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THE RISK FACTOR OCCURRING DIABETIC FOOT ULCER IN TYPE II DIABETES MELLITUS PATIENTS: *LITERATURE REVIEW*

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Abstract

Type II diabetes continues to increase in prevalence and incidence. One of the important complications of diabetes type II is diabetic foot ulcer, which is a growing public health problem and is a leading cause of amputations and death in diabetic patients. So it is necessary to know what causes diabetic foot ulcers to remain vigilant and prevent this condition. The method used in the preparation of this research is a Literature Review by analyzing several articles that have been determined. This study consisted of ten articles which were analyzed using the manual screening concerning the inclusion and exclusion criteria. The variables studied were neuropathy, duration of diabetes mellitus, foot care, and age. In this study, the results of three articles discussing neuropathy, seven articles discussing the duration of diabetes mellitus, six articles discussing foot care, and four articles discussing age with the occurrence of diabetic foot ulcers. Conclusion: In this study, factors associated with the occurrence of diabetic foot ulcers in patients with type II diabetes were neuropathy, duration of diabetes, foot care, and age.

Keywords: *Risk Factors, Diabetic foot Ulcers, Type II Diabetes mellitus*

Introduction

The increase in the number of people with diabetes mellitus (DM) causes an increase in the incidence of complications, one of which is diabetic foot ulcers. (Fatimah, 2015). Approximately 462 million individuals were affected by type 2 diabetes mellitus corresponding to 6.28% of the world's population (4.4% of those aged 15-49 years, 15% of those aged 50-69, and 22% of those aged 70+), or a prevalence rate of 6059 cases per 100,000. Over 1 million deaths per year can be attributed to diabetes alone, making it the ninth leading cause of mortality. The burden of diabetes mellitus is rising globally, and at a much faster rate in developed regions, such as Western Europe (Khan et al., 2020). Globally, the prevalence of diabetic ulcers is 6.3%, Belgium has the highest prevalence rate of 16.6%; Canada 14.8%; the United States 13%; Africa 7.2%; Asia 5.5%; Europe 5.1%; Oceania 3%; 1.5% is the lowest in Australia. In Indonesia, the incidence of diabetic ulcers is 12%, and the risk of diabetic ulcers is 55.4%. (Hidayatillah, Nugroho, & Adi, 2019)

Diabetic foot ulcers rank 5th with 8.7% of people with diabetes mellitus experiencing diabetic foot ulcers (Kemenkes RI, 2014). In Indonesia, the prevalence of diabetic foot ulcers is around 15%. The mortality rate from diabetic foot injuries is around 32%, and diabetic foot injuries are the leading cause of hospitalization for diabetes, 80% of which are diabetic. (Nurhanifah, 2017). According to information from the Makassar City Hospital, the number of diabetes mellitus sufferers in 2014 was 2053 patients, of which 30 patients had ulcers, decreased in 2015 by 1044 patients, of which 25 patients had ulcers, increased in 2016 by 1373 patients, of which ulcer in 46 patients (Junaiddin, 2017). At the beginning of the course of diabetes mellitus disease, individuals do not realize it, This is due to the absence of symptoms but they are only felt after further complications occur in the organs of the body. High blood glucose levels will increase blood viscosity so that blood flow to the tissues will slow down. Increased blood viscosity results in impaired blood flow to the periphery so leg disorders often arise including ulcers, infections, gangrene, and amputation (Indrawati, R, & Sidhu, 2019).

Ulcers if not treated or cared for properly will result in amputation of the limbs of the affected patient and can even lead to death. For this reason, it is necessary to identify the factors that are related to the formation of diabetic foot ulcers so that you can be vigilant and prevent these conditions from forming. Public knowledge of the factors that can trigger the

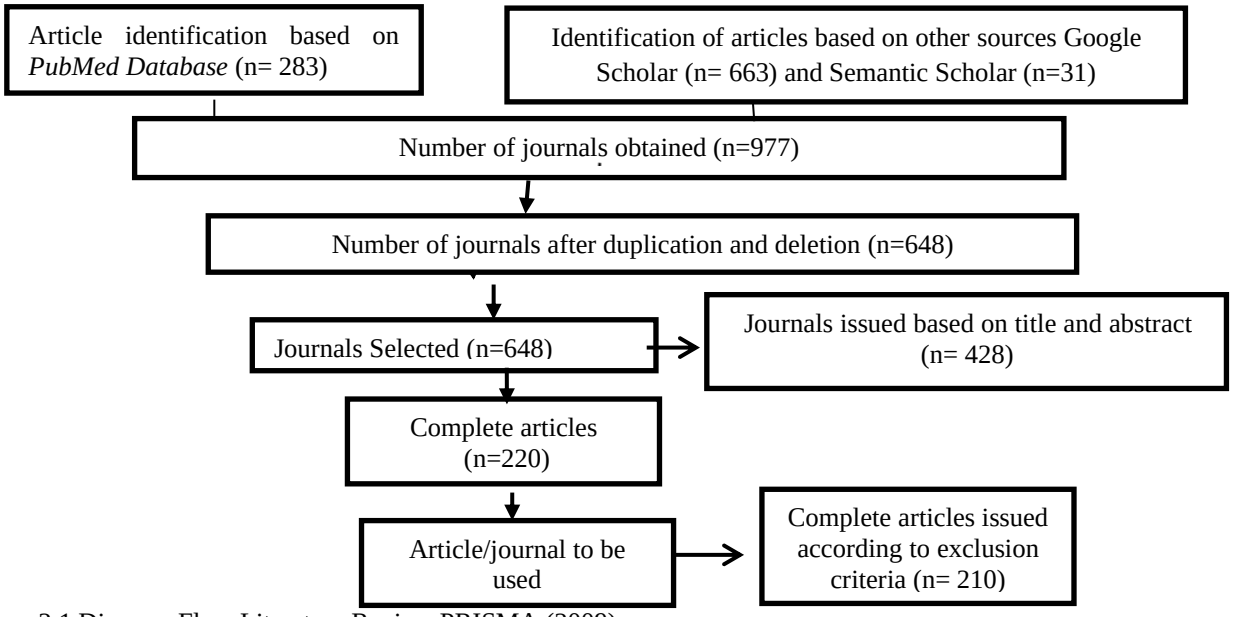
emergence of diabetic foot ulcers can be a solution so that sufferers can be free from complications of diabetes mellitus such as diabetic foot ulcers. This literature review aims to determine the risk of developing diabetic foot ulcers in patients with type II diabetes mellitus

Method

The research method used is the *Literature Review*. There were ten journals reviewed which in the search process went through three databases namely *Pubmed, Google Scholar,* and *Semantic Scholar* with inclusion criteria related to the incidence of diabetic foot ulcers in patients with Type II Diabetes mellitus using the keywords OR risk *OR* factors *OR* Causes *AND* diabetic foot *OR* ulcers *OR diabetic foot ulcers AND* diabetes mellitus *OR* type II diabetes mellitus. The population in this study were type II diabetes mellitus patients. The variables studied included neuropathy, duration of diabetes mellitus, foot care, and age.

Selection Study

After collecting data and information, all data was selected according to the inclusion criteria, namely the 2015-2020 Fulltext articles and using English and Indonesian. Articles that fit the topic of the study consisted of patients with Type 2 Diabetes mellitus, diabetic foot ulcers, and articles using the Cross-sectional study and *Quasi-Experimental methods.* The results of the selection of study articles can be described in the flow diagram below:



Picture 2.1 Diagram Flow Literature Review PRISMA (2009)

Results

In compiling the *literature review* researcher used ten articles to be examined, of which nine articles used a *cross-sectional study design* with the largest population, namely 277 respondents, and the least, namely 15 respondents and there was one article that used a *quasi-experimental design* with a total population of 240 respondents. The variables contained in the ten articles that will be discussed by researchers include neuropathy, duration of diabetes mellitus, foot care, age, blood sugar levels, stress levels, history of ulcers, dietary compliance, medication adherence, and use of footwear.

Table 1. Article Risk Factors for the Occurrence of Diabetic Foot Ulcers in Patients with Type II Diabetes mellitus

Author	Method (Design, Population, Variable	Results of
Junaiddin's	**Design:** *Cross-sectional study* **Population:** 61 participants **Variables:** Length of Suffering and Personal Hygiene	Length of suffering from diabetes mellitus and personal hygiene This has a relationship with the occurrence of diabetic foot ulcers
Retno Indarwati, Praba Dian R, Yunita Veronika Sidhu	**Design:** *Cross-sectional study* **Population:** 115 participants **Variables:** Blood sugar level, foot care, stress level	Blood sugar level, foot care, and stress level are positively correlated with the incidence of diabetic foot ulcers.
Safruddin, Rahmat Hidayat	**Design:** *Cross-sectional study* **Population:** 32 respondents **Variables:** Gender, duration of Diabetes mellitus, foot care, neuropathy, and history of ulcers.	From the study, it can be concluded that there is no relationship between gender and the occurrence of diabetic foot ulcers. There is a relationship between neuropathy, duration of diabetes mellitus, foot care, and history of ulcers with the incidence of diabetic foot ulcers.
Ani Astuti, Diah Merdekawati, Siti Aminah	**Design:** *Cross-sectional study* **Population:** 15 respondents **Variables:** Diabetes mellitus duration, glycemic control, foot care.	Prolonged diabetes, improper foot care, and poor blood sugar control can trigger diabetic foot.
Saenab Dasong, Suhartatik, Arlin Afrianti	**Design:** *Cross-sectional study* **Population:** 30 respondents **Variables:** Compliance with taking medication, age, duration of Diabetes mellitus.	The study concluded that there was a significant relationship between age, duration of diabetes, and adherence to taking medication with the incidence of diabetic foot ulcers.
Ida Samidah, Mirawati, Desi Mariyati	**Design:** *Cross-sectional study* **Population:** 91 respondents **Variables:** Age, duration of diabetes mellitus, foot care, and diabetic ulcer.	The study concluded that there was a significant relationship between the age duration of diabetes mellitus, and foot care with the incidence of diabetic ulcers.
Khairunnisak	**Design:** *Cross-sectional study* **Population:** 93 respondents **Variables:** Age, duration of diabetes mellitus, dietary compliance, and medication regularity.	This study concluded that there is a relationship between age, duration of diabetes mellitus, dietary compliance, and medication regularity with the occurrence of diabetic foot ulcers.

Neli Husniawati	**Design:** *Cross-sectional study* **Population:** 65 respondents **Variables:** Foot care, use of footwear, age, gender, duration of diabetes mellitus.	Diabetes mellitus ≥10 years, Irregular Foot Care and use of Improper Footwear a cause of diabetic foot ulcers. Age and gender have no relationship with the occurrence of diabetic foot ulcers.
Daba Abdissa, Tesfaye Adugna, Mendesak Gerema, Diriba Dereje	**Design:** *Cross-sectional study* **Population:** 277 respondents **Variable:** Peripheral neuropathy	The independent predictor of diabetic foot ulcers is peripheral neuropathy.
Piotr Nehring, Adam Makowski, Beata Mrozikiewicz-Rakowska, Agnieszka Sobczyk-Kopciol, Rafal Ploski and Waldemar Karnafel	**Design:** *Quasi Experimental* **Population:** 240 respondents **Variable:** Neuropathy	Identification of specific factors that increase the risk of DF of neuropathic origin in patients with type diabetes mellitus 2 is essential because of its implications for a clinician classifying patients into risk groups.

Based on the results of analysis from previous studies, it can be shown that factors that are closely related to the occurrence of diabetic foot ulcers in patients with type II diabetes are neuropathy, duration of diabetes, foot care, and age. The following describes the four factors:

1. Neuropathy

In compiling the *literature review*, three articles discuss the relationship between neuropathy and the occurrence of diabetic foot ulcers.

Neuropathy is damage to the nervous system which is a trigger factor for diabetic foot ulcers. Based on the results of research conducted by (Nehring, Makowski, Rakowska, Kopciol, Ploski, & Karnafel, 2015), in line with research conducted by (Safruddin & Hidayat, 2018) which states that the presence of deformity can cause fat under the bone. Continuous pressure on a certain area causes deformity and creates a callus that can turn into ulcers. This statement is proven by the statistical results test that has been carried out showing a p-value = 0.001, which means that there is a relationship between motor neuropathy and the occurrence of diabetic foot ulcers. Research conducted by

(Abdissa, Adugna, Gerema, & Dereje , Prevalence of Diabetic Foot Ulcer and Associated Factors among Adult Diabetic Patients on Follow-Up Clinic at Jimma Medical Center, Southwest Ethiopia, 2020), states that sensory neuropathy is also associated with the occurrence of diabetic foot ulcers. This is due to dysfunction of the peripheral nervous system promoting formation due to loss of protective pain sensation, loss of pressure sensation, and microcirculation constraints. This is evidenced by the results of statistical tests that have been carried out showing a p-value = 0.001, which means that sensory neuropathy has a relationship with the occurrence of diabetic foot ulcers.

2. Length of Suffering from diabetes mellitus

Long-suffering from Diabetes mellitus is one of the factors associated with the occurrence of diabetic foot ulcers. Based on research (Junaiddin, 2017), states that diabetes duration ≥ 5 years is a risk factor for diabetic foot ulcers because blood sugar levels are increasingly difficult to control which increases (hyperglycemia) so that oxygen and nutrient perfusion throughout the body's tissues is disrupted. This is evidenced by the statistical results test that has been carried out showing a p-value = 0.006, which means that the duration of diabetes mellitus has a relationship with the occurrence of diabetic foot ulcers. The research conducted (Safruddin & Hidayat, 2018), with the statistical results test that has been carried out shows a p-value = 0.014 which means that diabetes mellitus ≥ 5 years is a risk factor for diabetic foot ulcers. This statement is by (Astuti, Merdekawati, & Aminah, 2020), which state that the longer a person has diabetes mellitus, the more at risk of experiencing complications, one of which is foot ulcers. This is evidenced by the statistical results test that has been carried out showing a value of p = 0.011. Research conducted by (Dasong, Suhartatik, & Afrianti, 2020) stated that the prevalence of neuropathy increases with age and the duration of the disease. This is evidenced by the statistical test results that have been carried out showing a value of p = 0.027 (p <0.05), which means there is a relationship with the occurrence of diabetic foot ulcers.

Meanwhile, according to (Khairunnisak, 2019), which shows the value of the statistical test results that have been carried out with a p-value = 0.036 which means that the duration of suffering from diabetes mellitus which is ≥ 10 years has a relationship with the occurrence of diabetic foot ulcers. This statement is by , which states that diabetes mellitus patients who suffer from diabetes mellitus ≥ 10 years are a heterogeneous group of disorders characterized by increased blood glucose levels. If blood sugar levels are not controlled there will be complications related to blood vessels. This is evidenced by the statistical results test that has been carried out showing a value of p = 0.002. Research conducted by (Husniawati, 2015), states that the longer a person is diagnosed with diabetes mellitus, the more at risk of complications. This is evidenced by the statistical results test that has been carried out showing a value of p = 0.002.

3. Foot Care

In compiling the *literature review*, six articles discuss the relationship between foot care and the occurrence of diabetic foot ulcers. Foot care is an important concern in preventing foot ulcers. Based on Research conducted by (Safruddin & Hidayat, 2018) showed the results of statistical tests that were carried out and obtained a p-value = 0.005, which means that there is a relationship between foot care and the occurrence of diabetic foot ulcers. This statement is by , who states that effective foot care can cut the risk of developing diabetic foot ulcers. This is reinforced by the statistical results test that has been carried out showing a value of p = 0.003. Research conducted by (Astuti, Merdekawati, & Aminah, 2020), states that there is a relationship between foot care and the occurrence of diabetic foot ulcers. This is evidenced by the statistical results test that has been carried out showing a value of p = 0.023. This statement is by , stating that the occurrence of diabetic feet is caused by diabetics not doing proper foot care and the patient's lack of knowledge regarding foot care. This is reinforced by the statistical results test that has been carried out showing a value of p = 0.004.

Research conducted by (Husniawati, 2015), states that poor foot care will result in serious health problems that will result in amputation. This is proven by the statistical results test that has been carried out showing a p-value = 0.003, which means that there is a significant relationship between foot care and the occurrence of diabetic foot ulcers. According to (Junaiddin, 2017), one *personal hygiene* that can prevent foot ulcers is doing foot care, such as nail care, skin care, foot examination, and the use of footwear. This is evidenced by the statistical test results that have been carried out showing a value of p = 0.027, which means that *personal hygiene* has a relationship with the occurrence of diabetic foot ulcers.

4. Age

In compiling the *literature review* four articles discussed the relationship between age and the occurrence of diabetic foot ulcers, one of which stated that there was no relationship between age and the occurrence of diabetic foot ulcers. In compiling the *literature review*, there were ten articles used and four articles that discussed age. Three articles discuss the relationship between age and the occurrence of diabetic foot ulcers including article five, article six, and article seven. There is one article that states that there is no relationship between age and the occurrence of diabetic foot ulcers, namely article eight.

Age is a risk factor for diabetic foot ulcers. Based on Research conducted by (Dasong, Suhartatik, & Afrianti, 2020), shows the value of the statistical test results that have been carried out and the results obtained are p = 0.023 which means that there is a significant relationship between age and the occurrence of diabetic foot ulcers. This statement is by , which states that the elderly experience an aging process that causes reduced muscle mass and changes in blood vessels. This is evidenced by the statistical results test that has been carried out showing the value of OR = 5,769. Research conducted by (Samidah, Mirawati, & Mariyati, 2017), states that in old age there are changes such as reduced muscle mass and vascular changes related to the occurrence of peripheral insulin resistance in diabetes mellitus. This is evidenced by the statistical results test that has been carried out showing a p-value = 0.008, which means that there is a relationship between age > 60 years and the occurrence of diabetic foot ulcers. This research contradicts (Husniawati, 2015), which states that there is no significant relationship between age and the incidence of diabetic foot ulcers, because if respondents can handle diabetes properly and understand the causes of diabetic foot ulcers, the risk of complications can be minimized. This is evidenced by the statistical results test that has been carried out showing a p-value = 0.443, which means that there is no significant relationship between age and the occurrence of diabetic foot ulcers

C**onclusions**

In this study, it can be concluded that the factors that have a relationship with the occurrence of diabetic foot ulcers are: Neuropathy, duration of diabetes mellitus, foot care, and age. It is hoped that health workers can provide education about factors that can trigger diabetic foot ulcers in patients with type II diabetes mellitus by making this research a reference.

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