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# THE RELATIONSHIP BETWEEN DIABETES SELF MANAGEMENT AND ANKLE BRACHIAL INDEX VALUE IN PATIENTS WITH DIABETES MELLITUS

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**ABSTRACT**
Diabetes mellitus that is not monitored properly and correctly, it can risk causing various long-term complications that are strongly associated with worsening blood sugar control and can interfere with self-care behavior. Therefore, compliance / discipline is needed from patients in implementing diabetes self-management to improve the quality of life of patients. This study aims to determine the relationship between Diabetes Self Management and Ankle Brachial Index (ABI) values in patients with Diabetes Mellitus at UNS Hospital Surakarta City. The method used in this study is a correlation study with a cross sectional approach, the sampling technique in this study is purposive sampling at UNS Surakarta City Hospital totaling 52 samples from a total population of 106 people. Data analysis of this study was carried out by univariate and bivariate tests and agreement coefficient tests. The correlation results of the Spearman test with a value of 0.326 which shows a fairly strong correlation between the Ankle Brachial Index and Diabetes Self Management with a significant value of 0.018 (0.018 < 0.05) which means it is related or statistically significant.

Keywords: ankle brachial index (ABI); diabetes mellitus; diabetes self management

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## INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder disease caused by the pancreas not producing enough insulin or the body cannot use the insulin produced effectively. (Ministry of Health of the Republic of Indonesia, 2021). Delay in diabetes diagnosis and diabetes treatment results in an increased risk of cardiovascular disease, kidney dysfunction, blindness, and leg amputation (Petersmann et al., 2020). In general, DM complications are divided into two, namely acute complications and chronic complications. Acute complications in the form of hypoglycemia, hyperglycemia, ketoacidosis and nonketotic hyperosmolar hyperglycemia while chronic complications in the form of cerebrovascular disease, CHD, infection, nephropathy, peripheral vascular disease; neuropathy, retinopathy, diabetic ulcers and PAD (Peripheral Artery Disease). (Sahriana et al., 2023)

According to WHO data (2022), around 422 million people in the world suffer from diabetes mellitus. Based on data published by the World Health Organization (WHO), diabetes will be one of the top 10 causes of death worldwide in 2022. The International Diabetes Federation estimates that at least 463 million people aged 20-79 years in the world suffer from diabetes in 2019, equivalent to a valence rate of 9.3% of the total population of the same age. IDF estimates that the prevalence of diabetes increases with the age of the population to 19.9% or

111.2 million people aged 65-79 years. The number is predicted to continue to increase to reach 578 million in 2030 and 700 million in 2045 (IDF, 2019)

The results of the Basic Health Research report (2018) show that the prevalence of diabetes mellitus in Indonesia based on a doctor's diagnosis at the age of ≥15 years is 2%. However, the prevalence of diabetes mellitus according to the results of blood sugar tests increased from 6.9% in 2013 to 8.5 in 2018. This figure shows that only about 25% of diabetics know that they have diabetes. (Central Java Provincial Health Office, 2019 Diabetes mellitus that is not monitored properly and correctly, it can risk causing various long-term complications that are strongly associated with worsening blood sugar control and can interfere with self-care behavior. However, self-management support is still relatively underdeveloped in most countries, although optimal support is essential in chronic care. One of the main objectives of managing type 2 diabetes mellitus is to achieve glycemic control to delay or prevent the onset of diabetes complications (Zwane et al., 2023).

Some factors that can trigger poor glycemic control are poor patient adherence to predetermined treatment plans and management, poor patient attitudes (such as lack of motivation to take care of their own health), lack or limited patient knowledge (especially about diabetes, its complications and treatment goals). The goals of DM treatment include reducing the risk of complications of microvascular and macrovascular diseases, improving symptoms of complications, and reducing the number of death cases, as well as improving the quality of life of DM sufferers (Yulian, 2019). The way to prevent various kinds of complications that can be life-threatening is to use the Diabetes Self Management (DSM) approach (Pemudana, 2020).Self-management in DM is an individual activity that pays attention to and maintains health conditions and diseases, and prevents disease complications. This can be achieved by regulating and maintaining healthy living behaviors in terms of physical activity, nutrition, medicines, etc. (Islamsiasih, 2022). Self-management in people with type 2 diabetes requires regular handling in blood glucose monitoring, diet management, physical activity, medication, and ongoing medical care (Crittendon, 2020).

There are several diabetes self-management actions that can be done by DM sufferers to control DM, namely by doing physical activity to maintain body fitness and insulin sensitivity will be improved, exercise to increase blood flow and nerves throughout the body so as to control diabetes, diabetic diet so that blood glucose levels and blood pressure can be maintained and reach normal limits and lipid profiles (cholesterol) The risk of cardiovascular disease can also be prevented by applying nutritional intake and changing lifestyle and monitoring blood sugar to find out whether the therapeutic target has been achieved or not, if the therapeutic target has not been achieved, drug adjustments will be made according to the dose. Therefore, compliance / discipline is needed from patients in implementing diabetes self-management to improve the quality of life of patients (Riyanti, 2022).

However, there is one complication of type 2 diabetes mellitus that affects the peripheral nervous system, namely Peripheral Arthery Disease (PAD) is a condition where there are lesions in the blood vessels, causing blood flow in the arteries that supply blood to the extremities to be limited. Further examination needed on suspicion of PAD is the measurement of Ankle brachial index (ABI) which is the ratio of blood pressure in ankle and brachial. ABI values are considered normal when ≥1.0 while ABI values ≤0.9 can help establish the diagnosis of PAD. (Purwanti, 2019)

Based on a preliminary study conducted by researchers at UNS Hospital Surakarta City on DM patients in January-August 2023. There were 106 diabetics, researchers distributed the Diabetes Self Management Questionnaire (DSMQ) questionnaire to 20 people with DM and observed ABI examination with a coefficient of agreement test at UNS Hospital Surakarta City, especially in the inpatient ward. From the results of the questionnaire distributed to 20 people with DM, the results of answers were not appropriate (15%), quite appropriate (25%), appropriate (35%) and very appropriate (25%) and the results of abnormal ABI values or could be distributed as light PAD with values (0.70-0.90). Each patient does not understand about DSM which affects PAD which is involved in one of the complications of diabetes mellitus. This problem prompted researchers to conduct research on the relationship between Diabetes Self Management and Ankle Brachial Index scores in diabetics at UNS Hospital Surakarta City. This study aims to determine the relationship between Diabetes Self Management and Ankle Brachial Index (ABI) values in patients with Diabetes Mellitus at UNS Hospital Surakarta City.

## METHOD

This research is a quantitative research with the research design used is a correlation study method with a cross sectional approach. The sampling method in this study is purposive sampling with inclusion criteria, namely type 2 DM patients who are treated at UNS Surakarta City Hospital with age (18-90 years), willing to be respondents in the study and with exclusion criteria, namely DM sufferers who have physical, mental or cognitive limitations that can interfere with research (blind, deaf, mentally disabled) and DM sufferers with loss of consciousness. This study was carried out in the inpatient ward of UNS Hospital Surakarta City, starting from the preparation of proposals to the end of preparing the final report in June 2023 to January 2023 using a total sampling of 52 people who have diabetes. The instrument in this study used the Diabetes Self Management Questionnaire (DSMQ) consisting of 16 questions and demographic data (gender, age, education level, occupation, smoking history and disease complications), sphygnomanometer and stethoscope to measure ABI values.

Penelitian ini menggunakan Uji validitas dan reliabilitas kuesioner DSMQ baku yang telah dilakukan oleh Fuadi (2018) menggunakan SPSS 24 dengan degree of freedom 30-2 =28 (r tabel =0,374) didapatkan hasil dari 14 pertanyaan ada 2 item pertanyaan yang tidak valid yaitu pertanyaan nomer 4 (r = -0,171) dan nomer 9 (r = -0,044), tetapi karena substansi dari pertanyaan tersebut dianggap penting, maka item tersebut tidak dihilangkan, namun diperbaiki struktur kalimatnya. Uji reliabilitas kuesioner DSMQ telah dilakukan oleh Fuadi (2018) didapatkan hasil r Alpha Cronbach's 0,641 (r Alpha > 0,374), sehingga kuesioner DSMQ tersebut dikatakan reliabel. (Arsi, 2021) Analysis of research data was carried out by univariate and bivariate tests and agreement coefficient tests. Univariate analysis aims to identify data on respondent characteristics (age, sex, occupation, education level, smoking history, disease complications) Diabetes Self Management and ABI scores. While bivariate analysis aims to determine the relationship between independent variables and dependent variables with the aim of determining the relationship between Diabetes Self Management and ABI values. The analysis carried out is the analysis of the relationship between variables with ordinal scales and variables with nominal scales, then the statistical test used is using the Spearman test and all calculations will be tested using SPSS. This research has gone through a research ethics test process by the Research Ethics Committee of the Faculty of Medicine, Sebelas Maret University with the results of passing the ethical test (No.: 20/UN27.06.11/KEP/EC/2024). This shows that the implementation of this research has fulfilled the ethical principles of research in upholding the integrity of researchers and the rights of respondents.

## RESULTS

The results of data identification through interviews, direct observation and document review are presented as follows:

Table.1
Frequency Distribution of Respondent Characteristics

| Characteristic | f | % |
|---|---|---|
| Gender | | |
| Man | 24 | 46.2 |
| Woman | 28 | 53.8 |
| Age | | |
| 30-50 old | 14 | 26,9 |
| 51-70 old | 33 | 63,5 |
| >70 old | 5 | 9,6 |
| Work | | |
| Working | 38 | 73.1 |
| Not Working | 14 | 26.9 |
| Educational Level | | |
| > Senior High School | 29 | 55.8 |
| < Senior High School | 23 | 44.2 |
| Smoking History | | |
| Ever | 25 | 48.1 |
| Never | 27 | 51.9 |
| Complications of the disease | | |
| Have | 11 | 21.2 |
| Nothing | 41 | 78.8 |

Based on the data above, it can be explained that the characteristics of respondents based on gender with male categories by 46.2% and women by 53.8%, respondent characteristics based on age most respondents aged 51-70 years by 63.5%, respondent characteristics based on occupations with work categories by 73.1%, the majority of respondents work as laborers and do not work by 26.9%, respondent characteristics based on educational history by category> SMA by 55.8% and < SMA by 44.2%, respondents' characteristics based on smoking history with previous categories of 51.9% and never 48.1%, respondents' characteristics based on disease complications with existing categories of 21.2%, the majority of disease complications owned by respondents are hypertension and no complications by 78.8%.

Table.2
Diabetes Frequency Distribution Self Management

| Characteristic | f | % |
|---|---|---|
| Good | 12 | 23.1 |
| Enough | 30 | 57.7 |
| Less | 10 | 19.2 |

Diabetes Self Management distribution was obtained by distributing DSMQ questionnaires to respondents consisting of 16 questions with scores of less good (≤ 16), sufficient (17-23), good (24-48). The results of frequency distribution showed that most respondents had a level of self-management with sufficient categories as many as 30 respondents (57.7%), a level of self-management with a good category of 12 respondents (23.1%) and a category of less as many as 10 respondents (19.2%)

Table.3
Frequency Distribution of Ankle Brachial Index Value

| Characteristic | F | % |
|---|---|---|
| Normal | 24 | 46.1 |
| Lightweight PAD | 21 | 40.4 |
| Medium PAD | 7 | 13.5 |

Distribution of Ankle Brachial Index values obtained by making measurement observations to respondents. The results of frequency distribution showed that most respondents had Ankle Brachial Index values with normal results of 24 respondents (46.1%). In respondents with the results of ABI scores in the light PAD category as many as 21 respondents (40.4%) and the medium PAD category as many as 7 respondents (13.5%).

Tabel.4
Data Normality Test Results

| Variabel | Kolmogrov-Smirnov | Sig | Distribusi |
|---|---|---|---|
| Diabetes Self Management (X) | .236 | .000 | Tidak Normal |
| AnkIe Brachial Index (Y) | .138 | .015 | Tidak Normal |

Based on the Kolmogorov-Smirnov score, Diabetes Self Management (X) is 0.236 and AnkIe Brachial Index (Y) of 0.138 with the significance of Diabetes Self Management (X) 0.001 (0.001 < 0.05) and the significance of AnkIe Brachial Index (Y) 0.015 (0.015 < 0.05) which is with a result of more than 0.05 which means the residual data is abnormally distributed so that it uses the Spearman test.

Tabel. 5
Spearman Correlation Test Results

| | | | Diabetes Self Management (X) | AnkIe Brachial Index (Y) |
|---|---|---|---|---|
| Spearman's rho | Diabetes Self Management (X) | Correlation Coefficient | 1.000 | .326* |
| | | Sig. (2-tailed) | . | .018 |
| | | N | 52 | 52 |
| | AnkIe Brachial Index (Y) | Correlation Coefficient | .326* | 1.000 |
| | | Sig. (2- tailed) | .018 | . |

Based on the non-parametric correlation test shown above, it can be seen that the correlation between variables from Diabetes Self Management (X) and AnkIe Brachial Index (Y) shows a positive correlation number of +0.326, this means that the Ankle Brachial Index depends on Diabetes Self Management, and vice versa. The correlation results of the Spearman test with a value of 0.326 which shows a fairly strong correlation between the Ankle Brachial Index and Diabetes Self Management with a significant value of 0.018 (0.018 < 0.05) which means it is related or statistically significant.The results of the agreement coefficient test calculate the reliability of observation instruments using a formula from Arikunto (2006) with the agreement coefficient of two observers. In calculating reliability using manual means. If the reliability value of the instrument is said to be reliable if it is very close to 1, the reliability criterion is high. The results of observational reliability tests with formulas from Arikunto (2006). The results of the contingency agreement calculation show that the observation sheet used is reliable. This means that it has been proven from the value of patient 1 to patient 5 that the acquisition of 0.7 to 1 (>0.6) can be concluded that the results are reliable.

## DISCUSSION

### Diabetes Self Management in Diabetes Mellitus Patients

Based on the results of the study above, it is known that the majority of people with diabetes mellitus have self-management with a good category as many as 30 respondents (57.7%) and

are women with an average age of 51-70 years. Researchers assume that respondents with good self-management are due to secondary education and higher education. The higher a person's level of education, the more information he obtains and strives to improve his health, including self-care in diabetes. The majority of respondents with good self-management are female, according to researchers this is because women will be more concerned about their health status so that self-care in diabetes is really considered. This is in line with research conducted by Hartono (2019), most respondents have good self-management with the results of their research showing the age of more than 40 years. Age has a positive relationship with diabetes mellitus self-management, where a person's age who is maturing will have a lot of experience about the treatment or management of diabetes mellitus. By implementing good self-management, it can prevent complications. In this study, some respondents had sufficient self-management. This is because some respondents lack in controlling diet and monitoring blood sugar. This research is in line with what was conducted by Islamsiasih (2022) in the aspect of physical activity and monitoring blood sugar levels has less self-management, this is because the majority of respondents only monitor blood sugar at the initiative of the doctor so that patients feel the need to monitor if recommended by the doctor and feel the body is abnormal. (Islamsiasih, 2022)

**Ankle Brachial Index Value in Diabetes Mellitus Patients**

Based on the results of the study above, it is known that the majority of people with diabetes mellitus have ankle brachial index values with normal categories as many as 24 respondents (46.1%) are female. This study is in line with Pratomo (2020) found that 76 respondents (77.5%) had normal ABI with the highest number of women at 49 people (79.0%). This is evidenced that the majority of respondents work or routinely do physical activities such as gymnastics as many as 38 respondents (73.1%) and those who do not work as many as 14 respondents (26.9%). According to the American Diabetic Association (2015), exercise can also affect type 2 diabetes mellitus in high-risk individuals. By exercising glucose in the blood is burned into energy so that energy cells become sensitive to insulin, blood circulation becomes better and the risk of type 2 diabetes mellitus is reduced by 50% (Purwanti, 2019) This is in line with the theory that the normal ABI interpretation means that blood is still circulating properly, without significant obstruction in peripheral blood vessels, so that the nutritional and oxygen needs of the lower extremities can still be met properly(Pratomo, 2020)

**The relationship of Diabetes Self Management with Ankle Brachial Index scores**

The correlation results of the Spearman test with a value of 0.326 which shows a fairly strong correlation between the Ankle Brachial Index and Diabetes Self Management with a significant value of 0.018 (0.018 < 0.05) which means it is related or statistically significant. In this study, researchers assume that the results of the Ankle Brachial Index value depend on the respondent's Diabetes Self Management, and vice versa. According to the American Diabetes Association (2018) if someone does not do self-management properly, and proper control is not carried out, there will be an increased risk of complications and can be life-threatening if not treated immediately, for that good self-management is needed to manage the disease and prevent complications. Based on this study, the majority of respondents have self-management with good categories and normal ABI value results. This is due to several factors that support self-management compliance, namely factors such as age, gender, education level and respondent occupation. This study is similar by Dwitanta (2020) that the elderly show a low level of self-care in managing symptoms and difficulty in complying with self-care behavior in the long term and low education levels also affect the level of knowledge of respondents(Dwitanta, 2020)

**Research Limitations**

Limited data collection, most researchers read the contents of the questionnaire, because of the limited speed and understanding of respondents to read the questionnaire, and when read also needs to be repeated because there are respondents who are not understood Limitations in the number of samples, in this study may involve only a small number of participants, so the results may not be widely applicable to larger populations

## CONCLUSION

In this study, the majority of respondents suffering from diabetes mellitus were women with an age range of 51-70 years, the majority of respondents were high school and undergraduate education, most of them were still actively working, the majority of respondents had no history of smoking and most respondents had no complications of the disease, in managing Diabetes Self Management the majority of respondents had sufficient abilities and got normal ABI value results. Some of the factors that affect Diabetes Self Management and Ankle Brachial Index scores include gender, age, education level, occupation, smoking history and disease complications.This study can be concluded that there is a relationship between Diabetes Self Management and Ankle Brachial Index values in diabetics at UNS Hospital Surakarta City.

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