

IDENTIFICATION OF PATIENTS AT HIGH RISK FOR DIABETES-RELATED FOOT ULCERS IN DIABETES MELLITUS TIPE II (DMT2)

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ABSTRACT

Diabetes Mellitus (DM) remains one of the main health problems today. Diabetes is a one of chronic diseases characterized by high blood sugar levels or called Hyperglycemia. Hyperglycemia can caused many complications. One of the complications that often occurs in people with DM is the occurrence of ulcers or sores on the feet or called Diabetic foot Ulcer (DFU). Prevention of DFU can be done through early detection of the level of risk as soon as possible, but this often does not receive sufficient attention due to limited time for assessment or deficit knowledge. This research aims to describe the results of early detection of the risk of DFU in type 2 DM patient. The research method used was a descriptive method with a quantitative approach, with a sample of 95 respondents selected at random using kuesioner Inlow's 60-second diabetic foot screen screening tool. The results of the study showed that almost all respondents with DM had a moderate risk of experiencing DFU, but there were also those who had a low risk. Therefore, health education about foot care needs to be continuously provided and improved so that DFU prevention becomes more optimal. Apart from that, providing information from nurses about the importance of foot screening every year for those at low risk, while those at moderate risk are recommended to be screened every 6 months and those at high risk are recommended to be screened every 3 months.

Keywords: Diabetic, Diabetic Foot Ulcer, Diabetic Mellitus Patients

INTRODUCTION

DM is a disorder of carbohydrate metabolism that can cause acute and chronic complications. Based on data from the International Diabetes Federation, there are 537 million diabetes sufferers aged 20-79 years in the world in 2021 (Gupta et al., 2022). This number increased by 15.98% compared to 2019 which was 463 million people. The increase in the number of diabetes sufferers has been consistent in the last 21 years. The number increased to 255.63% compared to 2000 which was only 151 million people. Meanwhile, the IDF estimates that the number of diabetes sufferers will continue to increase until 2045. The figure will soar by 45.81% to 783 million diabetes sufferers in the next 24 years (Magliano et al., 2021).

In 2015, Indonesia was ranked seventh in the world for the highest prevalence of diabetes sufferers in the world along with China, India, the United States, Brazil, Russia and Mexico with an estimated number of people with diabetes of 10 million. The prevalence of people with DM in Indonesia is one -the only country in Southeast Asia that has a high prevalence (Ministry of Health, 2021). The high incidence of DM is accompanied by the high number of diseases resulting from DM complications. Chronic complications associated with DM are microvascular and macrovascular disease (Goyal et al., 2024). These diseases are: cardiovascular disease [CVD], diabetic kidney disease [DKD], diabetic retinopathy [DR], Diabetic Foot Ulcer and neuropathy (Cole & Florez, 2020). One of the complications of hyperglycemia that often occurs in DM sufferers is the occurrence of ulcers or wounds on the feet or known as diabetic foot Ulcer (DFU). The pathophysiology of DFU is related to neuropathy and peripheral arterial disease caused by poor glycemic control in DM patients. The pathological mechanisms underlying DFU consist of a triad: Neuropathy, vascular insufficiency, and secondary infection due to foot trauma (Raja et al., 2023). Hyperglycemia

conditions cause excess production of reactive oxygen species (ROS) which causes endothelial dysfunction and inflammation. These conditions cause vascular insufficiency which increases the incidence of DFU (Paneni et al., 2013).

Neuropathy that occurs in DM patients occurs due to increased regulation of aldose reductase and sorbitol dehydrogenase triggered by hyperglycemia, which in turn increases fructose and sorbitol production. These glucose products accumulate and induce osmotic stress, thereby reducing nerve cell myoinositol synthesis and nerve conduction (Ramirez-Perdomo et al., 2019). In addition, motor neuron dysfunction can cause muscle wasting and structural abnormalities in the foot, This causes focal increases in pressure in various zones of the plantar foot and increases the risk of ulceration (Skopljak et al., 2014).

Based on data (Ministry of Health of the Republic of Indonesia, 2020) the prevalence rate of DFU is quite high. The prevalence of DFU sufferers is approximately 12 –15% of all diabetes sufferers and is usually located in the lower extremities. According to the American Diabetes Association (in Amelia, 2018) Diabetic foot wounds have the potential for complications and cause more than 90% of lower extremity amputations in diabetes sufferers. Amputation in DM patients can cause serious complications, such as infection, pulmonary embolism, and septic shock. DM sufferers also have a higher risk of experiencing cardiovascular complications such as heart attack and stroke. In addition, amputation can cause lifestyle changes such as limited mobility and depression which can affect quality of life and worsen overall health conditions. Approximately 40% to 60% of non-traumatic lower extremity amputations worldwide are caused by diabetes complications, and 80% of these amputations occur due to diabetic foot ulcers (Hingorani et al., 2016). Therefore, early detection and prompt treatment of foot wounds in DM sufferers is very important to prevent amputation and reduce the risk of death.

Diabetic foot wounds (DFU) are chronic wounds so they require long-term healing. Diabetic foot wounds cause complicated problems, especially those that are made worse by poor care. Diabetic foot care management focuses on vascular, microbiology/infection, mechanics, education and wound care (Turns, 2011). Apart from that, one of the management treatments for diabetic foot wounds is standardized assessment or assessment and management of diabetic foot wounds (Roberts & Newton, 2015).

In an effort to prevent the risk of DFU complications which are often experienced by diabetes sufferers, there is prevention of complications including holistic management of diabetic feet including 6 controls, namely mechanical control, metabolic control, vascular control, wound control, infection control and educational control (Nisak , 2021). Foot care for diabetics is one of them.

In an effort to prevent the risk of DFU complications which are often experienced by diabetes sufferers, there is prevention of complications including holistic management of diabetic feet including 6 controls, namely mechanical control, metabolic control, vascular control, wound control, infection control and educational control (Nisak , 2021). Foot care for diabetics is one of the pillars of managing diabetes mellitus (DM). The ideal management to prevent and treat DFU is to undergo regular foot screening, providing knowledge to patients and health care providers, appropriate footwear, determining the risk of DFU and early treatment of foot problems (Parliani et al., 2023)

Diabetic foot screening is the first step in identifying the risk of DFU. Foot screening is the process of checking the feet of DM sufferers regularly to find out whether there are early signs of DFU such as wounds, infections, or changes in skin color. DM patients who undergo foot screening have a lower risk of amputation than DM patients who do not undergo diabetic foot screening (Ang et al., 2017). The importance of early detection in patients with DM is a

way to prevent the occurrence of DFU (Ming et al., 2024). Screening for early detection of the risk of DFU is very important because at an early stage, the symptoms of DFU are often unknown. Through routine screening, early signs of DFU can be found so as to reduce the risk of complications.

Screening can be done with the Inlow's 60-second diabetic foot screen screening tool questionnaire. To avoid or reduce DFU complications in the form of major amputations and death, identifying a high risk of DFU is important. The Inlow Diabetic Foot Screen is an instrument that has been widely and frequently used for many years due to its ease of use, rapid detection of high-risk diabetic foot and clear treatment planning regarding actions that must be taken by patients and doctors in risk categories. Additionally, the Inlow 60 second Diabetic Foot Screen provides a systematic overview of methods that can be used by patients and physicians for foot ulcer prevention and sustainability (Blanchette et al., 2023).

Screening after ulcers or complications occur. Based on this description, the author is interested in further research regarding early detection of the risk of DFU in type 2 DM sufferers. In this way, it is hoped that it can provide useful information for nurses in carrying out foot screening in DM sufferers so as to prevent the occurrence of DFU in type 2 DM sufferers. which is one of the complications that often occurs. The aim and objective of this research is to gain knowledge and conduct scientific studies regarding the risk of developing diabetic foot wounds (DFU) in type 2 DM sufferers.

METHOD

Participant characteristics and research design

Design This research uses a quantitative descriptive design. Participants involved in this research were type II DM patients registered at health services in Garut district. Inclusion criteria are: patients who have been registered with active health services for at least the last 6 months, want to take part in this research, and do not have other disease complications. Meanwhile, patients who had gestational DM and vascular disease were not included in this study.

Sampling procedures

Sampling in this research was carried out using a probability sampling technique, namely simple random sampling.

Sample size, power, and precision

The participants involved were 95 participants who were registered with health services. Researchers used patient information recorded at the Community Health Center. Next, the research team measured the incidence of DFU in patients who came to the puskesmas to carry out health checks/controls, while the remaining patients were visited each to measure the risk of DFU occurring. Intended sample size.

Measures and covariates

Risk data uses primary data both for ABI with direct measurements and also for Inlow's 60-second diabetic foot screen screening tool. A structured Indonesian version data collection

checklist was developed based. The check list has three parts. The first part is about socio-demographic characteristics (Sex, Age, duration of suffering from DM and blood sugar levels); the second is ABI measurement Observation Sheet; and the last part is the instrument inlow's 60-second diabetic foot screen screening tool. The variable measured in this study is the risk of DFU.

Data analysis

Data analysis in this research uses descriptive statistical analysis using the frequency distribution formula. After the data has been analyzed, the measurement results from the Inlow's 60-second diabetic foot screen screening tool examination sheet are then categorized into the following categories; (Low Risk < 8, Medium Risk: 8 – 16, High Risk: > 16) And categorize the measurement results from the ABI test into the following categories; (Normal: 0.90 – 1.30, Light Damage = 0.70 – 0.90, Medium Damage: 0.40 – 0.690, Severe Damage: <0.40). After the research data is categorized based on these categories, it is then interpreted into a frequency distribution

RESULTS AND DISCUSSION

This analysis aims to explain or describe the characteristics of each research variable in the frequency distribution and presentation of each variable including the distribution of gender, age, duration of suffering from DM, random blood sugar (GDs), results of early detection of the risk of DFU in type 2 DM sufferers.

Table 1. Responden Characteristic

| Responden Characteristic | Frekuensi N=95 | Precentage % |
|---------------------------------|-----------------------|---------------------|
| Sex | | |
| 1. Man | 33 | 34.7 |
| 2. Woman | 62 | 65.3 |
| Age | | |
| 1. 26-35 | 8 | 8.4 |
| 2. 36-45 | 17 | 17.9 |
| 3. 46-55 | 33 | 34.7 |
| 4. 56-65 | 27 | 28.4 |
| 5. 66-75 | 10 | 10.5 |
| Duration of suffering DM | | |
| 1. <5 Years | 48 | 50.5 |
| 2. >5 Years | 47 | 49.5 |
| Blood Glucose | | |
| 1. ≤200 mg/dl | | |
| 2. 200-300 mg/dl | 17 | 17.9 |
| 3. >300 mg/dl | 52 | 54.7 |
| | 26 | 27.4 |

Based on table 1, it shows the characteristics of the respondents, most of the respondents were female with a total of 63 respondents (65.3%), and a small portion of the remaining

respondents were male with a total of 33 respondents (34.7%). Based on the age of the respondents, it shows that the majority of respondents were in the age range 46 - 55 years amounting to 34 respondents (34.7%), and very few of the respondents in the age range 26 - 35 years amounting to 8 respondents (8.4%). Grouping the duration of suffering from DM based on time categories, some of the respondents had a history of diabetes mellitus ≥ 5 years totaling 47 respondents (49.5%), and some of the other respondents had a history of diabetes mellitus ≤ 5 years totaling 48 respondents (50.5%). Grouping categories based on instantaneous blood sugar (GDs) showed that some of the respondents had transient blood sugar levels (GDs) of 200-300 mg/dl totaling 52 respondents (54.7%), and very few of the respondents had instantaneous blood sugar levels (GDs) ≤ 200 mg/dl amounted to 17 respondents (17.9%).

Table 2.
inlow's 60 second diabetic foot screen screening tool

| <i>inlow's 60 second diabetic foot screen screening tool score</i> | Frequency | Presentase (%) |
|--|-----------|----------------|
| Right Ekstremitas | | |
| Low | 19 | 20 |
| mild | 76 | 80 |
| High | 00 | 0 |
| Left Ekstremitas | | |
| Low | 50 | 52.1 |
| Mild | 45 | 47.9 |
| High | | |

Based on Table 2, it shows that almost all of the respondents have a risk of developing DFU in the extremity of the right leg in the moderate category, totaling 76 respondents (80.0%), and very few of the respondents have a risk of developing DFU in the extremity of the right leg in the low category, totaling 19 respondents (20.0%). Meanwhile, some of the respondents had a risk of developing DFU in the left extremity in the low category, amounting to 50 respondents (52.1%), and some of the respondents had a risk of developing DFU in the right extremity in the moderate category, totaling 45 respondents (47.4%)

The results of research using the Inlow's 60 second diabetic foot screen screening tool showed that almost all of the respondents had a moderate risk of DFU in the extremity of the right foot amounting to 76 respondents (80.0%), while for the extremity of the left foot some of the respondents had a low risk of DFU amounting to 50 respondents (52.1%). Table 3 shows the comparison of the incidence of ulcers on the left and right feet. The incidence of DFU is in the moderate category and 76 people are on the right leg and 45 on the left leg.

The etiology of diabetic foot ulcers is multifactorial. Common underlying causes are poor glycemic control, calluses, foot deformities, improper foot care, ill-fitting footwear, peripheral neuropathy and poor circulation, dry skin, etc. (Tony I. Oliver & Mesut Mutluoglu, 2023). Apart from that, DFU in diabetes mellitus sufferers is a long-term complication. DFU can be influenced by several factors, namely: the patient's age, the patient's level of awareness, the type of diabetes, the patient's habits, the patient's practices related to self-care, the presence of neuropathy. All of these things are factors that influence the occurrence of foot ulcers in diabetes mellitus patients (Prasad Pilla et al., 2019).

According to research (Rahmi AS et al., 2022), it is known that there is a relationship between the duration of suffering from diabetes and the incidence of diabetic peripheral neuropathy with a positive relationship, meaning that the longer you suffer from diabetes, the higher the risk of developing diabetic peripheral neuropathy. Diabetic peripheral neuropathy generally causes typical symptoms including numbness and paresthesia; Pain, weakness, and loss of deep tendon reflexes may accompany these symptoms. Peripheral neuropathies usually develop over months to years, while some may develop more quickly and be progressive. Peripheral neuropathy has various levels of severity and clinical manifestations, because it can affect motor, sensory and autonomic fibers (Claudia Hammi; Brent Yeung., 2021) Daily activities can put pressure on the feet of DM sufferers, a combination of plantar pressure and sensory loss due to Neuropathy causes increased injury.

Based on this condition, it illustrates that preventive measures are very important to ensure that diabetic foot injuries do not occur. Early detection of foot ulcers is an important effort that aims to determine the risk of foot ulcers and assess foot abnormalities in diabetes mellitus sufferers early, so that early action can be taken to save the lower extremities (Suprihatin & Purwanti, 2021). In an effort to early detect the risk of diabetic foot injuries (DFU) in diabetes mellitus (DM) sufferers, the Inlow's 60 Second Diabetic Foot Screen screening tool questionnaire was used. This questionnaire is designed to assess the risk of DFU and monitor the condition of the feet periodically. Therefore, it is important to do this regularly to determine the risk of diabetic foot wounds and serve as a guide in determining nursing interventions for DM patients.

According to (Canadian Association of Wound Care, 2018) DM patients with a low risk of developing diabetic foot wounds are advised to undergo screening once a year. Meanwhile, for DM patients with moderate risk, it is recommended to carry out screening every 6 months and for DM patients with a high level of risk it is recommended to carry out screening every 3 months. Therefore, foot screening for the risk of developing diabetic foot wounds is very important to identify foot problems early, prevent serious complications, provide appropriate care, and increase education and awareness.

Inlow's 60 second diabetic foot screen screening tool has received much attention over the years due to its ease of use, rapid detection of high-risk diabetic foot and clear treatment planning of actions to be taken by patients and doctors in risk categories. In addition, *Inlow's 60 second diabetic foot screen screening tool Diabetic Foot Screen* provides a systematic overview of methods that can be used by patients and doctors for foot ulcer prevention and sustainability. Screening using this tool can be used easily and anywhere without using special tools.

LIMITATION OF THE STUDY

This research involves patients with consideration of access affordability, so that patients whose access range is too far away are not involved.

CONCLUSIONS AND SUGGESTIONS

Description of the results of early detection of the risk of DFU in type 2 DM sufferers based on the ABI value for the right extremity in the normal category while the left extremity is in the mild category. Description of the Results of Early Detection of the Risk of DFU in Type 2 DM Sufferers Based on the Inlow's 60 second diabetic foot screen screening tool questionnaire on the right extremity in the medium category while the left extremity is in the

low category. Based on the results of data collection and processing, discussions were then carried out and drawing research conclusions as described above, the researcher submitted suggestions that could be used as input material to the following parties:

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CONFLICT OF INTEREST STATEMENT

No Conflict Interest

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