**Title Page:**

**The Corelation Between Age And Hypertension With Diabetic Foot Ulcer**

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**Abstract**

**Background**: Diabetic foot ulcer is wound located on foot of diabetic patient, which is related to peripheral neuropathy and/or arterial disease. Hypertension can be related to diabetic foot ulcer by its mechanism that caused peripheral artery disease. Age also can be the one of risk factor of diabetic foot ulcer, because aging occurs reduction of insulin secretion, even insulin resistance. Insulin resistance occur macroangiopathy*.*

Objective: The purpose of this study to determine the correlation between age and hypertension with diabetic foot ulcer.

**Method:** Method of this study is using cross sectional design of research. Subject of this research is 112 diabetic patients on Rumah Sakit Islam Arafah Rembang using medical record from January 2022-June 2022. Data were collected using purposive sampling and analyzed using Chi Square test, and regression logistic test.

**Results:** Significant correlation found between age and diabetic foot ulcer (p-value <0.001, odds ratio 6.756, 95%CI 2.420-18.856). Significant correlation found between hypertension and diabetic foot ulcer (p-value 0.01:<0.001, oods ratio 3.800, 95%CI 1.219-7.468). Significant correlation found between age (p-value 0.01, odds ratio 3.800, 95%CI 1.379-10.573) and hypertension (p-value <0.001, odds ratio 8.118, 95%CI 2.701-24.398) with diabetic foot ulcer.

**Conclusion:** There is significant correlation between age and hypertension with diabetic foot ulcer.

*Keyword :* Age, Hypertension, Diabetes, Diabetic foot ulcers.

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**BACKGROUND**

Diabetes mellitus has proven to be one of the health problems both internationally and nationally. In 2021, the International Diabetes Federation (IDF) estimates an increase in the prevalence of diabetes in terms of age groups. The lowest prevalence was in the age range category of 20-24 years (2.2%), and the highest in the age range category of 75-79 years (24.7%). IDF also projects the prevalence of diabetes mellitus by country, Indonesia is ranked 5th out of the top 10 countries that have the largest diabetes patients in the world, with an estimated number of diabetic patients of 19.5 million people, up from 7th in 2019, which means that Indonesia has a major contribution to the incidence of diabetes in Landmark Asia (International Diabetes Federation, 2021).

Age is one of the risk factors for diabetic ulcers, because in the aging process there is a decrease in physiological body function, especially in the pancreas which produces the hormone insulin which results in reduced secretion to insulin resistance, this then causes glucose control in the body to be less optimal (Ferawati, 2014). As a result of insulin resistance, macroangiopathy occurs which can have an effect on reducing bleeding flow, including in large or moderate blood vessels in the legs, this causes diabetics to have diabetic ulcers more easily (Yazdanpanah, et al., 2018). Several studies have shown a strong correlation between age and diabetic ulcers, such as research by (Hameed A et al, 2020), showing that there is a relationship between diabetic ulcers and demographic characteristics including age, where the age group of 36-55 and >55 years has more diabetic ulcers. In contrast to research by (Ahmad, 2022) which shows that there is no significant correlation between age and diabetic ulcer.

From the various explanations above, the idea arose to carry out research on the relationship between age and hypertension history with the incidence of diabetic ulcers at the Arafah Rembang Islamic Hospital. This research was conducted because in Central Java itself, diabetes mellitus is one of the two priorities for controlling non-communicable diseases, and the high number of diabetes mellitus patients in Rembang Regency continues to increase. The emergence of pros and cons between previous studies also prompted the authors to carry out this study.

**Subjects and Methods**

1. **Study Design**

The type of research used in this study is analytical observational, to expose the relationship between various variables and hypotheses. Cross-sectional research design used to study the relationship of age and hypertension to the incidence of diabetic ulcer.

1. **Population and Sample**

All diabetes mellitus patients recorded at RSI Arafah Rembang. The samples taken are those that meet the established restriction criteria. In sampling, the method used is a non probability sampling method of purposive sampling type.

1. **Study Variables**

The study's free variables were age and hypertension. The bound variable of this study is diabetic ulcer.

1. **Operational Definition of Variables**

Age is the time since a person is born, can be measured by units of time, and can be viewed chronologically, and can be seen the degree of development anatomically and physiologically (Nuswantari, 1998). How to measure: Observation, Measurement tool: Medical record

Hypertension is often called high blood pressure, this occurs if the systolic pressure is ≥140 mmHg and/or the diastolic pressure is ≥90 mmHg. (Ministry of Health, 2020) How to measure: Observation, Measurement tool: Medical record

Wounds found on the legs of diabetic patients (Alexiadou, 2012). Measurement method: Observation , Measurement tool: Medical record

1. **Study Instruments**

Medical record data of patients with diabetes mellitus recorded at RSI Arafah Rembang.

1. **Data analysis**

Data processing is carried out using data processing software, namely the Statistical Program and Service Solution (SPSS) program. Bivariate analysis was tested with Chi Square test, while multivariate analysis was tested with logistic regression test.

1. **Research Ethics**

Ethical Clearance No.1.712/XII/HREC/2022 Health Research Ethics Comitte Dr.Moewardi General Hospital

**Result**

The following are the results of the frequency distribution listed in table 1

Table.1 Distribution of the frequency of occurrence of age, hypertension and diabetic ulcers

|  |  |  |
| --- | --- | --- |
| **Variabel** | **n** | **%** |
| **Age** Not Elderly (≤ 46 years old) Elderly (>46 years old) | 2785 | 18.881.3 |
| **Hypertension** Hypertension Not Hypertensive | 7933 | 70.529.5 |
| **Diabetic Ulcer** Ulcer No Ulcer | 8527 | 75.924.1 |
| Sum | 112 | 100 |

The results of the study in table 1 showed that most of the respondents were in the elderly (> 46 years) namely 85 people (81.3 %), and most of them were 79 people (70.5%) suffering from hypertension, while there were 33 people (29.5%) who did not experience hypertension. The distribution of respondents based on the incidence of Diabetic Ulcer was found to be 86 people (76.8%) had ulcers, while those who did not have diabetic ulcers were 26 people (23.2%).

**Age corellation with diabetic ulcer**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Age** | **Incidence of Diabetic Ulcer** | **Sum** | **P Value** | **OR** **(95% CI)** |
| **Exist** | **None** |
|  | **n** | **%** | **n** | **%** | **N** | **%** |  |  |
| Not Elderly (≤46 years old) | 9 | 42.9 | 12 | 57.1 | 21 | 100 | <0.001 | 6.756(2,420 – 18,856) |
| Elderly (> 46 yeras old) | 76 | 83.5 | 15 | 16.5 | 91 | 100 |  |  |
| Sum | 85 | 75.9 | 27 | 24.1 | 112 | 100 |  |  |

Table 2. Age corellation with the incidence of Diabetic Ulcer

The Chi-Square test at age produces a p-value = <0.001 which means it is smaller than α = 0.05, so it can be concluded that there is a significant relationship between age and diabetic ulcers. From the analysis, an odds ratio value of 6,756 was obtained, which means that a person who is over 46 years old is 6,756 times at risk of developing Diabetic Ulcer.

**Relationship of Hypertension with Diabetic Ulcer**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Hipertension** | **Incidence of Diabetic Ulcer** | **Sum** | **P Value** | **OR****(95% CI)** |
| **Exist** | **None** |
| **N** | **%** | **n** | **%** | **N** | **%** |
| YesNo | 6520 | 82.360.6 | 1413 | 17.739.4 | 7933 | 100100 | 0.015 | 3.018(1.219 – 7,468) |
| Sum | 85 | 75.9 | 27 | 24.1 | 112 | 100 |  |  |

Table 3. Relationship of Hypertension with Diabetic Ulcer

The Chi-Square test on variable hypertension produced a p-value = 0.015<0.05, thus it can be concluded that there is a strong correlation between hypertension and Diabetic Ulcer. From the analysis, an odds ratio value of 3.018 was also obtained, which means that a person suffering from hypertension is at risk of 3,018 times to experience Diabetic Ulcer.

**Logistic regression analysis of variables related to the incidence of Diabetic Ulcer**

Table.4 Logistic regression analysis of variables related to the incidence of Diabetic Ulcer

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **Coeff B** | **Wald** | **P Value** | **OR** | **95% CI** |
| Hypertension Age | 1,3350,561 | 6,65913.912 | 0,010<0.001 | 3,8008,118 | 1,379 – 10,4732,701 – 24,398 |

The results of the logistic regression test showed that hypertension and age had a p-value of < 0.05, so it can be concluded that hypertension (p = 0.010) and age (p<0.001) have a significant relationship with the incidence of Diabetic Ulcer. The odds ratio value indicates that age has the highest OR value of 8.118 (95% CI: 2.701 – 24.398). Thus it can be concluded that a person with an age of more than 46 years is at a higher risk of developing Diabetic Ulcer compared to the age of less than 46 years.

**Discussion:**

The hypothesis that age is associated with the incidence of diabetic ulcers is acceptable, because bivariate analyses using the Chi Square test yielded a p-value of <0.001 with OR of 6,756 which mean that someone over 46 years is 6,756 time at risk of developing a diabetic ulcer. This is the same as a study (hameed et al, 2020), which showed that there was a reltionship between diabetic ulcers and demographic characteristics including age, where in that study most patients suffering diabetic ulcers came from the age group >55 years, this may be due to old age posing a risk of reduced ability to self-care due to poor vision, and impaired mobility. Age affects the development of ulcers in diabetes mellitus patients due to an increased risk of angiopathy in old age (Jeyaraman, 2019). There is a physiological decline that causes a decrease in organ function as age develops, as in the theory put forward in the book (Ole Brunner & Suddarth, 2013), that with age, carbohydrate metabolism and insulin release change, it is influenced by the accumulation of glucose in the blood, and there is an obstacle to the release of glucose that enters the cells.

The relationship between hypertension and diabetic ulcer analyzed with bivariate analysis with the Chi Square test showed a p-value of 0.015 < 0.05 with an odds ratio of 3.018 which means that there is a significant correlation between hypertension and diabetic ulcer, and someone who suffers from hypertension is at risk of 3,018 times to experience diabetic ulcers which is in line with research by (Panganugraha, 2016), diabetes mellitus patients with hypertension are easier to experience endothelial dysfunction Since nitric oxide levels decrease and trigger macroangiopathy, this situation results in tissue hypoxia that triggers the formation of ulcers on the legs.

**Conclusion:**

The conclusion that can be drawn based on the results of the study is that there is a significant relationship between age and diabetic ulcer. There is a significant association between hypertension and diabetic ulcers. Age >46 years is at 8,118 higher risk of developing Diabetic Ulcer compared to age ≤46 years6. Compliance with

**Ethical Standards:**

This work is approved by institutional ethical committe.

**Conflict of interest:**

There is no conflict of Interest in this study.

 **Acknowledgement:**

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