



EXPERIENCES OF NURSES IN CARE OF DIABETIC FOOT ULCERS AMONG THE OLDER PERSONS.

Faith Jebichii

Deborah Jelimo Kimaiyo

Bachelor's thesis

April 2024

Bachelor of Health Care, Nursing

jamk | Jyväskylän ammattikorkeakoulu
University of Applied Sciences



jamk

jamk | Jyväskylän ammattikorkeakoulu
University of Applied Sciences

Kimaiyo Deborah & Jebichii Faith

Experiences of nurses in care of Diabetic Foot Ulcer among the older persons

Jyväskylä: Jamk University of Applied Sciences, April 2024, 57 pages

Degree Programme in Nursing. Bachelor's thesis.

Permission for open access publication: Yes

Language of publication: English

Abstract

Background; Diabetic foot ulcer is a severe and chronic complication that results due to neurological disorders and vascular diseases in the different parts of the body which leads to the formation of lesions in deep tissues. Foot ulceration in diabetic patients is the most common complication which leads to amputation of limbs and the ulceration can recur after treatment. It is estimated that 15 to 25 percent of people with diabetes are more likely to develop diabetic foot ulcers. Diabetic foot ulcer remains a major challenge as it results in most non-traumatic limb amputations leading to disabilities which poses a challenge to the social, physical, and economic states.

Aim and purpose; To establish the experiences of nurses in the care of diabetic foot ulcer older patients. The research's purpose is to assess ways in which nurses could provide better-quality care for older patients with diabetic foot ulcers

Methods; This is literature review research articles were identified from CINAHL and Medline databases.

Critical appraisal was done for article selection and analysis of data was conducted using content analysis method

Results; Experiences of nurses in care of diabetic foot ulcer among the older persons was categorized into three main categories. The first was skills and competences where nurses with many years of experience had more knowledge in the management of diabetic foot ulcer. The second category was multiprofessional teams where nurses appreciated the role of other professionals in care of diabetic foot ulcer since it also promoted sharing of knowledge. The final main category was external factors where personal issues or situations outside the working environment affected how nurses took care of patients.

Conclusion; Diabetic foot ulcer has been a burden globally; more research should be done pertaining to nurses' experiences in care of diabetic foot ulcer among the elderly. Furthermore, nurses should be provided with enough resources to help them improve their skills and competence in delivery of care among the elderly. Also, cooperation among the multiprofessional teams had a great positive impact and developed knowledge and experiences among health care professionals which improves quality of diabetic foot ulcer care.

Key words

Diabetes, nursing experiences, Diabetic foot ulcer, older persons, nurses **Miscellaneous**

None

Contents

1. Introduction	2
2. Background	3
2.1 Diabetes and pathophysiology	3
2.2 Diabetic foot ulcers	5
2.4 Older persons, diabetes, and diabetes foot ulcers	10
2.5 Nursing and diabetes	12
Aims, purpose and research question	13
3. Methods	13
3.1 Literature Review	13
3.2 Data search	15
3.4 Data selection and appraisal	16
3.5 Data analysis	18
4. Results	19
4.1 Skills and Competences	20
4.2 Multiprofessional teams	21
4.3 External factors	22
5. Discussion	24
6. Ethics	26
7. Conclusion	27
References	28
Appendices	39
Appendix 1. Selected articles for the literature review	39

Figures

Figure 1 Wagner Classification of DFU from grade 0 to 5 (Xs, 2018)	9
Figure 2. PRISMA Chart	18

Tables

Table 1. Wagner Classification system (Wang et al, 2022)	8
Table 2 . Inclusion and exclusion criteria	14
Table 3 . PICO's Table	15
Table 4. Key search terms	16
Table 5. Outcome of analysis	19

1. Introduction

Globally, Non-Communicable Diseases (NCDs) have been a great health burden attributed to high mortality rates accounting for 74 percent of deaths yearly and contributing to 80 percent of premature deaths (Bai et al., 2023; World Health Organization (WHO),2023). Before the age of 70, 17 million people globally die of NCDs, (WHO, 2023). In the European union, 90 percent of the deaths are attributed to NCDs, and it is one of the major economic burdens and social implications (Vandenberghe & Albrecht, 2020). According to WHO, Diabetes is the most prevalent NCD in the 21st century increasing the death rates and disability. Approximately 422 million people have diabetes, and 1.5 million deaths are recorded annually due to diabetes. The European region is estimated to have over 60 million people living with diabetes over 25 (WHO, 2023). In 2019, the global data showed that 488 million people between the age of 20 and 99 years lived with diabetes with half of the population unaware of having the condition (Sinclair et al., 2020).

The adult populations data between 40 and 59 years with diabetes has risen to 422 million in 2014 from 108 million in 1980. It is approximated that 77 percent of the population with diabetes live in poorly- developed and developing countries with growth and aging attributed to increasing incidence. Also, the global obesity epidemic and high body mass index has been a great contribution (Standl et al., 2019). According to Ong et al., (2023), increasing occurrence of diabetes is linked to high BMI, low physical activity levels, social and economic challenges affecting health. Research has shown significant improvement in diabetes management by lifestyle intervention of following healthy eating habits, reducing alcohol consumption and smoking, with the combination of pharmacological intervention. (Khaltaev & Axelrod, 2021; International Diabetes Federation (IDF), 2023).

The International Diabetes Federation considers aging as one of the factors increasing susceptibility to diabetes and cardiovascular complications causing death (Chami & Khaled, 2022). The ageing population is increasing, and it is estimated to rise from 12 percent to 22 percent between the years 2015 and 2050, proving a need for extensive research in the management of the elderly population (WHO, 2022; Hambleton et al., 2023). Further, the increment of non-communicable diseases at a global scale (WHO,2023) and diabetes being among the NCDs that cause both decreased quality of life and elevated rates of mortality (WHO,2023; Centers for

Disease Control and Prevention (CDC),2015). There is enough evidence to show why nurses should have interest in diabetes related complications among them being diabetic foot ulcer (DFU). Hence, this literature review aims to establish the experiences of nurses in managing diabetic foot ulcers.

2. Background

2.1 Diabetes and pathophysiology

The word diabetes originated from the Greek word `diabainen´ which means to go through meaning excessive passage of urine from the kidneys (Zaccardi et al., 2016). Diabetes is a metabolic condition that is defined by a series of symptoms from insulin abnormalities. This causes an alteration of breakdown of fat, protein, and carbohydrate because of lack of production of insulin and abnormality in how insulin works or both situations. As a result, it raises the blood glucose levels, hyperglycaemia which alters the normal physiological function of the body (Banday et al., 2020).

The presentation of diabetic symptoms progresses gradually and can result in adverse complications. The symptoms can manifest as thirst, weight loss, polyuria, blurred vision and in adverse cases it can result to ketoacidosis, a phenomenon where the liver metabolizes the fat and hence releases ketones which build up in the body and become harmful and can lead to death, (Petersmann et al., 2019). If diabetes is left untreated or is poorly managed, it results in different complications because hyperglycaemia alters the micro and macro vasculature functions of the body organs hence affecting the kidneys and can result in nephropathy, a complication leading to renal failure. Retinopathy can also occur due to damage of the retina of the eyes and can lead to visual impairment. Autonomic or peripheral nerve damage, neuropathy can occur, which can result in foot ulcers. DFU have been a major cause of amputations among adults. There is also an increased risk of developing cardiovascular related conditions (Banday et al., 2020).

Diabetes can be classified in various categories, type one diabetes, type two diabetes, gestational diabetes, or diabetes as complication of chronic or existing disorders. The main cause of type one diabetes is unknown, but it can be associated with genetic make-up or environmental factors that may trigger an autoimmune reaction in the body that can result in diabetes type one (Anderson-Lister & Treharne, 2014). It has juvenile onset, and it is insulin dependent, and it constitutes five to

ten percent of the diabetes cases. These patients remain dependent on insulin throughout life. It can develop later in life and is considered latent autoimmune disorder among adults (LADA) and there is a rare form of diabetes associated commonly with genetics called maturity onset diabetes of the young (MODY). The beta cells responsible for insulin production are dead and can result in diabetic ketoacidosis, which is a chronic complication leading to death, (Banday et al., 2020).

Type two diabetes is the most prevalent and constitutes 90 to 95 percent of the diabetic states. It develops in the adult stages, and it is non-insulin dependent. It can manifest in two ways: either as insulin resistance, or as a reduction in the sensitivity of peripheral tissues to insulin, which prevents the body's cells from responding to it. This results in dysfunction of the beta cells because it cannot compensate for the increasing resistance and eventually there is lack of insulin leading to hyperglycaemia (Banday et al.,2020). It is associated with unhealthy lifestyle patterns and its modification improves the outcome of the management. Obesity and poor lifestyle choices pre-dispose one to this form of diabetes (Capriotti, 2017). Treatment for this kind of diabetes involves changing lifestyle habits, such as maintaining a balanced diet, exercising, and cutting back on alcohol and tobacco use. Medications are also important to reduce the severity of symptoms and prevent complications (Petersmann et al., 2019; IDF, 2023).

Elevated blood sugar levels are a hallmark of gestational diabetes mellitus (GDM), which develops during pregnancy, typically in the second and third trimesters. It predisposes the baby and the mother to health complications of developing pre-eclampsia, or elevated blood pressure levels, experiencing obstructed labour and high birth weight among children. This condition arises from the placenta's production of distinct hormones during pregnancy, which modify the body's response to insulin and result in elevated insulin resistance (McIntyre et al., 2019). Women above the age of 45, who are overweight and with polycystic ovarian syndrome (PCOS) are at more substantial risk of developing the GDM. Even though GDM recovery is possible after pregnancy, these women are more likely to get this kind of diabetes in the coming years. (IDF, 2023).

The diagnosis of diabetes is critical, one elevated value cannot be a determinant of the condition. Laboratory measurement of venous blood plasma and HbA1C are used in diagnosis of diabetes (Chentli et al., 2015). According to WHO and IDF recommendations, the occasional plasma glucose, oral glucose tolerance test and fasting plasma glucose (OGTT) should be checked before a

conclusion is reached. Also, it is important to confirm the impaired fasting glucose (IFG) and impaired glucose tolerance (IGT) during the OGTT test. The clinical symptoms of urine output, thirst, weight loss, drowsiness should inform the decision and prompt tests for appropriate diagnosis (Magliano & Boyko, 2022).

The treatment and prevention of diabetes are aimed at the causative factors from physical, environmental, social, and economic interventions. It is important to handle the modifiable risk factors by engaging in physical activity, stopping alcohol consumption, and smoking and aiming at maintaining nutritional supplements adequately. Involvement of the multidisciplinary team for holistic care (Krasto et al., 2021). Pharmacological intervention is also an important management strategy for diabetes. This involves measuring of blood glucose, calculating the insulin required and administering metformin and prescribed drugs. Also, the patients need to count their carbohydrate intake. Drugs that improve or reduce glucose reabsorption can be administered to improve the general outlook of the condition (Hurst et al., 2020).

The complications of diabetes can result to death and disability. For this reason, early detection and screening is a beneficial factor in reducing the risk of diabetic complications. Patients with elevated risk of diabetes, family history or depicting warning signs like obesity is screened. Also, opportunistic screening is done for prediabetes and undiagnosed diabetes combining this with education and lifestyle modification to reduce the risk of diabetes (Chawla et al., 2020). In Finland, the use of antidepressants is common due to mental health issues because of diabetes. (Harding et al., 2019)

2.2 Diabetic foot ulcers

Diabetic foot syndrome is a common complication of diabetes and often a state that leads to leg amputation in most cases. DFU is also characterized by different foot ulcers symptoms associated with infection and arterial diseases of the periphery (Papatheodorou et al., 2018). Diabetic foot is a severe and chronic complication that results due to neurological disorders and peripheral vascular disease which leads to the formation of lesions in deep tissues. Foot ulceration in diabetic patients is the most common complication which leads to amputation of limbs and the ulceration can recur after treatment (Edmonds et al., 2021). DFU can be managed in diverse ways, and this can lessen the burden of disabilities and the global healthcare system. Identification of risk factors

is among the prevention strategies that help administer adequate care and prevent complications. (Al-Rubeaan et al., 2015).

The global estimation depicts likelihood of developing diabetic foot ulcers increases in 15 to 25 percent of those with diabetes. The African continent have an approximate of 10 to 30 percent prevalence rate of DFU. In the United States, the rate of occurrence of DFU is estimated to be 8 percent in 2013 and 52 percent in 2018. European countries, the percentages of occurrence ranges from 1 percent to 42 percent. There has been an increase of 15.9 percent from 1990 to 2016 with an average of 1.8 percent of the global population, 131 million people in 2016 with diabetic foot complications (Lo et al.,2021; IDF, 2022). DFU is a global health burden that affects the patient's overall quality of life, destabilizing the physical, emotional, and psychological state. It affects the prognosis and high society burden because of the disability costs and care (Yazdanpanah et al., 2018).

Diabetic foot ulcer remains a major challenge as it results in most non-traumatic limb amputations leading to disabilities which poses a challenge to the social, physical, and economic state. Amputations can inhibit the patients from performing the Activities of Daily Living, (ADLs). This change can cause psychological distress among the patients and the close relatives because of the responsibility to care for and aid ADLs (Iseli et al., 2021; Polikandroiti et al., 2020). These patients have a higher risk of developing anxiety, fear, and depression due to the limitations caused by DFU, and this affects general recovery of the patient (Polikandrioti et al., 2020).

The health costs of DFU management due the hospital admissions, pharmacological interventions, amputations, and post operative management are high. The global data shows that the chances of recurrence of DFU is 50 percent, with 33 percent of the expenditure linked to the management of DFU. These costs are due to an extensive team providing foot care, antibiotic therapy, and hospital admissions (Jodheea-Jutton et al., 2022)

2.3 Diabetic foot ulcer aetiology and staging

Diabetic foot ulcer (DFU) is an outcome of poorly managed diabetes, whose complication may lead to either minor (amputations below the ankle) or severe (amputations above the ankle). (Boulton

et al., 2018). DFU involves the damage of the epidermis and dermis layers of the skin. A minor ulcer, breach of the skin, blisters, callous, or erythema among the diabetic patients can progress to ulceration (McDermott et al., 2023). Peripheral artery disease, neuropathy, and nerve loss are frequently associated with ulceration and infection. This may result in adverse skin damage hence destroying the layers of skin and eventually forming full thickness lesions. The patients hence present with typical symptoms of tingling, loss of sensation and alteration of the motor function which can affect the general gait and movement. Further, imbalance and poor motor function resulting from an altered motor, sensory functions and gait increases the risk of injuries such as falls, and can also result in amputations (Wang et al., 2022).

According to McDermott et al., (2023), there are physical factors that can escalate the ulceration like choice of shoes which causes more pressure, poor or abnormal gait, and decreased sensation can result in adverse friction because the patient may not feel the pressure, injury or pain that informs action. Also, the causes of DFU can be ischemic, neuropathic or both symptoms can occur concurrently. Ischemic symptoms are because of peripheral arterial diseases which narrow the peripheral blood vessels. Neuropathic symptoms can be sensory, absence of pain, proprioception, and temperature sensation leading to gait abnormalities. Motor symptoms cause muscle atrophy leading to deformity and weakness. Autonomic symptoms damage the parasympathetic nerve supply and predispose the skin to dryness which hence vasoconstriction which causes swelling and poor healing (Noor et al., 2015).

There are different classification systems of diabetic foot ulcer and various classification and staging tools. These include Wagner classification tool (a six-grade system that measures the depth of the ulcer and the tissue necrosis), university of Texas classification system (uses a four-matrix classification and focuses on ulcer depth, ischemia, and infection) SAD system (size (depth, area), sepsis, denervation and arteriopathy classification) and the WIFI system (wound, ischemia, and foot infection system) and the SINBAD system (site, ischemia, neuropathy, bacterial infection, area, and depth). These tools have certain commonalities and discrepancies. For example, all the systems measure the depth of the ulcer and the rate of infection while some measure nerve effects and arterial effects (Wang et al., 2022). According to research done to compare different scoring systems, there is great connection of the Meggit Wagner system with the outcome while

SINBAD and SAD system shows a great correlation with the infection and shows the difference between soft and bone infection (Game, 2016).

However, the Wagner foot ulcer classification system is widely used since it contains more comprehensively important aspects in staging and classifying diabetic foot ulcer. Foot ulcer classification using this tool is given a numerical scale from zero to five. At stage zero, there is no open lesion, only existing pre-ulcerative symptoms. The first grade shows partial ulcer, second grade shows invasion of the tendon, bone, and the capsule. Stage 3 depicts joint sepsis, osteomyelitis, and presence of abscess. The fourth grade, there is presence of gangrene, tissue death but it is localized while the fifth grade depicts global foot gangrene (Wang et al., 2022).

Table I and Figure 1 below is a summary of the Wagner classification system.

Table 1. Wagner Classification system (Wang et al, 2022)

Grade	Ulcer Depth
0	Pre ulcerative area without an open lesion, there is no open wound. Cellulitis and deformity can be present.
I	Superficial ulcer, partial or full thickness. Total skin destruction is present.
II	Ulcer creep to the tendon, bone, and capsule, it penetrates the skin and there is infection
III	Stage two with abscess, osteomyelitis, or joint sepsis. Limited necrosis is present.
IV	Localized gangrene involves the part of the forefoot or the heel. There are also systemic effects.
V	Global foot gangrene, it is extensive and covers the entire

foot

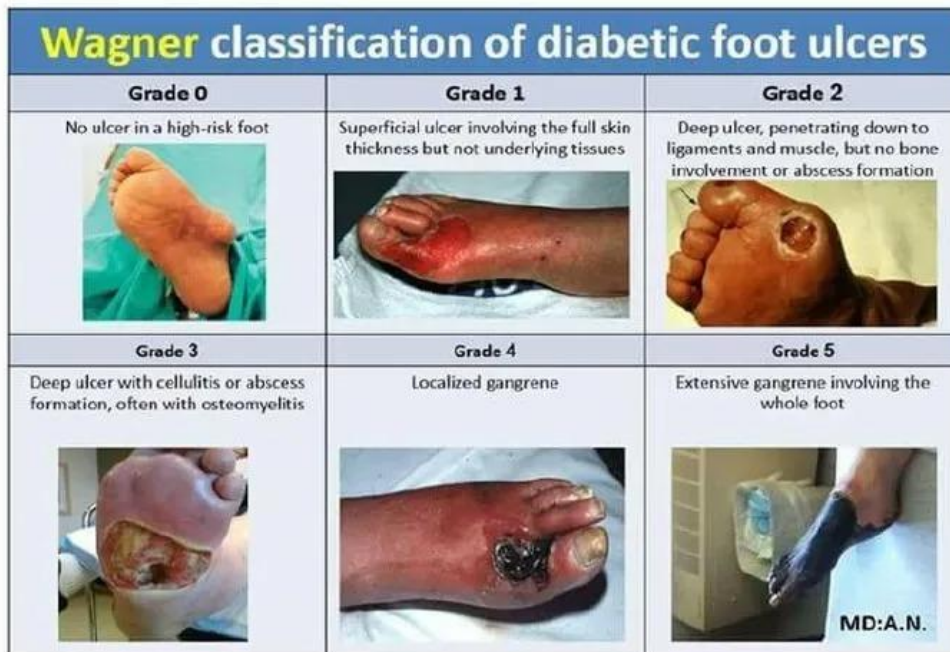


Figure 1 Wagner Classification of DFU from grade 0 to 5 (Xs, 2018)

DFU has grown to be a financial and worldwide health burden that lowers both the patients' and caregivers' quality of life. It also contributes to global disability burden (Edmonds et al., 2021). With the increasing costs of the management of diabetes, several interventions have been implemented to reduce the occurrence of diabetes and prevent the complications. Assessment of the risk factors has been key in recognizing the development of disease and complications from surgery. Also, the general wellbeing of the patient assists in healing and promotes the quality of life (Jeffcoate et al., 2018). Additional interventions include multiprotection collaboration for quality care including wound cleaning, surgery and general care and recovery. Also, postoperative care and therapy for appropriate footwear and walking aids (Wang et al., 2022).

2.4 Older persons, diabetes, and diabetes foot ulcers

According to International Diabetes Federation (IDF), older persons are people above the age of 70 (Dunning & Sinclair, 2014), while according to WHO (2015), they are above 60 years and American Diabetes Association, (2018) defines them as above 65 years. Aging has been defined as a physiological process that leads to a decline in beta cell function and regeneration resulting to deterioration of molecular and cellular functionality of an individual (Lee & Halter, 2017). As a result of aging, the person becomes susceptible to diseases and infections which eventually lead to death. Healthy ageing is the ability to sustain health-related characteristics to promote general well-being in elder age (WHO, 2015)

Diabetes is a heavy burden in the world affecting both the developed and developing countries economically (Chentli et al., 2015). In the US, more than a quarter of older adults suffer from diabetes (Mayeda et al., 2015) while in Europe the rate is lower though there are differences among the countries (Sesti et al., 2018). Finland has average incidence level of type 2 diabetes, but highest prevalence of type 1 diabetes as compared to other European countries. The precise number of individuals with type 2 diabetes is unknown because some control it with diet and exercise. However, as the population ages, it is anticipated that the number of diabetics would rise. (Terveyden ja hyvinvoinnin laitos (THL), 2023)

Older people with type 2 diabetes and comorbidities have a higher mortality rate as compared to those without comorbidities. However, those with comorbidities have regular visits to their healthcare provider which tends to reduce the mortality rate (Mellanen et al., 2023). Glycaemic control and the duration of diabetes affects the risk of mortality. Older adults with shorter duration of diabetes, less than 5 years, have a higher mortality risk with poor glycaemic control. On the other hand, those with long duration of diabetes, over 5 years, have a lower mortality risk associated with glycaemic control (Ghouse et al., 2020). Diabetes in older people is often undiagnosed because it is asymptomatic, or symptoms are not specific (Chentli et al., 2015)

Older persons with diabetes have an increased chance of developing micro and macro vascular complications which increases their mortality rate (Mordarska & Godziejewska-Zawada, 2017). Lower Extremity Amputations (LEA) is a microvascular complication due to diabetes and it poses a huge physical, economical, and psychological burden. However, it is also a preventive measure in

people with elevated risk of foot complications. In Finland, the incidence of major lower extremity amputation is 6 per 100, 000 people with diabetes (Harding et al., 2019). Geriatric conditions, such as impaired cognition and depression, are more common in the elderly than diabetic complications, decreasing the overall quality of life (Karter et al., 2015).

Older people with diabetes are among the vulnerable population in society due to low physical functioning. This leads to dependency on family support in performing activities of daily living. Furthermore, they depend on family for financial, information and psychological support. However, good family support improves the older persons level of self- management (Kristianingrum et al., 2018). Moreover, diabetes reduces the quality of life of older people since it is associated with higher risk of disability. Older women have a higher life expectancy than older male, however, women live a larger number of years of their life with functional disability. (Huo et al., 2016)

Older people with diabetes have a higher risk of cognitive development, such as dementia, which hinders self-management. Moreover, conditions such as cataracts and osteoarticular issues associated with aging can increase the risk of diabetic complications (Kalra & Sharma, 2018; Caetano Lima et al., 2023). The deterioration of health among the elderly increases the risk of DFU and reduces the rate of the healing process. For this reason, psychoeducational management is important among patients and their families (Chen et al., 2020). Diabetic foot ulcer is among the major complications and requires a multidisciplinary approach of treatment. Maintenance of mobility before and after treatment is a good indicator of success and improves the elderly's quality of life (Hartmann et al., 2017)

Other than reducing life span, diabetic foot ulcer among the elderly increases the risk of amputation, disabilities, physiological and psychological problems (Ahmad Sharoni et al., 2017). Dry skin, damage between toes and calluses lead to impaired blood flow to the feet which increases the chances of diabetic foot ulcer. (Caetano Lima et al., 2023). Considering this, elderly people with diabetes are advised and educated on diabetic foot ulcer risks and self-care practices.

2.5 Nursing and diabetes

The multidisciplinary approach in managing diabetes has shown significant improvement in patients' quality of life. The approach involves different professionals such as nurses, physicians, nutritionists, and podiatrists (Alshammari et al., 2021). Nurses play a significant role in the prevention and screening process, management, and treatment of complications. Nursing care includes raising awareness and providing education to the community in adopting a healthy lifestyle in terms of diet and physical activity (O'Flynn, 2022). Furthermore, the primary role of nurse in wound management requires extensive knowledge which needs a positive attitude from the nurses to provide the best care and adequate equipment. Also, the utilization of the current evidence-based materials on treatment of diabetic foot ulcer (Kumarasinghe et al., 2018).

There are general roles nurses are involved in managing diabetes. The roles include educating the patients about foot ulcers and proper footwear, therapeutic shoes and the effect on the plantar pressure, to avoid foot ulcers. Also, advising the clients to visit for regular check-ups where the condition of the foot is inspected and risk factors are assessed (Kaya et al., 2018; Lumbers, 2021). The nurses also assist the patient in promoting physical activities depending on their ability to improve the overall quality of life (Munshi et al., 2016). There are also special nurses who have specialized in the DFU management and are involved in administration of DFU care steps and assessments (Aalaa et al., 2017).

Although different professionals are involved in the formulation of self-education package in self-care management of patients, nurses are positioned exclusively to be present throughout the process (Azami et al., 2018). The nurses are involved in the comprehensive assessment in the primary health care clinics and assist the patients in adopting a healthy lifestyle through consistent follow ups. Moreover, they offer education and support during lifestyle transitioning, pharmacological aspect, and prevention of complications (Awang Ahmad et al., 2020). Nurse-led programs have also been adopted to help patients provide emotional and psychological support during lifestyle transition (Malcolm et al., 2015).

Due to the prevalence rate of diabetes, adoption of telemedicine, telehealth and use of technology has been adopted in the management of diabetes. The aim is to aid the patients during self-care and in lifestyle modification. Also, DFU has been managed commonly using telemedicine

and mobile application (Foong et al., 2020). The technology adoption in healthcare is a demonstration of utilization of evidence-based practice in nursing and has helped nurses make decisions and support patients virtually, which has reduced complexity of care (Colodetti et al., 2020).

Due to the central roles that nurses play in care of diabetic patients that may include, health promotion (O'Flynn,2022; Munshi et al., 2016), active nursing care (Kaya et al., 2018; Lumbers, 2021) counselling (Azami et al., 2018) and patient education (O'Flynn,2022). It is prudent to establish the experiences that nurses go through while caring for older diabetic patients with foot ulcers.

Aims, purpose and research question

This literature review's aim was to establish the experiences of nurses in the care of diabetic foot ulcer among older patients. The research's purpose is to assess ways in which nurses could provide better-quality care for older patients with diabetic foot ulcers. This literature review answered the research question; what are the experiences of nurses in caring for older patients with diabetic foot ulcer?

3. Methods

3.1 Literature Review

This research employs literature review methodology. Literature review is a method where the researcher reads and evaluates existing research by gathering a wide range of information to answer a research question (Wee& Banister, 2016; Snyder, 2019). The key role of the literature review is to give an opportunity to review existing literature with a similarity to the phenomenon of interest. Hence, this may allow a researcher's assessment and analyses of various literature towards producing new insights concerning a specific phenomenon. Therefore, it provides comprehensive answers to distinct research questions of a topic. (Torraco, 2016)

According to Aveyard & Bradbury-Jones (2019), the use of literature review method has been increasing and a similar range of terms have been used to describe it. The effectiveness in health care interventions has been remarkable. The research also identified similarities between different ways in which literature review is done and consistency in comprehensive search, critical appraisal, and analysis in most publications is recognized.

The process of searching, critiquing, synthesizing, and writing enables the utilization of previous extensive research. The literature review approach permits wide evaluation and use of quality publications and makes it more suitable to answer research questions.

This literature review followed the three steps of doing a literature review as elaborated by Marshall, (2010). The steps start with searching, critiquing and finally synthesizing and writing. The search process involved defining the inclusion and exclusion criteria, determining the key search terms, selecting the electronic databases, and conducting the search and article selection. Critiquing involved evaluating the evidential quality of the selected papers using the critical appraisal tools. The last step of synthesizing and writing involved objective data analysis and conclusions.

The table below summarizes the steps of a literature review as elaborated by Marshall 2010,

Table 2. Inclusion and exclusion criteria

Stage	Tasks
Searching	Explaining the inclusion and exclusion criteria Formulation of the key search terms Choosing the electronic databases Search and article selection process

Critiquing	Using the critical appraisal to check the quality of the articles selected for literature review.
Synthesizing and writing	Objective data analysis Presentations of results and conclusions of the review.

3.2 Data search

The data used was retrieved from two scientific databases, CINAHL, and Medline. The search was performed following a preformulated PICO against inclusion and exclusion criteria. This literature review included P- Population: nurses I- Interest: experiences of diabetic foot ulcer care Co-Context: older patients S- studies: peer reviewed, published in English between 2014-2024, abstract available, full text, free for Jamk students and articles that answered the research question. All the studies that did not meet the criteria were excluded.

The table below shows PICOS against inclusion and exclusion criteria,

Table 3. PICOs Table

PICOs		Inclusion	Exclusion
P- Population	Nurses	This study only includes nurses who are licensed to practice nursing.	All other healthcare professionals and unregistered nurses will not be considered
I – Interest	Experiences of diabetic foot ulcer care	Only nurses' experiences of diabetic foot ulcer care will be considered	All other experiences that are not diabetic foot ulcer care will be excluded
Co - Context	Older patients	Only contexts with older patients will be considered for inclusion	All other contexts that older patients will be excluded

S – studies	Peer reviewed, published between 2014-2024, English language, abstract available, full text, free for Jamk students	This review will consider only studies that are Peer reviewed, published between 2014- 2024, English language, abstract available, full text, free for Jamk students.	All other studies not meeting the inclusion criteria will not be considered
--------------------	---------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------

Key search words

The key search terms used in the data search were formed based on the PICO's table. The search terms were nurses AND experiences, perceptions, attitudes OR views AND diabetic foot ulcers AND older patients OR older adults OR geriatric OR elderly.

Table 4. Key search terms

Nurses OR nursing OR nurse or nurses' or nurses'
AND experiences, perceptions, attitudes, OR views
AND diabetic foot ulcer care
AND older patients OR older adults OR geriatric OR elderly

3.4 Data selection and appraisal

Data selection and screening were done by the authors independently using the inclusion criteria and later did the final selection together. This was essential in ensuring time management and

achieving our goal and purpose in securing quality papers. A total of N= 405 papers were retrieved from two databases, (CINAHL, n = 178 and PubMed, n = 227). The first step of article selection involved removal of the duplicates where both authors participated. Among the records screened, 136 duplicates were found and automatically eliminated. The next screening step involved article selection based on the title and abstract reading, where n 180 articles were eliminated because they did not answer the research question. The remaining 89 articles were then analysed by the authors individually and finally came together for the final decision. The 51 articles which were not answering the research question were then eliminated. The remaining 38 articles were then evaluated if eligible for the review, and 30 articles were eliminated due to wrong population and wrong outcome. N = 8 articles were selected for the data analysis. The PRISMA flow chart below, figure 3, represents the steps involved in data screening and selection.

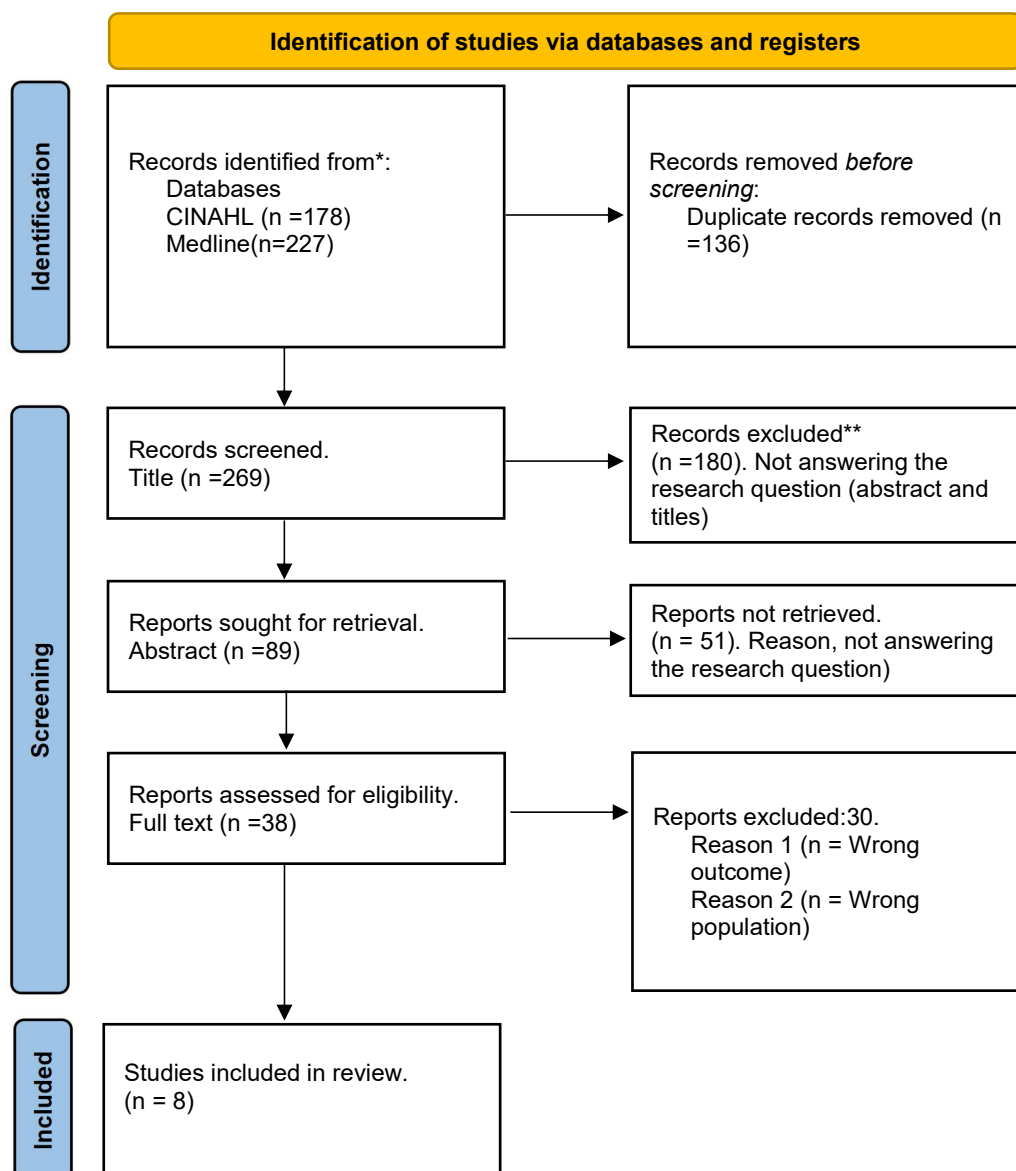


Figure 2. PRISMA Chart

The critical appraisal tool by Hawker et al., (2012), was used to evaluate the quality of the 8 articles selected for the review. The elements considered in the Hawker tool include the abstract and title, introduction and aims, method and data, sampling, data analysis, ethics and bias, results, transferability or generalizability and implications and usefulness. The tool scores the papers as good (4), fair (3), poor (2), and low score (poor quality) The maximum score for a quality approved article is 36. The articles n= 8 selected were of good quality with a maximum core of 32 and a minimum of 28 and therefore appropriate for the data analysis. (See Appendix 1)

3.5 Data analysis

Content analysis is a method used in research for analysing data and interpreting the contents and it involves three main phases, preparation, organization and reporting of results (Elo et al., 2014). The preparation stage involves gathering, interpretation and decision of the appropriate for content analysis. Open coding, forming categories and abstraction are the elements of second phase. Results are then described using the analysis units in the reporting stage (Elo et al., 2014; Elo & Kyngäs, 2008).

This literature review adopted three step processes of data analysis, preparation, organization, and reporting as explained by Kyngäs (2020). The basic way of data abstraction involves data reduction, data grouping and formation of concepts. The process involved reading, organizing, integration, and forming categories, and themes through analysing the similarities and differences of the coded data. The significance of this process to form an abstract summary of the main themes, concepts, and categories, and give the correlations to provide the final topics or subtopics which answers the research question (Kyngäs, 2020)

Content analysis aims at providing the theoretical basis and understanding of the exact described data. The researcher can understand the general concept from the data and gain new insights (Graneheim et al., 2017; Kyngäs, 2020). The analysis process involved categorization of data into

62 meaning units and 35 open codes. During the phase of abstraction and interpretation, 7 subcategories and 3 main categories were obtained as shown in table 5.

4. Results

The n=8 analysed papers were published between the years 2016 and 2023, (2016), (2017) (2018), (2018), (2022), (2020) (2018), (2023). The following countries, China, Iran, Denmark, United Kingdom, Turkey, United States, Sri Lanka, and Norway conducted the studies. Four studies used the qualitative method, two used cross-sectional descriptive study, one study used situational case study design and one study used inductive interpretive description approach.

From the analysis, three main categories were derived, and categories formed. Skills and competences was selected as among the categories, and it elaborated the views of nurses on knowledge and awareness, work attitude and experiences while managing older persons. The second category was multiprofessional team which represented the different roles of multiprofessional team and holistic care in older persons. External factors were the third main category which shows different factors that affect nurses in their workplace and the way perceptions of older patients affect the delivery of care. Table 5 below represents the outcome analysis.

Table 5. Outcome of analysis

Main Categories	Categories
Skills and competences	Knowledge and awareness
	Work attitude
	Work experience

Multiprofessional team	Holistic care
	Multidisciplinary roles
External factors	Personal factors
	Patients' factors

4.1 Skills and Competences

Knowledge and Awareness

The knowledge and awareness on the assessment and management of DFU among older patients was significant in providing quality care. (Kolltveit et al., 2016; Kaya & Karaca, 2018; Kumarasinghe et al., 2018; Wang et al., 2023; Bilal et al., 2018; Schaarup et al., 2017; Malakai & Mohammadnezhad, 2022; Nayeri et al., 2020). Limitations in knowledge and awareness resulted in challenges in handling patients and providing the proper guidance on treatment (Wang et al., 2023; Malakai & Mohammadnezhad, 2022; Kaya & Karaca, 2018). The nurse's knowledge was dependent on the level of hospitals they work in, the exposure to different trainings on DFU care (Wang et al., 2023), peer sharing of knowledge (Kolltveit et al., 2016) and work experience (Kumarasinghe et al., 2018). The gaps in the scientific knowledge limited education and awareness provided to elderly DFU patients about foot care and examination (Kaya & Karaca, 2018). This was contributed by lack of opportunities inadequate time and resources which leads to workload (Nayeri et al., 2020), and lack of opportunities for training and learning (Malakai & Mohammadnezhad, 2022). Provision of appropriate equipment for screening and support from colleagues made delivery of care easy and promoted confidence among the nurses (Kolltveit et al., 2016).

Work attitude

Nurses attitude towards work was affected by age (Bilala et al., 2018; Kumarasinghe et al., 2018), environmental factors such as home conditions (Malakai & Mohammadnezhad, 2022), knowledge

and work experience (Schaarup et al., 2017; Bilala et al., 2018; Wang et al., 2018). According to Bilala et al., (2018) nurses' attitude was positive where highest priority was given to foot ulcer care followed by patient education and ulcer prevention. It was also found that lack of enough knowledge on foot care demotivated the nurses in doing their work (Malakai & Mohammadnezhad, 2022). Nurses with enough knowledge and work experience portrayed positive work attitude (Wang et al., 2023). Bilal et al., (2018), Kumarasinghe et al., (2018) & Wang et al., (2023) reported no significant effect of gender and work experience on nurses' work attitude. However, these three studies observed that nurses with ages less than 40 years had positive attitude compared to older nurses. On the other hand, patients' attitude and beliefs was a factor which affected their healing outcomes either positively or negatively (Nayeri et al., 2020).

Work experience

Nurses' work experience was related to their skills since nurses with many years of experience had higher skills and provided better care compared to their counterparts. (Kaya & Karaca, 2018; Kumarasinghe et al., 2018; Nayeri et al., 2020; Bilal et al., 2018; Kolltveit et al., 2016). Patients trusted and had confidence in nurses with more experiences (Nayeri et al., 2020). Additionally, nurses who worked in the in-patient department were more skilled compared to those who worked in outpatient department due to more encounters with wound care (Kumarasinghe et al., 2018). Nurses were also concerned that they lacked opportunities to attend diabetic foot workshops (Malakai & Mohammadnezhad, 2022) current experience and that gained at vocational institutes was insufficient (Kaya & Karaca, 2018). Kumarasinghe et al., (2018) reported that nurses gained their experience through their daily work, and this enabled them to identify healing wounds and use the correct dressing materials. Nurses encountered patients with hope and those who had despaired on the healing of foot ulcer (Nayeri et al., 2020).

4.2 Multiprofessional teams

Holistic Care

The nurses recognized the importance of focusing on various aspects of care in the management of DFU older patients other than what brought them to the hospital (Nayeri et al., 2020; Malakai & Mohammadnezhad, 2022; Kaya & Karaca, 2018), and this was dependent on their level of

knowledge and skills (Nayeri et al., 2020). According to Nayeri et al., (2020), there was a need for nurses to adopt their knowledge in focusing on various aspects of health of the DFU older patients, taking full responsibility despite the involvement of the multidisciplinary team in delivering care. Holistic care was crucial in identifying the risk factors, the complications and exacerbating factors like footwear and glycaemic control, which improved health outcomes (Kaya & Karaca, 2018). The role of nurses in holistic care was challenged and influenced by their competences (Kaya & Karaca, 2018), workload, and inadequate time which limited their provision of extensive care (Nayeri et al., 2020).

Multidisciplinary roles

Nurses recognized that for effective and proper management of a diabetic patient, multidisciplinary team is important (Schaarup et al., 2017; Malakai & Mohammadnezhad, 2022; Nayeri et al., 2020; Kolltveit et al., 2016). Multidisciplinary care promoted healing process among patients, created hope and helped them recognize importance of selfcare, follow up treatment and prevention (Nayeri et al., 2020). Due to the improved healing process among patients, the nurse's self-confidence and independence were promoted (Nayeri et al., 2020). Multiprofessional team reduced the burden of work (Malakai & Mohammadnezhad., 2022) and the discussions with different experts improved the knowledge of the nurses (Schaarup et al., 2017). Multi professionalism diversified the delivery of care, incorporation of telemedicine promoted communication and discussions with the patients (Kolltveit et al., 2016). Lack of teamwork and collaboration, conflicts, and lack of nurse centered team care were among the challenges the nurses faced in implementing multidisciplinary roles (Nayeri et al., 2020).

4.3 External factors

Nurses' factors, Individual factors of the nurses.

The quality of care offered by nurses was affected by personal factors such as what happened at home or outside hospital. Nurses tend to project their bad mood or negative attitude towards their diabetic patients. Additionally, in situations where the patient was nurses' relative, they favoured them and offered them quick care compared to other patients (Malakai & Mohammadnezhad, 2022). Furthermore, during some day's nurses had other priorities or

commitments aside from work which made them not concentrate on the care they offered on the day (Malakai & Mohammadnezhad, 2022). Older patients who did not comply to regular check-up visits discouraged the nurses thus affected their mood which eventually led to poor diabetic foot ulcer management (Wang et al., 2023; Malakai & Mohammadnezhad, 2022). According to Kumarasinghe et al., (2018), pain experienced by diabetic patients during cleaning and management of foot ulcer did not matter to nurses.

Patients' factors

Patients' attitudes or beliefs affected the care provided to them by nurses (Nayeri et al., 2020; Malakai & Mohammadnezhad, 2022; Wang et al., 2023). Malakai & Mohannadnezhad, (2022) established that older patients did not adhere to their diabetic foot clinic visits hence worsening their situation therefore this affected the nurse's mood and attitude. Additionally, older patients were not co-operative or were too ill making the assessment of diabetic foot ulcer difficult for nurses (Wang et al., 2023). Apart from this, patients stuck to their own beliefs, customs, culture, and religion regardless of whether it impacted their treatment positively or negatively (Nayeri et al., 2020). Older patients who had diabetes for many years had lost hope and despaired hence expressed their feelings that one was better off with cancer than diabetes (Nayeri et al., 2020).

5. Discussion

This literature review was conducted to establish the experiences of nurses in the management of DFU among the elder population. The results established that nurses experienced positive outcomes and face different challenges in delivery of care. Workplace environment, personal factors and patients' factors influenced their attitude towards work and impacted their outcomes.

This review established that self-care among the elderly in the management of DFU results to improved health outcomes and promoted confidence among nurses (Wang et al., 2023). A study conducted to identify the selfcare deficits among the elderly revealed that more education and support is needed from the health care professionals in ensuring selfcare and reduce the burden of amputation and disability (Sharoni et al., 2017). Another study done using the Orem's self-care nursing theory among the elderly revealed that adoption of the selfcare theory in nursing practice assisted nurses in decision making as it provided contributing factors that promote and limit self-care in DFU management (Lama et al., 2023; Fereidooni et al., 2024). So as established in this literature review, patient education, and support towards selfcare is an important determinant on how patients participate in their own care. Even previous research investigating selfcare in long-term conditions such as Hypertension, Stroke and Cancer (Lee et al., 2018; Park & Kim, 2019; Sangsaikaew et al., 2021) have shown positive outcomes in disease management and aversion of adverse outcomes.

The results showed that the response of patients in the treatment impacted the motivation of nurses in providing care with a positive attitude. Also, the consistency of patients in abiding to care instructions promoted healing, hence the nurses were encouraged and determined to ensure positive outcomes (Wang et al., 2023). This was consistent with Zhu et al., (2023), where self-care behaviours, a crucial tool in care of DFU was depended on their cognitive and emotional factors of

the patients which led to poor illness perceptions, which eventually demotivated nurses. Another research suggested that lack of knowledge, low level of commitment and communication among nurses in treatment influenced the negative compliance of the patients in executing their self-care roles (Coffey et al., 2019)

This research found out that nurses experienced improvement in skills and competence with the use of technology. Moreover, technology led to ease in collaboration with other members of multiprofessional team since nurses could take the pictures of DFU which they could later discuss on the management (Kolltveit et al., 2016). Equivalent results were highlighted by Nayeri et al., (2020) where multiprofessional approach led to increase in competence and improvement of nurse- patient relationship. Additionally, corresponding results were found by Subrata & Phuphaibul (2019), where multiprofessional collaboration not only led to better outcomes but also prevented recurrence of DFU. Malakai & Mohammadnezhad (2022) appreciated the roles of different multidisciplinary members in provision of quality care in DFU. Nurses suggested that they would like to have nurses who specifically handled DFU to avoid disruptions in their clinic. Multiprofessional approach in other disciplines such as palliative care is of importance due to promotion of knowledge sharing among the team members all aimed at better outcomes of the patient (de Queiróz Borba et al., 2020)

Furthermore, nurses' attitude towards management of DFU was positive (Kumarasinghe et al., 2018). It was found out that nurses that younger nurses had a positive work attitude compared to older nurses (Bilala et al., 2018; Kumarasinghe et al., 2018; Wang et al., 2023). Bilal et al., (2018) further found out that nurses with more years of work experience portrayed a positive work attitude. However, contrasting results were found by Kumarasinghe et al., (2018) where nurses attitude had no relation with their work experience.

The adoption of technology in the healthcare system has been advancing especially due to the COVID-19 pandemic, and many companies have been developing telemedicine tools to assist in health management (Keegan et al., 2023). Telemedicine has also been used in the follow up care of DFU patients, which promoted quality care. There was also improvement in the wound assessment knowledge and skills among the healthcare professionals, and the communication among practitioners improved confidence levels (Kolltveit et al., 2016). The use telehealth and

telemedicine in DFU management has shown remarkable results in the monitoring and prevention of amputations among DFU patients, and despite the positive outcomes, more communication and collaboration are required from the health care professionals to ensure effectiveness and quality care (Yammine et al., 2022; Hazenberg et al., 2020).

6. Ethics

Ethical principles in nursing research were followed during writing of this literature review. It was conducted by two researchers under supervision of one supervisor (Doody & Noonan, 2016). The rights of other authors were respected during the research; hence, in-text citation and proper referencing was done to prevent plagiarism (Åstedt-Kurki & Kaunonen, 2018; Lipscomb, 2019). To ensure quality and reliable results, research papers were analysed using a quality appraisal tool and the papers with the highest scores were included in the study (Lipscomb, 2019). Additionally, an inclusion and exclusion criteria were used to select the articles (Garside, 2014).

The data was also analysed using the inductive content analysis approach (Graneheim et al., 2017) where data was categorized into meaning units and open codes to ensure order, which led to formation of main categories. (Lipscomb, 2019). To create transferability and dependability (Garside, 2014), the research papers used for this literature review were published in different countries using different research methods during the period of 2017 to 2023. However, this study had limitations since only peer-reviewed articles, written in English language and which were available for free for Jamk students were used. Therefore, this affected the generalizability of the results since it cannot be applicable in a wider context.

7. Conclusion

This literature review aimed to establish the experiences of nurses in the management of DFU among the elderly. It is evident that nurses play a critical role in the management of DFU among the elderly, and their experiences are dependent on diverse factors from environmental factors and personal factors which determine the behaviour and attitude towards the patients and the workplace environment. The elderly require specialised care because they belong to high-risk age group and are susceptible to infections and comorbidities which makes nurses to be equipped with knowledge.

There is a gap in knowledge among the nurses, more trainings and utilization of evidence-based nursing is needed among the nurses to ensure quality care among DFU patients and the elderly. More research is needed to identify the health care needs among the elderly and how to promote their general health and quality of life. DFU management requires knowledge and consistency of care to ensure healing, more useful tools could be established to aid in managing like use of technology. This will assist nurses and make work easier hence reducing the pressure and stress which influence reduce the workload and fatigue, also saves times, and eventually improving quality of care delivery.

Despite the crucial roles of nurses, quality care is achieved through multidisciplinary approach. The collaboration between different professions diversifies the care administered to the older persons. Health care organizations should aim at diversifying care and training health care professionals on significance of collaboration and support to improve delivery of care. The team needs to work together for better results and knowledge insights and experiences especially to the newly employed nurses, while recognizing the vulnerability of the elderly people.

Health care system should strive to strengthen the care of the elderly and invest in educating the nurses to promote their confidence in DFU management. Factors that promote the quality of care and improve the experiences of nurses should be investigated more for better decision making and policies to support the elderly with DFU.

References

Aalaa, M., Sanjari, M., Shahbazi, S., Shayeganmehr, Z., Abooeirad, M., Amini, M. R., ... & Mehrdad, N. (2017). Diabetic foot workshop: Improving technical and educational 3 skills for nurses. *Medical journal of the Islamic Republic of Iran*, 31, 8. <https://doi.org/10.18869%2Fmjiri.31.8>

Aghakhani, N., Baghaei, R., Sadeghi, R., Rahim, R. N., & Akbari, M. (2020). The effect of collaborative care model training on diabetic foot ulcer patients' quality of life: A semi-experimental study. *Journal of diabetes and metabolic disorders*, 19(2), 1557-1562. <https://doi.org/10.1007/s40200-020-00692-0>

Al-Rubeaan, K., Derwish, M. A., Ouizi, S., Youssef, A. M., Subhani, S. N., Ibrahim, H. M., & Alamri, B. N. (2015). Diabetic Foot Complications and Their Risk Factors from a Large Retrospective Cohort Study. *PLoS One*, 10(5) <https://doi.org/10.1371/journal.pone.0124446>

Alshammari, M., Windle, R., Bowskill, D., & Adams, G. (2021). The role of nurses in diabetes care: a qualitative study. *Open Journal of Nursing*, 11(8), 682-695. <https://doi.org/10.4236/ojn.2021.118058>

American Diabetes Association (2011). Diagnosis and classification of diabetes mellitus. *Diabetes care*, 34 Suppl 1(Suppl 1), S62–S69. <https://doi-org.ezproxy.jamk.fi:2443/10.2337/dc11-S062>

American Diabetes Association. "11. Older adults: standards of medical care in diabetes—2018." *Diabetes Care* 41.Supplement_1 (2018): S119-S125. [11. Older Adults: Standards of Medical Care in Diabetes—2018 \(silverchair.com\)](https://doi.org/10.2337/14S119)

Åstedt-Kurki, P., & Kaunonen, M. (2018). Ethics in nursing research and research publications. *Scandinavian journal of caring sciences*, 32(2), 449-450. <https://doi.org/10.1111/scs.12593>

Aveyard, H., & Bradbury-Jones, C. (2019). An analysis of current practices in undertaking literature reviews in nursing: findings from a focused mapping review and synthesis. *BMC medical research methodology*, 19(1), 1-9. <https://doi.org/10.1186/s12874-019-0751-7>

Awang Ahmad, N. A., Sallehuddin, M. A. A., Teo, Y. C., & Abdul Rahman, H. (2020). Self-Care Management of Patients with diabetes: nurses' perspectives. *Journal of Diabetes & Metabolic Disorders*, 19, 1537-1542. <https://diabetesjournals.org/care/article/43/7/1636/35565>

Azami, G., Soh, K. L., Sazlina, S. G., Salmiah, M. S., Aazami, S., Mozafari, M., & Taghinejad, H. (2018). Effect of a nurse-led diabetes self-management education program on glycosylated hemoglobin among adults with type 2 diabetes. *Journal of diabetes research*, 2018. <https://doi.org/10.1155/2018/4930157>

Bai, J., Cui, J., Shi, F., & Yu, C. (2023). Global Epidemiological Patterns in the Burden of Main Non-Communicable Diseases, 1990–2019: Relationships With Socio-Demographic Index. *International Journal of Public Health*, 68, 1605502. <https://doi.org/10.3389/ijph.2023.1605502>

Banday, M. Z., Sameer, A. S., & Nissar, S. (2020). Pathophysiology of diabetes: An overview. *Avicenna journal of medicine*, 10(04), 174-188. [Thieme E-Journals - Avicenna Journal of Medicine / Full Text \(thieme-connect.com\)](https://www.thieme-connect.com/FullText/10.1055/s-0010-1491100)

Bilal, M., Haseeb, A., Rehman, A., Hussham Arshad, M., Aslam, A., Godil, S., . . . Ahmad, H. (2018). Knowledge, Attitudes, and Practices Among Nurses in Pakistan Towards Diabetic Foot. *Curēus (Palo Alto, CA)*, 10(7), e3001. <https://doi.org/10.7759/cureus.3001>

Boulton, A. J., Armstrong, D. G., Kirsner, R. S., Attinger, C. E., Lavery, L. A., Lipsky, B. A., ... & Steinberg, J. S. (2018). Diagnosis and management of diabetic foot complications. <https://doi.org/10.2337/db20182-1>

Caetano Lima, P., Dias Bittencourt, G. K. G., Pereira Nogueira, W., Costa Dias, T. K., Soares Dantas, J., & Albernaz Pinheiro de Carvalho, M. (2023). Main Self-Care Deficits Found in Elderly People with Diabetic Foot Ulcer: An Integrative Review. *Aquichan*, 23(3). <https://doi.org/10.5294/aqui.2023.23.3.6>

Centers for Disease Control and Prevention (CDC), 2015. Indicator Definitions – Diabetes. [Indicator Definitions - Diabetes | CDI | DPH | CDC](https://www.cdc.gov/diabetes/data-research/indicator-definitions-diabetes.html)

Chami, M. A., & Khaled, M. B. (2022). Epidemiology, diagnosis, and assessment of diabetes mellitus in the elderly population: a purposive review. *The North African Journal of Food and Nutrition Research*, 6(13), 9-21. <https://doi.org/10.51745/najfnr.6.13.9-21>

Chawla, R., Madhu, S. V., Makkar, B. M., Ghosh, S., Saboo, B., Kalra, S., & RSSDI-ESI Consensus Group. (2020). RSSDI-ESI clinical practice recommendations for the management of type 2 diabetes mellitus 2020. *Indian journal of endocrinology and metabolism*, 24(1), 1.
https://doi.org/10.4103%2Fijem.IJEM_225_20

Chen, H., Cai, C., & Xie, J. (2020). The effect of an intensive patients' education program on anxiety, depression and patient global assessment in diabetic foot ulcer patients with Wagner grade 1/2: A randomized, controlled study. *Medicine*, 99(6).
<https://doi.org/10.1097%2FMD.00000000000018480>

Chentli, F., Azzoug, S., & Mahgoun, S. (2015). Diabetes mellitus in elderly. *Indian journal of endocrinology and metabolism*, 19(6), 744–752. <https://doi.org/10.4103/2230-8210.167553>

Colodetti, R., Prado, T. N. D., Bringuento, M. E. D. O., & Bicudo, S. D. S. (2021). Mobile application for the management of diabetic foot ulcers. *Acta Paulista de Enfermagem*, 34.
<https://doi.org/10.37689/acta-ape/2021AO00702>

Coffey, L., Mahon, C., & Gallagher, P. (2019). Perceptions and experiences of diabetic foot ulceration and foot care in people with diabetes: a qualitative meta-synthesis. *International wound journal*, 16(1), 183-210. <https://doi.org/10.1111/iwj.13010>

Crasto, W., Patel, V., Davies, M. J., & Khunti, K. (2021). Prevention of microvascular complications of diabetes. *Endocrinology and Metabolism Clinics*, 50(3), 431-455.
<https://doi.org/10.1016/j.ecl.2021.05.005>

de Queiróz Borba, Juliana Carla, Zaceara, A. A. L., de Andrade, F. F., Marinho, H. L. M., Santos, M. S. d. L., & Fernandes, M. A. (2020). PATIENTS AT THE END OF LIFE RECEIVING PALLIATIVE CARE: EXPERIENCES OF A MULTIPROFESSIONAL TEAM. [Pacientes sob cuidados paliativos em fase final de vida: vivência de uma equipe multiprofissional Pacientes en fase final de vida en la atención paliativa: experiencia de un equipo multi profesional] *Revista De Pesquisa, Cuidado é Fundamental Online*, 12, 1227-1232. <https://doi.org/10.9789/2175-5361.rpcfo.v12.9453>

Doody, O., & Noonan, M. (2016). Nursing research ethics, guidance and application in practice. *British journal of nursing (Mark Allen Publishing)*, 25(14), 803–807.
<https://doi.org/10.12968/bjon.2016.25.14.803>

Dunning, T., & Sinclair, A. (2014). The IDF global guideline for managing older people with type 2 diabetes: Implications for nurses. *Journal of diabetes nursing*, 18(4), 145-150.
<https://hdl.handle.net/10536/DRO/DU:30063635>

Edmonds, M., Manu, C., & Vas, P. (2021). The current burden of diabetic foot disease. *Journal of clinical orthopaedics and trauma*, 17, 88-93. <https://doi.org/10.1016/j.jcot.2021.01.017>

Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K., & Kyngäs, H. (2014). Qualitative content analysis: A focus on trustworthiness. *SAGE open*, 4(1), 2158244014522633. <https://doi.org/10.1177/2158244014522633>

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of advanced nursing*, 62(1), 107-115. <https://doi.org/10.1111/j.1365-2648.2007.04569.x>

Graneheim, U. H., Lindgren, B. M., & Lundman, B. (2017). Methodological challenges in qualitative content analysis: A discussion paper. *Nurse education today*, 56, 29-34. <https://doi.org/10.1016/j.nedt.2017.06.002>

Fereidooni, G. J., Ghofranipour, F., & Zarei, F. (2024). Interplay of self-care, self-efficacy, and health deviation self-care requisites: a study on type 2 diabetes patients through the lens of Orem's self-care theory. *BMC Primary Care*, 25(1), 48. <https://doi.org/10.1186/s12875-024-02276-w>

Foong, H. F., Kyaw, B. M., Upton, Z., & Tudor Car, L. (2020). Facilitators and barriers of using digital technology for the management of diabetic foot ulcers: A qualitative systematic review. *International wound journal*, 17(5), 1266-1281. <https://doi.org/10.1111/iwj.13396>

Game, F. (2016). Classification of diabetic foot ulcers. *Diabetes/metabolism research and reviews*, 32, 186-194. <https://doi.org/10.1002/dmrr.2746>

Garside, R. (2014). Should we appraise the quality of qualitative research reports for systematic reviews, and if so, how? *Innovation (Abingdon, England)*, 27(1), 67-79. <https://doi.org/10.1080/13511610.2013.777270>

Ghouse, J., Isaksen, J. L., Skov, M. W., Lind, B., Svendsen, J. H., Kanters, J. K., Olesen, M. S., Holst, A. G., & Nielsen, J. B. (2020). Effect of diabetes duration on the relationship between glycaemic control and risk of death in older adults with type 2 diabetes. *Diabetes, obesity & metabolism*, 22(2), 231-242. <https://doi-org.ezproxy.jamk.fi:2443/10.1111/dom.13891>

Hambleton, I. R., Caixeta, R., Jeyaseelan, S. M., Luciani, S., & Hennis, A. J. (2023). The rising burden of non-communicable diseases in the Americas and the impact of population aging: a secondary analysis of available data. *The Lancet Regional Health—Americas*, 21. <https://doi.org/10.1016/j.lana.2023.100483>

Hartmann, B., Fottner, C., Herrmann, K., Limbourg, T., Weber, M. M., & Beckh, K. (2017). Interdisciplinary treatment of diabetic foot wounds in the elderly: Low risk of amputations and mortality and good chance of being mobile with good quality of life. *Diabetes and Vascular Disease Research*, 14(1), 55-58. <https://journals.sagepub.com/doi/full/10.1177/1479164116666477>

Harding, J. L., Pavkov, M. E., Magliano, D. J., Shaw, J. E., & Gregg, E. W. (2019). Global trends in diabetes complications: a review of current evidence. *Diabetologia*, 62(1), 3–16. <https://doi-org.ezproxy.jamk.fi:2443/10.1007/s00125-018-4711-2>

Hazenbergh, C. E., van de Stegge, W. B., Van Baal, S. G., Moll, F. L., & Bus, S. A. (2020). Telehealth and telemedicine applications for the diabetic foot: A systematic review. *Diabetes/metabolism research and reviews*, 36(3), e3247. <https://doi.org/10.1002/dmrr.3247>

Hoffstad, O., Mitra, N., Walsh, J., & Margolis, D. J. (2015). Diabetes, lower-extremity amputation, and death. *Diabetes care*, 38(10), 1852-1857. <https://doi.org/10.2337/dc15-0536>

Huo, L., Shaw, J. E., Wong, E., Harding, J. L., Peeters, A., & Magliano, D. J. (2016). Burden of diabetes in Australia: life expectancy and disability-free life expectancy in adults with diabetes. *Diabetologia*, 59(7), 1437-1445. <https://doi.org/10.1007/s00125-016-3948-x>

Jeffcoate, W. J., Vileikyte, L., Boyko, E. J., Armstrong, D. G., & Boulton, A. J. (2018). Current challenges and opportunities in the prevention and management of diabetic foot ulcers. *Diabetes care*, 41(4), 645-652. <https://doi.org/10.2337/dc17-1836>

Jodheea-Jutton, A., Hindocha, S., & Bhaw-Luximon, A. (2022). Health economics of diabetic foot ulcer and recent trends to accelerate treatment. *The Foot*, 52, 101909. <https://doi.org/10.1016/j.foot.2022.101909>

Kaya, Zahide, and Anita Karaca. "Evaluation of nurses' knowledge levels of diabetic foot care management." *Nursing research and practice* 2018 (2018). <https://www.hindawi.com/journals/nrp/2018/8549567/>

Keegan, A. C., Bose, S., McDermott, K. M., Starks White, M. P., Stonko, D. P., Jeddah, D., . . . Hicks, C. W. (2023). Implementation of a patient-centered remote wound monitoring system for management of diabetic foot ulcers. *Frontiers in endocrinology (Lausanne)*, 14, 1157518. <https://doi.org/10.3389/fendo.2023.1157518>

Khaltaev, N., & Axelrod, S. (2021). Global trends in diabetes-related mortality regarding lifestyle modifications, risk factors, and affordable management: a preliminary analysis. *Chronic Diseases and Translational Medicine*, 7(3), 182-189. <https://doi.org/10.1016/j.cdtm.2021.03.003>

International Diabetic Federation, IDF, 2022. Diabetic foot related complications. [IDF-Diabetic-Foot-Report.pdf \(diabetesatlas.org\)](https://diabetesatlas.org/IDF-Diabetic-Foot-Report.pdf)

Iseli, R. K., Lee, E. K., Lewis, E., Duncan, G., & Maier, A. B. (2021). Foot disease and physical function in older adults: A systematic review and meta-analysis. *Australasian journal on ageing*, 40(1), 35-47. <https://doi.org/10.1111/ajag.12892>

Kalra, S., & Sharma, S. K. (2018). Diabetes in the Elderly. *Diabetes Therapy*, 9, 493-500. <https://doi.org/10.1007/s13300-018-0380-x>

Karter, A. J., Laiteerapong, N., Chin, M. H., Moffet, H. H., Parker, M. M., Sudore, R., Adams, A. S., Schillinger, D., Adler, N. S., Whitmer, R. A., Piette, J. D., & Huang, E. S. (2015). Ethnic Differences in Geriatric Conditions and Diabetes Complications Among Older, Insured Adults With Diabetes: The Diabetes and Aging Study. *Journal of aging and health*, 27(5), 894–918. <https://doi-org.ezproxy.jamk.fi:2443/10.1177/0898264315569455>

Kaya, Z., & Karaca, A. (2018). Evaluation of Nurses' Knowledge Levels of Diabetic Foot Care Management. *Nursing Research and Practice*, 2018 <https://doi.org/10.1155/2018/8549567>

Kolltveit, B. H., Gjengedal, E., Graue, M., Iversen, M. M., Thorne, S., & Kirkevold, M. (2016). Telemedicine in diabetes foot care delivery: Health care professionals' experience. *BMC health services research*, 16(133), 134. <https://doi.org/10.1186/s12913-016-1377-7>

Kristianingrum, N. D., Wiarsih, W., & Nursasi, A. Y. (2018). Perceived family support among older persons in diabetes mellitus self-management. *BMC geriatrics*, 18(Suppl 1), 304. <https://doi-org.ezproxy.jamk.fi:2443/10.1186/s12877-018-0981-2>

Kumarasinghe, S. A., Hettiarachchi, P., & Wasalathanthri, S. (2018). Nurses' knowledge on diabetic foot ulcer disease and their attitudes towards patients affected: A cross-sectional institution-based study. *Journal of clinical nursing*, 27(1-2), e203-e212. <https://doi.org/10.1111/jocn.13917>

Kyngäs, Helvi. Inductive Content Analysis. 2019. https://doi.org/10.1007/978-3-030-30199-6_2.

Lee, P. G., & Halter, J. B. (2017). The Pathophysiology of Hyperglycemia in Older Adults: Clinical Considerations. *Diabetes care*, 40(4), 444–452. <https://doi.org/10.2337/dc16-1732>

Lee, S. H., Lee, K. H., & Chang, S. J. (2018). Do health literacy and self-care behaviours affect quality of life in older persons with lung cancer receiving chemotherapy? *International journal of nursing practice*, 24(6), e12691-n/a. <https://doi.org/10.1111/ijn.12691>

Lima, P. C., Bittencourt, G. K. G. D., Nogueira, W. P., Dias, T. K. C., Dantas, J. S., & de Carvalho, M.,Albernaz Pinheiro. (2023). Main self-care deficits found in elderly people with diabetic foot ulcer: An integrative review. *Aquichan*, 23(3), 1-21. doi: <https://doi.org/10.5294/aqui.2023.23.3.6>

Lipscomb, M. (2019). *Nursing literature reviews : A reflection*. Taylor & Francis Group

Lo, Z. J., Surendra, N. K., Saxena, A., & Car, J. (2021). Clinical and economic burden of diabetic foot ulcers: a 5-year longitudinal multi-ethnic cohort study from the tropics. *International wound journal*, 18(3), 375-386. <https://doi.org/10.1111/iwj.13540>

Lumbers, M. (2021). Osteomyelitis, diabetic foot ulcers and the role of the community nurse. *British journal of community nursing*, 26(Sup6), S6-S9. <https://doi.org/10.12968/bjcn.2021.26.Sup6.S6>

Magliano, D. J., & Boyko, E. J. (2022). IDF diabetes atlas.[IDF DIABETES ATLAS - Abstract - Europe PMC](https://doi.org/10.1016/j.idatlas.2022.08.001)

Malakai, S. R., & Mohammadnezhad, M. (2022). Healthcare workers' perceptions on diabetic foot ulcers (DFU) and foot care in Fiji: a qualitative study. *BMJ Open*, 12(8) <https://doi.org/10.1136/bmjopen-2022-060896>

Malcolm Moore, M. B. B. S., McCarron, T., & David Lyle, M. B. B. S. (2015). Nurse-led diabetes management in remote locations. *Canadian Journal of Rural Medicine*, 20(2), 51. <https://www.srpc.ca/resources/Documents/CJRM/vol20n2/pg51.pdf>

Marshall, G. (2010). Writing... a literature review. *Imaging & Therapy Practice*, 20.

Mayeda, E. R., Whitmer, R. A., & Yaffe, K. (2015). Diabetes and cognition. *Clinics in geriatric medicine*, 31(1), 101–ix. <https://doi.org/10.1016/j.cger.2014.08.021>

McDermott, K., Fang, M., Boulton, A. J., Selvin, E., & Hicks, C. W. (2023). Etiology, epidemiology, and disparities in the burden of diabetic foot ulcers. *Diabetes Care*, 46(1), 209-221. <https://doi.org/10.2337/dci22-0043>

Mellanen, E., Kauppila, T., Kautiainen, H., Lehto, M., Rahkonen, O., Pitkälä, K., & Laine, M. K. (2023). Use of primary health care services and mortality in older patients with type 2 diabetes with or without comorbidities. *Scandinavian Journal of Primary Health Care*, 41(4), 392-399. <https://doi.org/10.1080/02813432.2023.2255062>

Gestational diabetes mellitus (PrimeView). (2019). *Nature Reviews: Disease Primers*, 5(1)
doi:<https://doi.org/10.1038/s41572-019-0104-1>

Mordarska, K., & Godziejewska-Zawada, M. (2017). Diabetes in the elderly. *Menopause Review/Przegląd Menopauzalny*, 16(2), 38-43. <https://www.termedia.pl/Journal/-4/pdf-30159-10?filename=diabetes%20in.pdf>

Munshi, M. N., Florez, H., Huang, E. S., Kalyani, R. R., Mupanomunda, M., Pandya, N., ... & Haas, L. B. (2016). Management of diabetes in long-term care and skilled nursing facilities: a position statement of the American Diabetes Association. *Diabetes care*, 39(2), 308-318.
<https://watermark.silverchair.com/dc152512.pdf?>

Nayeri, N., Samadi, N., Mehrnoush, N., Allahyari, I., Bezaatpour, F., & NaseriAsl, M. (2020). Experiences of nurses within a nurse-led multidisciplinary approach in providing care for patients with diabetic foot ulcer. *Journal of family medicine and primary care*, 9(6), 3136-3141.
https://doi.org/10.4103/jfmprc.jfmprc_1008_19

Noor, S., Zubair, M., & Ahmad, J. (2015). Diabetic foot ulcer—A review on pathophysiology, classification and microbial etiology. *Diabetes & metabolic syndrome clinical research & reviews*, 9(3), 192-199. <https://doi.org/10.1016/j.dsx.2015.04.007>

O'Flynn, S. (2022). Nurses' role in diabetes management and prevention in community care. *British journal of community nursing*, 27(8), 374-376. <https://doi.org/10.12968/bjcn.2022.27.8.374>

Ong, K. L., Stafford, L. K., McLaughlin, S. A., Boyko, E. J., Vollset, S. E., Smith, A. E., ... & Brauer, M. (2023). Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: a systematic analysis for the Global Burden of Disease Study 2021. *The Lancet*.
[https://doi.org/10.1016/S0140-6736\(23\)01301-6](https://doi.org/10.1016/S0140-6736(23)01301-6)

Papatheodorou, K., Banach, M., Bekiari, E., Rizzo, M., & Edmonds, M. (2018). Complications of Diabetes 2017. *Journal of diabetes research*, 2018, 3086167-4.
<https://doi.org/10.1155/2018/3086167>

Sangsaikaew, A., Pilayon, B., Junsevg, K., Inchaiya, C., Dankasai, C., & Koontalay, A. (2021). Factors Influencing Self-Care Behavior in Older Persons with Hypertension. *International Journal of Nursing Education*, 13(1), 40–46. <https://doi-org.pc124152.oulu.fi:9443/10.37506/ijone.v13i1.13309>

Schaarup, C., Pape-Haugaard, L., Jensen, M. H., Laursen, A. C., Bermark, S., & Hejlesen, O. K. (2017). Probing community nurses' professional basis: A situational case study in diabetic foot ulcer

treatment. *British journal of community nursing*, 22(Sup3), S46-S52.

<https://doi.org/10.12968/bjcn.2017.22.Sup3.S46>

Sharoni, S. K. A., Razi, M. N. M., Rashid, N. F. A., & Mahmood, Y. E. (2017). Self-efficacy of foot care behaviour of elderly patients with diabetes. *Malaysian Family Physician*, 12(2), 2-8. Retrieved from <http://ezproxy.jamk.fi:2048/login?url=https://www.proquest.com/scholarly-journals/self-efficacy-foot-care-behaviour-elderly/docview/1977739651/se-2>

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of business research*, 104, 333-339.

<https://www.sciencedirect.com/science/article/pii/S0148296319304564>

Subrata, S. A., & Phuphaibul, R. (2019). Diabetic foot ulcer care: a concept analysis of the term integrated into nursing practice. *Scandinavian journal of caring sciences*, 33(2), 298–310.

<https://doi.org/10.1111/scs.12645>

Park, Y., & Kim, C. (2019). Effects of the Health Literacy and Knowledge on Adherence to Self-care Behavior among Elderly with Ischemic Stroke Visiting Local General Hospitals. *Söngin Kanho Hakhoe chi*, 31(5), 573. <https://doi.org/10.7475/kjan.2019.31.5.573>

Petersmann, A., Müller-Wieland, D., Müller, U. A., Landgraf, R., Nauck, M., Freckmann, G., ... & Schleicher, E. (2019). Definition, classification and diagnosis of diabetes mellitus. *Experimental and Clinical Endocrinology & Diabetes*, 127(S 01), S1-S7. [Thieme E-Journals - Experimental and Clinical Endocrinology & Diabetes / Full Text \(thieme-connect.com\)](https://www.thieme-connect.com/products/ejournals/abstract/10.1055/a-0891-1000)

Polikandrioti, M., Vasilopoulos, G., Koutelekos, I., Panoutsopoulos, G., Gerogianni, G., Babatsikou, F., ... & Toulia, G. (2020). Quality of life in diabetic foot ulcer: associated factors and the impact of anxiety/depression and adherence to self-care. *The International Journal of Lower Extremity Wounds*, 19(2), 165-179. <https://doi.org/10.1177/1534734619900415>

Sesti, G., Incalzi, R. A., Bonora, E., Consoli, A., Giaccari, A., Maggi, S., ... & Ferrara, N. (2018). Management of diabetes in older adults. *Nutrition, Metabolism and Cardiovascular Diseases*, 28(3), 206-218. <https://www.sciencedirect.com/science/article/pii/S0939475317302958>

Sharoni, S. K. A., Razi, M. N. M., Rashid, N. F. A., & Mahmood, Y. E. (2017). Self-efficacy of foot care behaviour of elderly patients with diabetes. *Malaysian Family Physician*, 12(2), 2-8. Retrieved from <http://ezproxy.jamk.fi:2048/login?url=https://www.proquest.com/scholarly-journals/self-efficacy-foot-care-behaviour-elderly/docview/1977739651/se-2>

Sinclair, A., Saeedi, P., Kaundal, A., Karuranga, S., Malanda, B., & Williams, R. (2020). Diabetes and global ageing among 65–99-year-old adults: Findings from the International Diabetes Federation Diabetes Atlas. *Diabetes research and clinical practice*, 162, 108078.
<https://doi.org/10.1016/j.diabres.2020.108078>

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of business research*, 104, 333-339.
<https://www.sciencedirect.com/science/article/pii/S0148296319304564>

Standl, E., Khunti, K., Hansen, T. B., & Schnell, O. (2019). The global epidemics of diabetes in the 21st century: Current situation and perspectives. *European journal of preventive cardiology*, 26(2_suppl), 7-14. <https://doi.org/10.1177/2047487319881021>

Terveyden ja hyvinvoinnin laitos (THL) 2023, Folk Diseases, Diabetes.
<https://thl.fi/aiheet/kansantaudit/diabetes/diabeteksen-yleisyys>

Torraco, R. J. (2016). Writing Integrative Literature Reviews: Using the Past and Present to Explore the Future. *Human Resource Development Review*, 15(4), 404-428.
<https://doi.org/10.1177/1534484316671606>

Vandenbergh, D., & Albrecht, J. (2020). The financial burden of non-communicable diseases in the European Union: a systematic review. *European Journal of Public Health*, 30(4), 833-839.
<https://doi.org/10.1093/eurpub/ckz073>

Wang, X., Yuan, C. X., Xu, B., & Yu, Z. (2022). Diabetic foot ulcers: Classification, risk factors and management. *World Journal of Diabetes*, 13(12), 1049.
<https://doi.org/10.4239%2Fwjv.v13.i12.1049>

Wang, H., Luo, W., Ye, Y., Li, N., Li, X., Fu, X., . . . Zhou, Q. (2023). Knowledge, attitudes, and practice of Endocrinology healthcare workers regarding screening for pre-ulcerative diabetic foot lesions. *Journal of tissue viability*, 32(4), 472-479. <https://doi.org/10.1016/j.jtv.2023.07.005>

Wee, B. V., & Banister, D. (2016). How to write a literature review paper? *Transport reviews*, 36(2), 278-288.
https://enec.cug.edu.cn/local/7/5D/D5/F6B458239ED7C561A94AE6FC685_29C49420_5C86E.pdf

Wild, S., Roglic, G., Green, A., Sicree, R., & King, H. (2004). Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes care*, 27(5), 1047–1053.
<https://doi.org/10.2337/diacare.27.5.1047>

Winchester, C. L., & Salji, M. (2016). Writing a literature review. *Journal of Clinical Urology*, 9(5), 308-312. <https://doi.org/10.1177/2051415816650133>

World Health Organization. (2015). World report on ageing and health. World Health Organization.

World Health Organization, WHO, 2022. Aging and Health. [Ageing and health \(who.int\)](https://www.who.int/news-room/fact-sheets/detail/ageing-and-health)

World Health Organization (WHO), 2023. The global update on diabetes. <https://www.who.int/news-room/fact-sheets/detail/diabetes>

Xs, B. N. (2018). Review on general effective & therapeutic diabetic wound management. *Current Research in Diabetes & Obesity Journal*, 8(4), 65-73. <http://dx.doi.org/10.19080/CRDOJ.2018.08.555743>

Yamine, K., & Estephan, M. (2022). Telemedicine and diabetic foot ulcer outcomes. A meta-analysis of controlled trials. *The Foot*, 50, 101872. <https://doi.org/10.1016/j.foot.2021.101872>

Yazdanpanah, L., Shahbazian, H., Nazari, I., Arti, H. R., Ahmadi, F., Seyed, E. M., . . . Hesam, S. (2018). Incidence and risk factors of diabetic foot ulcer: A population-based diabetic foot cohort (ADFC study)—Two-year follow-up study. *International Journal of Endocrinology*, 2018, 9. doi: <https://doi.org/10.1155/2018/7631659>

Zaccardi, F., Webb, D. R., Yates, T., & Davies, M. J. (2016). Pathophysiology of type 1 and type 2 diabetes mellitus: a 90-year perspective. *Postgraduate Medical Journal*, 92(1084), 63. <https://doi.org/10.1136/postgradmedj-2015-133281>

Zhu, X., Lee, E. S., Lim, P. X., Chen, Y. C., Chan, F. H. F., & Griva, K. (2023). Exploring barriers and enablers of self-management behaviours in patients with diabetic foot ulcers: A qualitative study from the perceptions of patients, caregivers, and healthcare professionals in primary care. *International wound journal*, 20(7), 2764-2779. <https://doi.org/10.1111/iwj.14153>

Appendices

Appendix 1. Selected articles for the literature review

	Authors	Published year and country	Titles	Research Methods or Instrument	Main results	Critical appraisal (Hawker et. al 2002)
1	Kolltveit et al	2018, Norway	Health care professionals' experience in using telemedicine in DFU delivery.	Inductive Interpretive Description (ID) approach.	The use of telemedicine showed great improvements in knowledge and skills and created more confidence in handling patients. The intervention promoted health professional development.	28
2	Nayeri, N. D. , Samadi, N. , Mehrnoush, N. , Allahyari, I. , Bezaatpour, F. & NaseriAsl, M.	2020, Iran	Experiences of nurses treating patients with diabetic foot ulcers using a nurse-led interdisciplinary approach.	Qualitative study, descriptive and inductive method	A positive impact was found with the nurse- led multidisciplinary approach in management of diabetic foot ulcers. It was also found that having nurse substitutes in the primary care team impacted the quality of care provided.	32
3	Schaarup, C., Pape-Haugaard, L., Jensen, M. H., Laursen, A. C., Bermark, S., & Hejlesen, O. K.	2017, Denmark	Examining the qualifications of community nurses: a situational case study on the management of DFU.	Situational case study design	It was found out that nurses with many years of experience had a good understanding in management of diabetic foot ulcer compared to those with few years of experience.	32
4	Malakaj, S. R., & Mohammadnezhad, M.	2022, London	Healthcare professionals' opinions about foot care and DFU in Fiji	Qualitative study	It was established that most healthcare workers had general knowledge rather than the specific skills on diabetic foot ulcer management. Additionally, diabetic foot ulcer management should be tailored in consideration of cultural practices and beliefs of people. Foot education and advice should be given to patients with diabetes who have not yet gotten foot ulcer, rather than being used as a treatment method for DFU.	30
5	Kaya, Z., &	2018,	Assessment of Nurses' Diabetic Foot Care Management Knowledge	Descriptive cross-sectional	It was concluded that nurses had sufficient knowledge of DFU, but it was hard to apply the knowledge among	30

	Karaca, A. (2018).	Turkey, Istanbul	Levels.	study	patients.	
6	Bilal, M., Haseeb, A., Rehman, A., Hussham Arshad, M., Aslam, A., Godil, S., Qamar, M. A., Husain, S. N., Polani, M. H., Ayaz, A., Ghazanfar, A. S., Ghazali, Z. M., Khoja, K. A., Malik, M., & Ahmad, H.	2018, United States	The knowledge, attitudes, and practices of Pakistani nurses on DFU.	Cross-sectional descriptive study	It was found out that most nurses had knowledge on diabetic ulcer care though they were not aware of presentation of complications of the ulcer. Evidence-based practices should be adopted to help improve the attitudes of nurses and improve the quality of care.	32
7	Wang, H., Luo, W., Ye, Y., Li, N., Li, X., Fu, X., Yu, L., Hu, T., Dai, W., & Zhou, Q.	2023, China	Healthcare professionals in endocrinology's knowledge, attitudes, and screening practices for diabetic foot lesions that may lead to ulceration, a journal	Qualitative study	Most nurses lacked relevant training on screening though they had positive attitude. They also demonstrated insufficient knowledge.	30
8	Kumarasinghe, S. A., Hettiarachchi, P., & Wasalathanthri, S.	2018, Sri Lanka	Nurses' perspectives on patients impacted by diabetic foot ulcer disease and their understanding of the condition:	Nonexperimental descriptive cross-sectional study	Nurses' skills in management of diabetic foot ulcer improved with experience. It was also found that nurses are interested in DFU care but not in research involving it.	32

