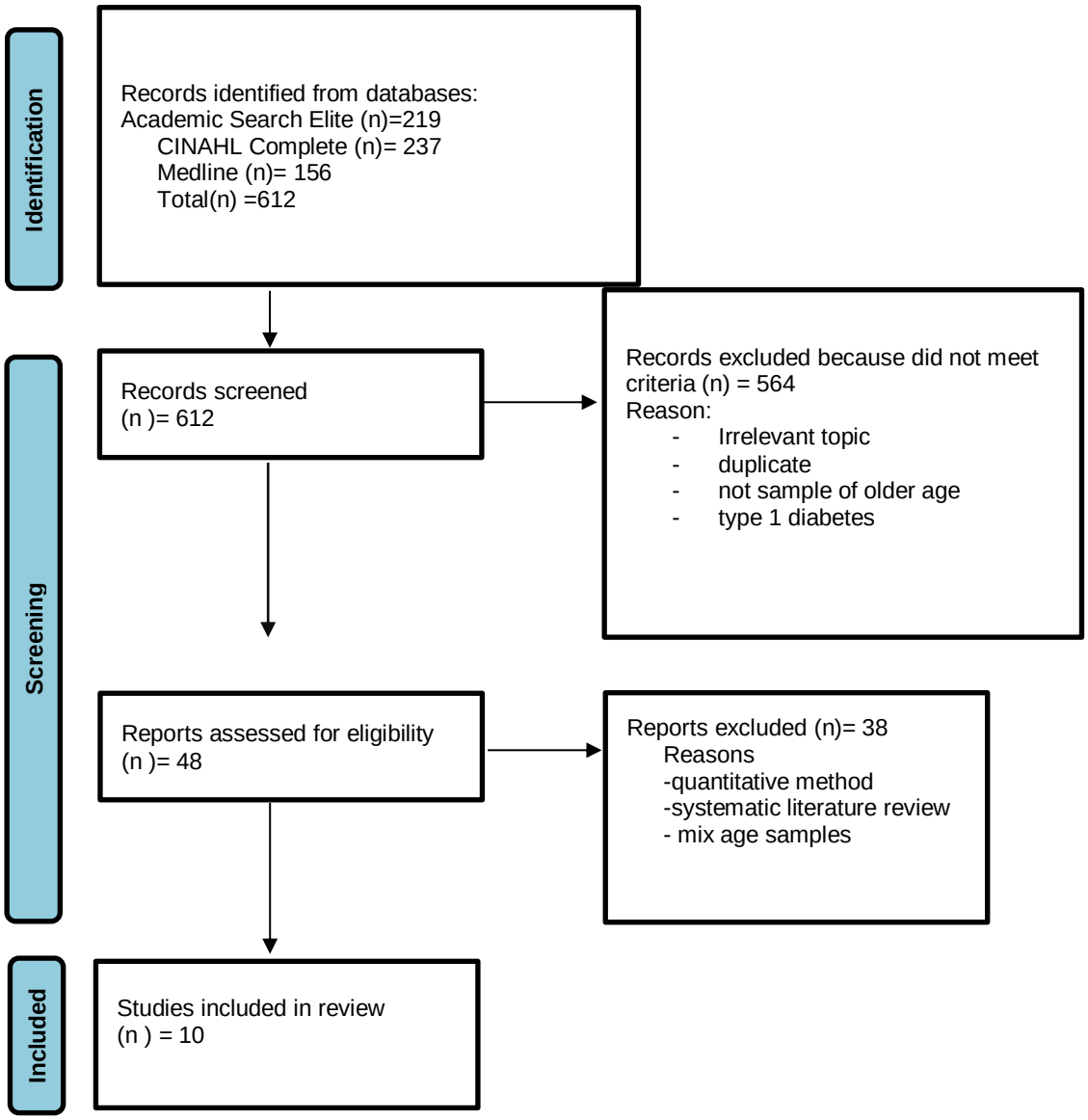

Figure 2. PRISMA flow diagram

5.4 Content analysis

Content analysis is the process of analyzing and interpreting studies. According to Gerrish & Lacey (2010, p. 184), content analysis requires a 'reading' strategy that entails back-and-forth movement between the expression or details of the study and the sense of the text as a whole. It presents a text of the whole context, giving a sense of the meaning of the study within the text. Gerrish & Lacey (2010, p. 184) outline systematic procedures for content analysis, which include:

- Reading the whole text to make sense of meaning,

- Coding process in categorizing and labeling segments of the extracted data,

- Dividing text into 'meaning units,'

- Developing categories and themes that represent recurring concepts, ideas, or topics that emerge across the selected study,

- Synthesis and interpretation of categories and themes in relation to the research question,

- Comparative analysis, which entails similarities, differences, and trends in content across the selected studies.

The author of this paper followed the above procedures to conduct data analysis. The researcher found and collected the relevant studies, read the whole text thoroughly, and understood the meaning and sense of the study by coding, categorizing, and identifying patterns and themes across selected studies. The researcher in this paper gained a comprehensive understanding of the research question and contributed to evidence-based practice and the advancement of nursing knowledge. The author categorized four themes and ten subthemes based on selected studies to understand the deeper knowledge of nurses' role in the management of type 2 diabetes.

5.5 Ethical considerations

Any kind of research that involves animals or human beings should address ethical issues. Nurses have developed their own ethical guidelines (Polit & Beck, 2010 p. 118). One of the most fundamental principles in human research is that research should harm less and

maximize benefit for the individual or society as a whole. The second principle of research is respect for human dignity which includes the participant's self-determination and right to full disclosure. The third principle is justice which includes participants' right to fair treatment and privacy (Polit & Beck, 2010, p. 121). Different country has their own ethical guidelines. In term of Finland, guidelines The Finish Code of Conduct for Research Integrity and Procedures for Handling Alleged Violations of Research Integrity in Finland has been published by The Finish National Board on Research Integrity (TENK) that aims to promote the responsible conduct of research, prevent misconduct in research, promot discussion, and spread information on research in Finland (TENK, 2023).

The literature used for this systematic literature review consists of scientific articles from different high-quality databases and academic sources. All sources are cited and credited by the author, and ethics are considered throughout the whole research process. The author follows all instructions and guidelines in research writing provided by Novia University of Applied Sciences. This study potentially adheres all the guidelines stated in the responsible conduct of research by the Finnish National Board on Research Integrity (TENK). Credibility, dependability, confirmability, and transferability of the findings are practiced in this research. The articles will be thoroughly checked, and the findings will be rigorously evaluated to ensure ethical standards are maintained, as outlined in the guidelines. As stated in the responsible conduct of research, the reliability of the study shall be checked thoroughly (Finnish National Board on Research Integrity TENK, 2012). Any kind of plagiarism shall be avoided, only authenticated articles from the scientific databases shall be used. Personal perspective, bias, any kind of fabrication, and sources that are vulnerable to plagiarism shall be avoided (Polit & Beck, 2017). The findings of this study will be published on a public platform by giving proper credit and respect to the other researchers. (Finnish National Board on Research Integrity TENK, 2012).

6 Results

Four main themes were emerged from the content analysis accompanied with ten sub-themes which are explained as follows:

Table 2. Nurses' role in management of type 2 diabetes among elderly people:

Themes	Sub-themes
1. pharmacological support	• Reminding to take medicine (n) =2 • Giving medicine knowledge (n)=3 • Introducing technology (n)=2
2.Physical activities	• Designing and instructing exercise intervention. (n)= 2 • Encouraging patient to exercise (n)=3 • Motivating patient to walk (n)=2
3. Healthy eating	• Presenting dietary advice (n) =3 • Planning nutritional meal (n) =2
4.Counselling	• Offering psychological support (n) =2 • Providing education (n) =4

n = Number of article studied for the subthemes

6.1 Pharmacological support

Medication plays an essential role to mitigate the symptoms and prevent the complications of diabetes mellitus. Medication adherence is associated with controlled glycemic levels and better health outcomes. However, medication adherence is challenging in older people due to age-related factors and the management of diabetes mellitus in the elderly has become a concern (Upamail & Rathnayake, 2023). The theme 'pharmacological support' emerged after a thorough review of the articles. Within this theme, sub-themes highlight the significant role of nurses in providing support for pharmacological matters.

6.1.1 Reminding to take medicine

There was evidence from a qualitative study (Upamail & Rathnayake, 2023) that age-related memory impairments were one of the common problems in the older population that can directly affect medication adherence. As people age, they often encounter issues with memory, making it difficult for them to recall medication names, doses, and times. Individuals with memory problems are prone to forgetting to take their medicine. Another study (Oliveira & Guerreiro, 2022) explained that elderly individuals living alone have a higher chance of forgetting to take their medication. With advancing age, individuals often contend with various chronic diseases and use multiple medications. Polypharmacy in the elderly poses challenges, as it makes it difficult for them to remember medicine names, doses, and times. Sometimes, they might accidentally take the same medicine twice, while at other times, certain medications may be forgotten altogether (Oliveira & Guerreiro, 2022). Therefore, age-related memory impairments can impact medication adherence, resulting in poor management of blood glucose in the older population.

Hence, nurses play a pivotal role as reminders to ensure consistent medication intake in older individuals with type 2 diabetes. Nurses can ask, engage in conversations, check medications, and remind them to take their medicine on time. Nurses can also create separate pillboxes, serving as a visual reminder of whether a patient has taken their medicine or not. This approach not only reduces the risk of overdosing on the same medication but also minimizes the chances of missing necessary medicines. Nurses play a crucial role in ensuring that individuals with type 2 diabetes remember to take their medication regularly, contributing to effective management of glycemic levels.

6.1.2 Providing medicine knowledge

One study (Upamail & Rathnayake, 2023) demonstrated that older individuals with diabetes had limited knowledge about the uses of their medication. Patients lacked awareness of the consequences of skipping or missing doses. Some patients found taking regular medication stressful and intentionally skipped it, while others believed that skipping doses would not significantly impact blood sugar control, as long as they took another dose later. Another study (Tan et al., 2018) identified that patients were resorting to traditional herbs, neglecting their diabetes medication. Additionally, some patients had unpleasant experiences with medication due to side effects, fostering a negative perception of medication outcomes. Consequently, they were hesitant to take medication, fearing it might worsen their condition rather than improve it. Similarly, another study (Oliveira & Guerreiro, 2022) emphasized that older individuals with diabetes were averse to taking medication, particularly as they had to manage several medicines due to comorbidities. Older patients with type 2 diabetes also believed that regular pills might harm their body's organs and impair their overall health, resulting in the avoidance of regular medication.

Therefore, when an older patient with type 2 diabetes lacks knowledge about medication uses, shows negligence towards taking medication, or has misconceptions about its outcomes, nurses play an essential role as educators. They provide knowledge about the medication's uses, outcomes, benefits, and potential side effects. Nurses explain the purpose of each prescribed medicine, detailing how it contributes to blood sugar control. Emphasizing the importance of consistently taking prescribed medication without skipping any doses, nurses encourage patients to inform healthcare providers about any other herbs or medications they may be taking to prevent adverse effects. By imparting knowledge on medication adherence, nurses empower older individuals with type 2 diabetes to achieve optimal diabetes control.

6.1.3 Introducing technology

According to Jeffrey et al. (2019), the advent of new technology, such as mobile apps, has proven to be a significantly useful tool for self-management of type 2 diabetes in elderly individuals. This technology allows for the monitoring of blood glucose levels, adherence to medication or insulin therapy, dietary tracking, realistic goal setting, managing medication doses, and receiving reminders about taking medication via text messages. The study reported positive self-management outcomes among patients with type 2 diabetes who used mobile apps. Additionally, Orgin et al. (2021) proposed that technology has played a crucial

role in supporting diabetes self-management. Telemedicine, defined as electronic communication between healthcare providers and patients, and Flash Glucose Monitoring (FGM), which immediately displays blood glucose levels by simply swapping the sensor, have successfully improved glycemic levels in type 2 diabetes patients. However, the use of technology and mobile apps for self-management may not be convenient for some older populations due to a lack of technological knowledge, user-unfriendly interfaces, difficulties in navigation, and connectivity issues. Some patients had never heard of it, while others believed that mobile apps do not offer any assistance and are an unnecessary task (Jeffrey et al., 2019).

Thus, nurses play a crucial role as technology instructors for older patients, providing them with the knowledge and skills needed to effectively and properly use technology to manage blood glucose levels. Nurses can teach and explain the benefits of using technology for self-management, 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.

6.2 Physical activities

Physical activities are considered a cornerstone for managing blood glucose levels, and they should be designed according to patients' health conditions and preferences. Regular exercise can help improve insulin sensitivity, control glycemic levels, manage weight, and enhance overall health and well-being in older individuals with type 2 diabetes (Nielsen et al., 2022). Another theme, 'physical activities,' emerges from the chosen studies, consisting of the following three sub-themes.

6.2.1 Designing and instructing exercise intervention

Nielsen et al. (2022) demonstrated that an exercise intervention conducted in a different hospital in Denmark had a positive impact on older patients with type 2 diabetes in controlling their glycemic levels. A structured and tailored exercise program increased patients' confidence in engaging in exercise sessions. Patients also felt safe and comfortable exercising under supervision and instruction, and they were motivated to participate in group sessions. Patients reported better control of their blood glucose levels after engaging in regular physical exercise. Similarly, another study outlined that patients were happier, more

comfortable, and energetic, and they successfully reduced their glycemic levels while exercising (Che, Meng, Jiang, Ye & Xie, 2022). On the other hand, the same study conducted by Che et al. (2022) mentioned that older patients were hindered from exercising due to physical discomfort such as arm and leg pains, weakness, fatigue, and back pain. Likewise, some patients were less active in outdoor exercise due to weather, exercise areas, and lack of assistive devices. Some patients expressed the opinion that even though they understood the benefits of regular exercise in managing blood glucose levels, they did not know which exercises were suitable for them or how to exercise safely and effectively. They were afraid that physical activities might harm them if not performed in an appropriate way.

Thus, studies illustrate the benefits of regular exercise in managing blood glucose levels and barriers to performing physical activities effectively in older patients with type 2 diabetes. Nurses play an essential role as exercise designers and instructors for older patients. Nurses assess and evaluate the patient's health status, strength, fitness, mobility, and any contradictions or limitations that affect involvement in exercise programs. They set realistic and individualized exercise goals to control blood glucose levels, enhance muscular strength, maximize cardiovascular fitness, and reduce the risk of falls. Nurses develop customized exercise programs considering individuals' needs, health status, preferences, and capabilities. They ensure the safety of exercise programs, teach and instruct proper techniques, and emphasize providing clear and detailed instructions for older individuals.

6.2.2 Encouraging patients to exercise

According to Upamail & Rathnayake (2023), as people age and retire from work, they may become less active, preferring to sleep rather than engage in physical activities. Che et al. (2022) argued that older individuals were hesitant to walk outside or participate in outdoor exercise in dark, rainy, or bad weather. Similarly, unfavorable moods, unpleasant experiences, or negative attitudes toward exercise affected patients' willingness to engage in physical activities. It was emphasized that some patients became frustrated when the amount or technique of exercise they completed did not yield positive results in glycemic control, leading them to quit physical exercise. Additionally, one study (Ansari, Harris Hosseinzadeh & Zwar, 2021) indicated that some patients were unaware of how exercise could help control glucose levels and perceived it as an extra burden.

In this context, nurses play a crucial role in encouraging older patients with type 2 diabetes to engage in regular exercise. Nurses can assess, evaluate, and monitor exercise progress and

the results of blood glucose levels. They can explain the progression, improvements, and results, celebrate achievements, and offer positive reinforcement to patients. Nurses also explain the benefits of exercise in managing blood glucose and help older patients identify and address any barriers to exercise, encouraging them to participate in physical activities. Nurses listen to and understand patients' feelings, experiences, wishes, and preferences, tailoring the exercise program accordingly with supervision, support, safety instruction, and education, providing ongoing motivation and encouragement for exercise. Nurses provide emotional support, fostering positive feelings towards exercise. Moreover, nurses can encourage them to engage in a high level of social interaction, which facilitates participation in physical activities.

6.2.3 Motivating patients to walk

A study (Raynolds, Moodie, Venn & Mann, 2020), conducted in Dunedin, New Zealand, highlighted that regular walking after every meal had a positive impact on older patients' self-esteem, feelings of well-being, digestion, weight loss, sleep quality, and improved blood glucose levels. Additionally, prescribing regular walking is more feasible for older patients since they can walk at their own time and pace, and it does not require the time and cost associated with attending exercise classes or a gym. Similarly, another study found that walking for 30 minutes every day helped patients stabilize their blood sugar levels over time. On the other hand, some patients were too lazy to walk; they preferred sleeping or watching TV after a meal instead of going outside for a walk (Ansari, Harris Hosseinzadeh & Zwar, 2021). Additionally, according to Raynolds, Moodie, Venn & Mann (2020), some patients were afraid to go out for a walk when it was dark outside, and some preferred having friends or company to walk with instead of going alone. Another study (Ansari, Harris Hosseinzadeh & Zwar, 2021) suggested that some older patients were unaware of whether walking could significantly benefit in controlling their blood glucose levels or not.

Since studies have shown the benefits of walking in the management of blood glucose levels and the limitations and barriers to walking, nurses' role emerges as motivators for daily walking to control glycemic levels in older patients with type 2 diabetes. Nurses can create a walking plan that practically fits the needs of older patients and motivate them to follow the routine, explaining its outcomes. For those patients who are afraid to walk outside alone or afraid of darkness, nurses can motivate them to walk indoors. Nurses can also suggest and assist them in using technology such as mobile apps or fitness trackers to record their walking or step activities, which can be motivating and provide a sense of achievement.

6.3 Healthy eating

One of the major components in the management of blood glucose is adopting healthy eating behavior, which involves reducing the intake of foods high in sugar, fat, and sodium, and increasing the consumption of foods rich in fiber and protein, such as whole grains, fruits, vegetables, and fish (Schure, Goins, Jones, Winchester & Bradley, 2019). Another theme, 'healthy eating,' is derived from the selected studies, followed by two sub-themes.

6.3.1 Presenting dietary advice

Schure et al. (2019) suggested in their study that patients had been successful in the self-management of blood glucose levels through dietary behavioral changes, such as cutting out sugar, fat, and salt in food while cooking, replacing soda and sweet drinks with water, and adding more salad, green vegetables, and fruits to their meals. On the other hand, Tan et al. (2018) believed that some patients were not willing to reduce their favorite, even if unhealthy, foods, and some did not enjoy tasteless food due to its low salt or sugar content. Similarly, the same study mentioned that some patients encountered difficulties in changing their healthy eating behaviors due to cultural and traditional eating habits, such as consuming roasted and high-calorie foods and sugary desserts. Additionally, according to Ansari, Harris Hosseinzadeh & Zwar (2021), some patients were not interested in adopting healthy eating habits due to a lack of knowledge.

In this context, nurses play an essential role in providing dietary advice to manage glycemic levels in older patients, explaining the importance of proper nutritional food in reducing diabetes complications and managing blood glucose levels. Nurses can interpret foods that contain healthy or unhealthy compounds, explain the relationship between diet and blood glucose control, and provide motivation to change eating patterns towards healthier options, explaining the outcomes of both healthy and unhealthy foods.

6.3.2 Planning nutritional meals

One study (Upamail & Rathnayake, 2023) investigated that as people age and develop comorbidities along with type 2 diabetes, they are prone to less involvement in physical activity, spend more hours sitting, and sleep longer, resulting in less interest in consuming balanced diets. According to Ansari, Harris Hosseinzadeh & Zwar (2021), some patients expressed that they ate whatever food was convenient and feasible to cook rather than trying to find a variety of balanced food.

Therefore, nurses play a vital role as meal planners in developing and implementing nutritional meals to control blood glucose levels in older patients who are at a higher risk of getting insufficient nutrient foods. Nurses assist patients in establishing regular meal schedules and ensure consistency in meal timing, which helps stabilize blood glucose levels. Nurses guide patients in making healthier food choices, emphasizing the patients' needs, preferences, and any allergic foods.

6.4 Counseling

This theme explores how nurses, in their role as counselors, facilitate the control of blood glucose levels in older patients. It consists of two sub-themes, as described below.

6.4.1 Offering psychological support

Previous research (Upamail & Rathnayake, 2023) identified that older patients with type 2 diabetes often experienced feelings of frustration as they aged with comorbidities, and they showed little interest in self-care management. Some patients harbored anxiety and fear about their health conditions, difficulties, and abnormalities, as well as misconceptions about diabetes medication and its outcomes. Similarly, some patients were hesitant to discuss their high blood glucose levels with healthcare providers and tended to blame themselves. Another study (Oliveira & Guerreiro, 2022) detailed that patients expressed concerns about insufficient family support in terms of caring for and treating their disease. Some patients felt embarrassment if they had type 2 diabetes in their old age. Additionally, changing lifestyle behaviors in old age proved difficult and was not easily accepted, leading to feelings of worthlessness in life.

Therefore, nurses play a crucial role as psychological counselors, providing emotional support and helping patients cope with the psychological aspects of their condition. Nurses listen to patients' emotions, fears, concerns, and feelings, offering emotional support that can provide significant relief to patients struggling with the emotional impact of the disease. Nurses can teach coping strategies to manage psychological stress associated with diabetes. They empower patients with knowledge about their diseases and help reduce anxiety and uncertainty. Nurses address any fears or concerns related to medication, explain the importance of medication adherence to manage blood glucose, and discuss any negative feelings or frustrated thoughts patients may have.

6.4.2 Providing Education

According to Upamail & Rathnayake (2023), older patients were often unaware of the medications they were taking and their benefits in controlling blood sugar levels and minimizing the complications of type 2 diabetes. Some patients preferred herbal remedies over prescribed medicine due to cultural and personal beliefs. Patients feared the side effects of medication, and some had misunderstandings about its outcomes, leading them to avoid taking prescribed medicine. Older individuals tended to sleep longer, reduce physical activities, and neglect proper timing for food and medication, resulting in poor glycemic control. Another study (Oliveira & Guerreiro, 2022) described changing lifestyle behaviors in the older population as restrictive; therefore, they continued their lifestyle without adopting healthy eating and physical activity behaviors. Moreover, Ansari, Harris Hossein Zadeh & Zwar (2021) stated that patients lacked knowledge in diabetes self-care management, believing the disease came from God and should be cured by God. Additionally, patients failed to follow health care provider's advice regarding healthy food and physical activities. Patients were not aware of self-care management, often indulging in unhealthy foods during festivals, gatherings, and social events (Ansari, Harris Hosseinzadeh & Zwar, 2021; Tan, et al., 2018; Schure et al., 2019).

In this context, nurses play an essential role as educators, providing effective education to assist older patients with type 2 diabetes in the self-management of blood glucose levels. Nurses educate patients about their prescribed medicine, explaining its benefits, outcomes, and potential side effects. Nurses provide knowledge to address any misunderstandings about the disease, ensuring that patients have a clear understanding of their condition and its control. Nurses also teach the relationship between healthy eating, physical activities, and blood glucose levels, encouraging the adoption of healthier lifestyles.

7 Discussion

Type 2 diabetes is common in elderly people, and uncontrolled diabetes can lead to severe complications and even death. Therefore, the management of type 2 diabetes is essential to reduce diabetes complications and establish the overall health and well-being of elderly people. This paper aims to enhance and deepen the understanding of nurses' roles in the

management of type 2 diabetes in the elderly, highlighting their pivotal role in providing pharmacological support, facilitating physical activities, promoting healthy eating habits, and offering counseling. This chapter will discuss the results, explain why Orem's self-care theory has been chosen for this paper, and outline the process and implementation of the methodology.

7.1 Discussion of results

Four analytical themes from this study indicate potential areas of nurses' roles in glycemic control. The first theme pertains to pharmacological support in older people with type 2 diabetes, focusing on medication adherence. Older people are more prone to medication non-adherence due to age-related factors such as forgetfulness, polypharmacy, and lack of knowledge. The findings of this study provided evidence of challenges related to cognition, memory, and knowledge, which are common in the older population. Older people with memory impairment can easily forget about their medication, mix one medicine with another, and become confused about taking medicine. Consistent with the findings of a previous study (Swiatoniowska et al., 2021), cognitive impairment in older patients with diabetes potentially interferes with their ability to perform self-monitoring of blood glucose levels, and self-care management tasks, such as memory, attention, calculation, learning capacity, and planning. Similarly, this study reported that older people skipped medicine, neglected to take medication, or tried some herbs instead of taking prescribed medication due to a lack of knowledge. Moreover, older people were unaware of new technology in terms of treatments, and some older people did not believe in it. Another study (Muhamad, Alabed, Abdullah, & Poddar, 2022) conducted in Malaysia supported the current finding that older people with type 2 diabetes may not be concerned about taking medication due to a lack of knowledge about the benefits of medication compliance. These age-related circumstances contribute to medicine non-adherence, resulting in poor glycemic control. An earlier study (Doucet et al., 2023) highlighted that medicine adherence significantly aids in glycemic control in older patients. Similarly, a previous study reported the importance of medication in the control of blood glucose levels and in the reduction of cardiovascular events (Alabkal, Medlinskiene, Silcock & Graham, 2023). Therefore, this paper emphasizes nurses' significant role in reminding older patients to take medication, providing knowledge about medication uses and outcomes, and introducing technology to facilitate easier screening and self-evaluating of blood glucose levels, significantly aiding in managing type 2 diabetes in older patients.

The second theme is related to physical activities since they play a vital role in the management of type 2 diabetes; however, being involved in physical activities is challenging for older patients due to comorbidities, weakness, physical impairments, lack of motivation, and education. Current findings reported that older patients with type 2 diabetes suffered from different diseases, that interfered with their daily activities, including exercise. Older patients feel weak, tired, fatigued, in pain, and scared, making it difficult for them to perform physical activities. Similar to the findings of a previous study (Kuo, Huang & Garcia, 2022), fatigue is commonly reported in older patients with type 2 diabetes due to diabetes distress, depression, and sleep quality, which reduces their interest in performing exercises. Likewise, a number of studies suggested that older patients with type 2 diabetes faced physical limitations due to frailty and sarcopenia (Bahat, Ozkok & Petrovic, 2023; Nakamura et al., 2019). The current findings indicated that older patients had a lack of knowledge and motivation for regular exercise, similar to the findings from Dranebois et al., 2022, in which 50% of patients in the study showed a lack of knowledge about the relationship between exercise and the management of type 2 diabetes. Another study (Goins et al., 2020), examining the perception of type 2 diabetes in older Indian Americans, also identified a higher rate of obesity and physical inactivity due to a lack of motivation and education. Moreover, the current study reported that older patients did not know what kind of exercises were beneficial for them and how to perform them. Conversely, earlier research pointed out that older patients with type 2 diabetes were instructed, supervised, guided, and evaluated by healthcare providers to perform exercises (Soderlund et al., 2019). An earlier study (Lucertini et al., 2019), conducted in the Italian primary care sector, showed that older patients with type 2 diabetes who participated in an exercise referral scheme intervention had significantly improved glucose control and increased fitness status, psychological well-being, and metabolic profile compared to non-participating patients. Prior research (Harrington & Henson, 2021) suggested that older patients with type 2 diabetes walk a minimum of 150 minutes per week, which can significantly help them be active in physical activities. Physical activities are considered an important component in the management of type 2 diabetes. They not only help control blood sugar but also reduce diabetes-related complications, support overall health, and enhance the quality of life for older adults living with type 2 diabetes. Therefore, nurses play a crucial role in promoting physical activities in older patients with type 2 diabetes. Nurses assess patients' abilities and disabilities for any physical activities and design exercise plans. Considering the existence of comorbidities and complications, individualized plans should be structured based on patients' preferences, needs, goals, and physical limitations. Nurses not only design exercise plans, but they also

teach, educate, consult, and motivate patients to be involved in physical exercise. Nurses provide emotional support to elderly patients to understand and encourage them and offer any possibilities that are convenient for patients. Nurses' comprehensive approach, from personalized exercise plans, education, motivation, and ongoing support, helps elderly people effectively manage their type 2 diabetes and improve their overall health and well-being through physical activities.

The third theme is related to healthy eating behavior, which is also an important part of lifestyle behavior to manage type 2 diabetes. The current study found that when older people had comorbidities along with type 2 diabetes, they showed less interest in eating balanced and nutritious foods. This supported the result of Tasci, Safer & Naharci (2019) that undernutrition was commonly presented among older adults with type 2 diabetes. Moreover, this study reported that people ate unhealthy food at their social events, festivals, and meetings because of personal and cultural beliefs. In addition, the current study reported that some patients did not want to change their eating patterns even if they were unhealthy, and some people did not know the benefits of eating healthy food in terms of diabetes management. Another research also identified and reported on healthy eating behavior, stating that persons with type 2 diabetes in North Ethiopia had poor behavior (Gebreyesus et al., 2021) where nutrition education is significantly required. Conversely, Tatoli et al., 2022, indicated that older adults with type 2 diabetes from southern Italy knew about healthy food, and apparently, they had shown healthier diets than non-diabetic older adults. A previous study (Papamichou et al., 2022), conducted in a private practice clinic in Sydney, Australia, demonstrated that type 2 diabetes patients who followed a Mediterranean diet (rich in vegetables and fruits, whole grain, olive oil, fish) had significantly reduced glycated hemoglobin (HbA1c), blood pressure, Body Mass Index (BMI), and improved metabolic parameters compared with patients who had a normal diet. Likewise, a number of studies identified improvement in glycemic control in older patients with type 2 diabetes through healthy eating patterns (Almutairi, Hosseinzadeh & Gopaldasani, 2020; Marsi et al., 2020). Therefore, nurses play an important role as nutritional educators, planners, and motivators to make healthier food choices in the management of type 2 diabetes among the older population. Nurses explain the benefits of a healthy diet in controlling blood glucose levels, differentiate between healthy and unhealthy foods, and encourage following healthy food patterns. Nurses can conduct a comprehensive dietary assessment to understand patients' current eating habits, preferences, limitations, and any cultural and individual factors that affect their food-consuming behaviors and offer potential options such as meal plans,

nutrition tracking, meal schedules, optional foods, and supplement diets, which help stabilize blood glucose levels.

The last theme is associated with counseling, which is required to manage type 2 diabetes in older populations through psychological support and education. The current study identified frustrated feelings in older patients with type 2 diabetes. Along with anxiety, depression, fear, and the existence of comorbidities and physical impairment, self-care management activities in diabetes such as taking medicine, following healthy eating patterns, and doing exercises were limited in the older population. A previous study (Kuo, Huang & Garcia, 2022) also demonstrated that the prevalence of diabetes distress, depression, and low quality of sleep were common in older diabetes patients, limiting their participation in exercise. In addition, the findings of this report pointed out that patients were not given sufficient family support regarding their treatments, which made them more worried and stressed about their health condition. Patients suffering from psychological distress due to diabetes need emotional and psychological support. Moreover, current analyzed data revealed that older patients had a lack of knowledge about their self-care management in diabetes, such as medicine adherence, physical activities, and healthy eating behavior. Therefore, diabetes self-care education is essential to improve self-care behavior to manage type 2 diabetes in the older population. A previous study conducted at Jimma University Medical Centre in Ethiopia illuminated significant improvements in diabetes self-care behaviors and self-care knowledge after getting nurse-led diabetes self-management education (Hailu, Moen & Hjortdahl, 2019). Similarly, a number of studies explained effectively improved glycemic control in type 2 diabetes patients through diabetes self-management education (Ji et al., 2019; Singh et al., 2018). Thereby, the nurses' role is significant in providing education about self-care management to manage type 2 diabetes among elderly people. Nurses try to understand patients' feelings, emotions, anxiety, and offer emotional and psychological support and consult with patients and their relatives to establish the overall mental well-being of patients.

Dorothea Orem’s self-care deficit theory of nursing was applied in this paper because this theory highlights the importance of self-care and how nurses can assist individuals in meeting their self-care needs when they are unable to perform independent tasks. Based on Orem’s theory, self-care is essential to maintaining individuals’ optimal levels of health, and if individuals cannot perform self-care activities due to physical or mental impairments, diseases, and disabilities, nurses play a crucial role in helping them based on their needs, which is associated with this research. This paper found that self-care management is an

important component to manage type 2 diabetes in the elderly and highlighted the areas of nurses' roles to assist them in achieving and maintaining their optimal levels of health and well-being.

Some older patients with type 2 diabetes were engaged in self-care activities; however, many of them were limited in self-care activities due to age-related factors (i.e., comorbidities, mental and physical impairments), lack of knowledge and motivation, and psychological factors such as depression, stress, anxiety, and fear. Moreover, this study outlined nurses' potential roles as educators, motivators, counselors, instructors, and supporters to assist them by assessing their limitations, needs, and aims to ensure their level of dependency. Orem's theory empowers the patient to take an active role in their self-care and provides nurses with a framework for assessing, planning, and delivering care. It helps nurses determine when and how to support patients in their self-care abilities. Therefore, this theory is important for this paper to guide nurses in making decisions in treatment. This paper reported that older patients with type 2 diabetes were less involved in self-care activities such as medication adherence, healthy eating behaviors, and physical activities. Therefore, the nurses' role emerges as per Orem's self-care theory's assumption that nurses can assist patients in their self-care abilities based on their physical limitations, fitness, and level of knowledge. Orem's theory assumes that every individual has unique abilities to learn self-care activities and can be motivated to be involved in self-care management through nurses' support. Nurses assess the patient's abilities to perform self-care activities using Orem's self-care theory. After assessing patients' abilities, nurses identify if there are any limitations or deficits that limit patients' self-care activities. In type 2 diabetes patients, this may include monitoring blood glucose levels, managing medication, dietary choices, and routine exercise. As Orem's theory emphasizes empowering patients to perform self-care activities, nurses play a vital role in promoting self-care activities through education, which may include healthy eating patterns, regular exercise, and the importance of medication adherence to manage blood glucose levels. Nurses can use Orem's theory as a framework to guide their practice and support older patients in managing blood glucose levels and enhancing overall health and well-being.

7.2 Discussion of methodology

This paper is a systematic literature review conducted using qualitative research methods and content analysis. A systematic literature review integrates a large number of evidence-based studies, providing a structured and thorough approach to synthesize all empirical data

to answer a specific chosen research question. According to Polit & Beck (2010, p.37), a systematic literature review is a level 1 review in the evidence hierarchy due to the wide range of evidence-based studies collected. Therefore, the author of this research chose a systematic literature review to answer the clinical research question, ensuring accurate, reliable, and bias-diminished results. A systematic literature review requires content analysis, which means reading the entire text to make sense and categorize themes and sub-themes into 'meaning units' (Gerrish, Lacey & Cormack, 2010, p.184). The author of this paper initially created a protocol based on background knowledge and interest in the research area, then formulated the research aim and research method. As the researcher was interested in the management of type 2 diabetes among the elderly, the aim of this research was to enhance and understand the deeper knowledge of nurses' role in the management of type 2 diabetes in the elderly. The researcher conducted a comprehensive research strategy using different academic databases such as Academic Search Elite (EBSCO), CINAHL Complete, and MEDLINE, employing various keywords such as "management or managing," "type 2 diabetes," "elderly or older," "aged or elderly people or old people," "self-care," "physical activities or exercise," "healthy eating," "healthy diet," or "healthy food." In total, ten articles out of 612 were selected that were relevant for this study to answer the clinical research question. Inclusion and exclusion criteria were used for the selection of the articles, detailed in the PRISMA chart (figure no. 2), and the research followed ethical guidelines, considering the importance of research ethics in the study.

7.3 Trustworthiness

The researcher must demonstrate the trustworthiness of collected data, which encompasses credibility, dependability, confirmability, and transferability. The main principle of trustworthiness is ensuring that findings can accurately reflect the participants' experience and perception rather than the researchers' opinion. Credibility means confidence in the truth of the data (Polit & Beck, p. 108). Dependability refers to the consistency of data over time and conditions, and credibility cannot be achieved without dependability. Confirmability refers to objectivity, ensuring that data accurately represent the participants' perceptions and not the bias or perspective of the researcher. Transferability is the shifting of findings to other settings so that others can make conclusions in the same context (Polit & Beck, 2012, p. 494).

This research has met all the criteria of trustworthiness as explained by Polit & Beck. The authors have confidence in the truth of the current results since all the data were collected

from scientific evidence-based studies. Similarly, if someone wants to research the same topic, "nurses' role in the management of type 2 diabetes among the elderly," researchers will have enough information from current findings to replicate the study and get the same results. In addition, findings in the current study were presented from the participants' perspective without any biased decision or personal perspective, and results from the current study can be transferred to another topic with the same context.

7.4 Implication of results

Findings from this study may guide decision-making in different healthcare sectors where healthcare providers work with older patients with type 2 diabetes. Healthcare professionals, clinicians, and caregivers will better enable the development of new supportive interventions to manage type 2 diabetes in the elderly. Nurses, healthcare providers, and diabetes educators may want to understand barriers to dietary adoption, physical activities, and medication adherence in older age. They can determine the level of intervention needed to overcome those barriers and thus manage type 2 diabetes and minimize its complications in the older population.

7.5 Limitations and future studies

One of the important limitations of this research is the collection of data from elderly patients with type 2 diabetes from different ethnicities and regions. While experiences from older people of specific ethnicities or regions were used to support results, it was sometimes impossible to determine whether reported experiences were unique to the older population in general. For instance, the role of nurses emerged as dietary advisors for rural Pakistani older patients when results showed unhealthy eating behavior. On the other hand, older patients with type 2 diabetes from southern Italy showed healthier eating habits than other non-diabetic elderly. Additionally, the lack of studies exclusively on older patients with type 2 diabetes was another limiting factor in this research. The selection of studies was limited due to the majority of studies being in mixed-aged groups. This outlines the importance of conducting more empirical studies on older populations with type 2 diabetes in future research.

8 Conclusion

Type 2 diabetes is a common and serious chronic disease in the older population, characterized by high sugar levels in the blood due to insufficient insulin production or insulin resistance in the body. The prevalence of type 2 diabetes in older people has been rapidly increasing globally due to aging, a sedentary lifestyle, unhealthy food, and obesity, resulting in diabetes complications and a higher number of deaths. Uncontrolled or unmanaged blood sugar leads to serious life-threatening complications such as nephropathy, retinopathy, neuropathy, and cardiovascular disease. On the other hand, managed or controlled blood glucose can reduce the risk of diabetic complications. Therefore, the management of type 2 diabetes is essential to mitigate the symptoms and prevent the complications of diabetes mellitus. However, managing type 2 diabetes in the elderly is challenging due to age-related factors such as physical and mental impairments, comorbidities, lack of knowledge and motivation, and psychological factors such as depression, anxiety, and fear.

The findings of this study emphasize the nurses' pivotal role in assisting elderly people with type 2 diabetes in managing blood glucose levels to prevent diabetic complications, prompt early detection, and establish the overall health and well-being of older people. The findings reveal that self-care management, which includes medication, healthy eating habits, physical activities, and education, is the major component of managing type 2 diabetes in elderly people. Nurses play a crucial role in reminding patients to take medicine, providing medicine knowledge, introducing technology, designing and instructing exercise interventions, encouraging patients to exercise, motivating them to walk, presenting dietary advice, planning nutritional meals, offering psychological support, and providing education to implement these important components to establish controlled blood glucose levels and better health outcomes. Moreover, this nurses' support should be personalized based on individuals' needs, goals, preferences, abilities, and physical and mental limitations. Furthermore, empirical data and participatory research in older patients with type 2 diabetes are needed in further studies due to the lack of studies exclusively on the older population with type 2 diabetes.

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Appendix 1. The number of selected studies for this paper.

No of article	Author, tittle, and publication year	Purpose	Method	Result
1.	Upamali, S., & Rathnayake, S. (2023). Perspectives of older people with uncontrolled type 2 diabetes mellitus towards medication adherence: A qualitative study. PLoS ONE, 18(9), 1–18. https://doi-org.ezproxy.novia.fi/10.1371/journal.pone.0289834	To explore the perspective of elderly people with uncontrolled type 2 diabetes towards medication adherence	Qualitative method	Age related factor, knowledge, lifestyle, and negligence were main factor to influence the adherence to medication among elderly people with type 2 diabetes.
2.	De Sousa Oliveira, C. J., & Guerreiro José, H. M. (2022). Older adults with type 2 diabetes mellitus: Contributions to understanding medication regimen management. Revista de Enfermagem Referência, 1–8. https://doi-org.ezproxy.novia.fi/10.12707/RV21029	To understand how elderly people with type 2 diabetes manage their medication regimen.	Qualitative method	This study found out age related problems (physical and mental impairments) in older patients with type 2 diabetes in manage medication regimen.

3.	Nielsen, S. G., Danielsen, J. H., Grønbæk, H. N., Molsted, S., Jacobsen, S. S., Vilsbøll, T., & Varming, A. R. (2022). Transforming Motivation for Exercise in a Safe and Kind Environment-A Qualitative Study of Experiences among Individuals with Type 2 Diabetes. International Journal of Environmental Research and Public Health, 19(10). https://doi-org.ezproxy.novia.fi/10.3390/ijerph19106091	Understand needs, barrier and motivation for exercise based on exercise participation among type 2 diabetes elderly patients.	Qualitative method	Supportive patient center exercise program promoted transformative motivation for development of physical activity.
4.	Ansari, R. M., Harris, M., Hosseinzadeh, H., & Zwar, N. (2021). Healthcare Professionals' Perspectives of Patients' Experiences of the Self-Management of Type 2 Diabetes in the Rural Areas of Pakistan: A Qualitative Analysis. International Journal of Environmental Research and Public Health, 18(18). https://doi-org.ezproxy.novia.fi/10.3390/ijerph18189869	To explore the health care professional's perspective towards management of type 2 diabetes in older population	Qualitative method	Social and cultural barrier has influenced to manage type 2 diabetes in elderly population.

5.	Reynolds, A. N., Moodie, I., Venn, B., & Mann, J. (2020). How do we support walking prescriptions for type 2 diabetes management? Facilitators and barriers following a 3-month prescription. Journal of Primary Health Care, 12(2), 173–180. https://doi-org.ezproxy.novia.fi/10.1071/HC20023	To identify facilitators and barriers experienced by older people with type 2 diabetes during prescribed walking	Qualitative method	Health benefit, family support and walking routine was carried out as motivation and fear to walk in evening was determined as barrier
6.	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	To evaluate experiences, barriers, and facilitators regarding use of diabetes mobile app among type 2 older patients	Qualitative method	Most of the patients have improved type 2 diabetes self-management via diabetes mob app and lack of knowledge and awareness towards technology and app was identified as barrier.

7.	Che, S., Meng, M., Jiang, Y., Ye, X., & Xie, C. (2022). Perceptions of exercise and exercise instruction in patients with type 2 diabetes mellitus and sarcopenia: a qualitative study. BMC geriatrics, 22(1), 892. https://doi.org/10.1186/s12877-022-03519-0	To understand perception of exercise and exercise instruction from the type 2 patients' perspective.	Qualitative method	Knowledge, attitude, motivators, and barriers were identified regarding exercise among type 2 diabetes in elderly.
8.	Ogrin, R., Aylen, T., Thurgood, L., Neoh, S. L., Audehm, R., Steel, P., Churilov, L., Zajac, J., & Ekinci, E. I. (2021). Older People with Type 2 Diabetes-Individualising Management With a Specialised Community Team (OPTIMISE): Perspectives of Participants on Care. Clinical Diabetes: A Publication of the American Diabetes Association, 39(4), 397–410. https://doi-org.ezproxy.novia.fi/10.2337/cd20-0129	To understand perspective of older participants who were engaged in type 2 diabetes individualizing management with specialized community team.	Qualitative method	Technology incorporated into program helped elder people for self-management of type 2 diabetes which was viewed as positively by type 2 diabetes elderly.

9.	TAN, C. C. L., CHENG, K. K. F., SUM, C. F., SHEW, J. S. H., HOLYDARD, E., & WANG, W. (2018). Perceptions of Diabetes Self-Care Management Among Older Singaporeans with Type 2 Diabetes: A Qualitative Study. Journal of Nursing Research (Lippincott Williams & Wilkins), 26(4), 242–249. https://web-s-ebscohost-com.ezproxy.novia.fi/ehost/detail/detail?vid=5&sid=c889bf05-b780	Explore the experience of older people with type 2 diabetes in diabetes self-care management.	Qualitative method	Careless was found in elder people with type two diabetes in diabetes self-care management.
10.	Schure, M., Goins, R. T., Jones, J., Winchester, B., & Bradley, V. (2019). Dietary Beliefs and Management of Older American Indians with Type 2 Diabetes. Journal of Nutrition Education & Behavior, 51(7), 826–833. https://doi-org.ezproxy.novia.fi/10.1016/j.jneb.2018.11.007	To examine dietary related, believe and self-management among older American Indians with type 2 diabetes	Qualitative method	Unhealthy eating behavior was found among Older American Indians with type 2 diabetes.
