

Description Of Ankle Brachial Index In Persadia Community Who Undergo Diabetes Foot Gymnastics At Subang District Hospital

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Abstract, Introduction: Diabetes mellitus is a degenerative disease with an increasing number of patients characterized by hyperglycemia due to impaired insulin secretion. Ineffective management in managing DM disease will result in complications such as peripheral artery disease (PAP). One of the examinations that can be done to find out the condition of the blood vessels of the lower extremities is by measuring the Ankle Brachial Index. One of the efforts to prevent the occurrence of PAP is by exercising diabetic feet. The purpose of this study is to analyze the picture of the Ankle Brachial Index in the Persadia Community who undergo diabetic foot exercises at Subang Hospital. **Method:** The method used in this study is quantitative descriptive. The sample in this study was 59 people taken using a simple random sampling technique. Data collection in this study used a sphygmomanometer and observation sheet, data analysis using frequency distribution. **Results:** The results of the study showed that the characteristics of respondents in the Persadia Community were 59 women (100.0%) with an average age of 50.03 years, IRT jobs as many as 28 people (47.5%) with the last high school education level of 35 people (59.3%). Meanwhile, the majority of ABI scores in the persadia community with an average score of 1.02. **Conclusion:** This study can be an input for DM patients to conduct routine ABI examinations to detect early vascular disorders in the extremities and as a prevention of the risk of leg ulcers.

Keywords : Diabetes Mellitus, Diabetes Foot Exercises, Ankle Brachial Indeks.

1. INTRODUCTION

Diabetes mellitus is a degenerative disease with an increasing number of patients characterized by hyperglycemia due to impaired insulin secretion. Ineffective management in dealing with DM will lead to complications such as peripheral artery disease (PAP). One of the examinations that can be done to determine the condition of the lower extremities' blood vessels is measuring *the Ankle Brachial Index*. One of the efforts to prevent the occurrence of PAP is diabetic foot exercises. This study aimed to analyze Diabetes mellitus is one of the non-communicable diseases that have a risk of causing death; this causes the prevalence and incidence to continue to increase every year, namely as many as 643 million in 2030 and 783 million in 2045 (*International et al.*, 2021). One of the most common complications of diabetes mellitus is diabetic foot ulcers due to pathological disorders such as infections, ulcers, and amputations. To overcome this complication, physical activity such as sports or diabetic foot exercises is recommended because it can improve peripheral blood circulation and improve nerve function (Matos et al., 2019). To prevent and overcome the occurrence of diabetic foot ulcers, one of the severe complications of diabetes mellitus, it is necessary to

take specific measures. These measures include measuring *Ankle Brachial Index* (ABI) values using a *Sphygmomanometer* to assess the condition of peripheral arteries (Lung et al., 2020).

Diabetic foot injuries are a severe problem with a high prevalence, especially in Indonesia. According to a report by *the International Diabetes Federation* (IDF, 2021), the number of cases of diabetic foot wound prevention ranges from 9.1 million to 26.1 million every year. In Indonesia, diabetic foot injuries are the cause of most hospital care, with a percentage of 80%. The prevalence of diabetic foot injuries in Indonesia reaches around 15%, with an amputation rate of 30% and a mortality rate of 32%.

Diabetes mellitus is a degenerative disease with an increasing number of patients characterized by hyperglycemia due to impaired insulin secretion. Ineffective management in dealing with DM will lead to complications such as peripheral artery disease (PAP). One of the examinations that can be done to determine the condition of the lower extremities' blood vessels is measuring *the Ankle Brachial Index*. One of the efforts to prevent the occurrence of PAP is diabetic foot exercises. This study aimed to analyze Diabetes mellitus is one of the non-communicable diseases that have a risk of causing death; this causes the prevalence and incidence to continue to increase every year, namely as many as 643 million in 2030 and 783 million in 2045 (*International et al.*, 2021). One of the most common complications of diabetes mellitus is diabetic foot ulcers due to pathological disorders such as infections, ulcers, and amputations. To overcome this complication, physical activity such as sports or diabetic foot exercises is recommended because it can improve peripheral blood circulation and improve nerve function (Matos et al., 2019). To prevent and overcome the occurrence of diabetic foot ulcers, one of the severe If diabetes mellitus is not treated correctly, it can cause serious complications in the form of Peripheral Artery Disease (PAP). According to *the World Health Organization* (WHO), there are more than 17.8 million deaths from PAP every year.

Data from the Indonesian Ministry of Health in 2023 notes that the death rate due to PAP in Indonesia reaches 650,000 people per year. PAP is caused by atherosclerosis, which occurs in peripheral arteries. Atherosclerosis causes hardening and narrowing of blood vessels due to plaque buildup on the walls of blood vessels. When hyperglycemia occurs (high blood glucose levels), the blood can become viscous, obstructing blood supply to tissues and increasing the risk of atherosclerosis. (Simanjuntak, et al 2019). Atherosclerosis in peripheral vascular disease can cause decreased blood flow (perfusion) to the lower extremities. This decrease in blood flow can be characterized by a decrease in ABI (Surya et al., 2019).

ABI is a *non-invasive examination* of blood vessels used to detect clinical signs and symptoms of ischemia, a decrease in peripheral perfusion that can lead to angiopathy and diabetic neuropathy. This method involves measuring blood pressure in the *Ankle* (feet) and *Brachial*(hands) regions using a *Sphygmomanometer*. The results of ABI measurements provide information about the blood circulation in the lower limbs. The range of ABI values is usually between 0.90 to 1.2, indicating average blood circulation to the limb region. Decreased peripheral blood flow may be indicated if the ABI value <0.9 . The comparison of systolic blood pressure in the foot and hand area gives this value (Katuk, 2019).

Diabetic foot gymnastics can increase ABI in patients with diabetes mellitus. Based on the study results (Toton, 2019), there was a significant difference in mean ABI between the treatment group that received foot gymnastics intervention and the control group that did not. The mean ABI in the group that did leg gymnastics was higher than in the group that did not. In theory, diabetic foot gymnastics can help improve blood circulation, improve leg blood flow, and also increase systolic blood pressure in the legs. Physical exercise, such as foot gymnastics, is believed to strengthen the small muscles of the feet and help prevent foot deformities in patients with diabetes mellitus (Ministry of Health RI, 2019).

2. MATERIAL AND METHODS

This type of research is quantitative research with a descriptive approach. The population in this study was members of the Persadia Community who underwent diabetic foot ssena at Subang Regional Hospital, as many as 145 people. Samples were taken from as many as 59 people with sampling techniques using *Accidental Sampling*.

The research instrument used in this study was a demographic questionnaire consisting of respondents' age, gender, education and occupation. The measuring instrument used in this study was a Sphygmomanometer to obtain data on *Ankle Brachial Index values*, observation sheets to record the results of *Ankle Brachial Index values*, and Operational Standards for *Ankle Brachial Index measurement procedures*. First, take care of the research permit letter by bringing a letter from campus to the Subang Regency Hospital, then ask permission from the RSUD, and after getting permission from the RSUD, ask permission from the Persadia Community to get initial data. The researcher continues the research process by selecting prospective respondents according to the criteria, doing a time contract, introducing themselves to respondents, and then providing informed *consent*. The tools used in the study were a *Sphygmomanometer* and an observation sheet to record the blood pressure of respondents.

Then, researchers measured the respondent's blood pressure on the right arm (*brachial*) and then on the left arm using a digital sphygmomanometer and recorded systolic pressure on each arm. Afterwards, researchers measured blood pressure in the right *leg (ankle)* and left foot using a digital sphygmomanometer and recorded systolic pressure on each leg. The ABI calculation formula compares systolic pressure dividing the highest systolic pressure of both extremities in the ankle area with the highest systole in the brachial area. After completion, researchers proceed to process the data that has been collected and then analyzed and presented in the discussion. In this study, univariate analysis will be presented in the form of a frequency distribution table of independent variables and related variables.

3. RESULT

Table 1. Characteristics of Demographic Data

Characteristic	N	%
Age		
Mean	50,3	
Gender		
Woman	59	100
Legal Law	0	0
Education		
SD	0	0
SMP	10	16,9
SMA	35	59,3
College	14	23,7
Work		
Not Working	0	0
PNS/TNI/POLRI	14	23,7
Wiraswasta	17	28,8

IRT	28	47,5
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Based on the results of the study, table 1 explains the demographic data of respondents based on gender; most of them are women, with a total of 59 respondents (100%). The results of age characteristics obtained showed that the average age of respondents was 50.3 years. The results of educational demographic characteristics were mostly high school education as many as 35 respondents (59.3%). The results of most job characteristics are IRT as many as 28 respondents (47.8%).

Table 2. Ankle Brachial Index Value Distribution

VARIABLE	Mean	Minimum	Maximum	SD
Nilai ABI	1,02	0,7	1,3	0,1644

Based on table 2 Based on the table above, the distribution of respondents ABI scores in the Persadia Community of Subang Regency Hospital found that the average value was 1.02.

4. DISCUSSION

a. Age Characteristics

At the age characteristics, individuals will be at risk of developing diabetes mellitus starting at the age of 10-14 years. Respondents in this study that the average age of respondents was 50.03 years. According to research by Detty et al. (2020), they were said that at the age of 50-65 years have a high risk of developing DM with diabetic ulcer complications. This condition is caused by reduced secretion or insulin resistance, causing the body to be unable to control high blood sugar. From this age, individuals of higher age tend to develop diabetes. In addition, age also affects the prevalence of atherosclerosis; atherosclerosis will also increase the intensity or chance of diabetic foot ulcers to be higher. A lack of physical activity causes diabetic foot ulcers and amputations without adequate diet, and other diseases aggravate diabetes.

Thus, it can be concluded that age is a major internal factor that plays a vital role in the development of diabetic ulcers, and the older a person is, the higher the risk of developing diabetes and its complications, including diabetic ulcers.

b. Gender Characteristics

The analysis showed that the number of respondents was predominantly female, as much as 100.0%. According to research by Hidayah et al. (2021), in general, women are more susceptible to diabetes than men because there is a menopausal process causing resistance to the hormone insulin. According to Taylor (2019) states that the leading cause of many women developing diabetes is a decrease in the hormone estrogen, especially during menopause. The hormones estrogen and progesterone can increase the insulin response in the blood. When menopause begins, the insulin response decreases due to the low levels of the hormones estrogen and progesterone. According to research by Hereiter et al. (2019), women have a higher risk of developing diabetes than men. This is because women have a greater chance of experiencing an increase in body mass index or risk of obesity than men due to hormonal processes, monthly cycle syndrome, or postmenopause that facilitates the accumulation of body fat distribution if there is insulin resistance.

Thus, women are more susceptible to diabetes due to the process of menopause and increased BMI, which can cause resistance to the hormone insulin, and women have a lower possibility of experiencing diabetes complications.

c. Educational Characteristics

Respondents in this study mostly had a high school education level of 59.3%. According to (Doubova et al., 2019), the level of education usually refers to a person's knowledge. Lack of knowledge about health at the educational level can be an obstacle that will reduce the involvement of individuals in disease prevention and management programs so that they are vulnerable to various diseases such as diabetes mellitus.

Thus, the researchers concluded that when ABI is below normal tends to cause complications;. However, there is no direct relationship between education level and the incidence of diabetic foot ulcers, there is a relationship between education level and the incidence of diabetes mellitus, where individuals with low education levels have a higher risk of developing diabetes.

d. Job characteristics

The results of the analysis showed that most of the respondents' work was IRT as much as 47.5%. According to Khoirun (2019) research which found that most respondents have a work status, most of whom are housewives (IRT), will be at risk of developing diabetes mellitus because they tend to do less physical activity so that the

metabolic process or burning calories does not work properly. This is because it has reached old age, the luxury of housewives has become no longer the main task but has been helped by others so that IRT is just a status in the household, housework is no longer handled by individuals with conditions like this because their physical activity is limited.

Thus researchers concluded, that the type of work affects the risk of diabetes mellitus, work with less physical activity can cause lack of energy burning so that it can cause weight gain and a great risk of developing diabetes mellitus.

e. ABI depiction in Persadia Community undergoing foot gymnastics

The study's results found that the average ABI value of respondents was 1.02. Pratomo (2019) concluded that the ABI value of 1.02 in the ABI interpretation is average, which means that blood is still circulating properly without any significant blockage in peripheral blood vessels so that the nutritional and oxygen needs of the lower extremities are still well met. Diabetic foot exercise is one of the physical exercises for people with diabetes that can improve blood circulation and prevent the development of diabetic foot ulcers.

According to Ernawati (2019), DM patients with an ABI value of 0.7 are interpreted *as borderline perfusion. These patients are two to three times more likely to experience peripheral blood vessel blockage in the form of PAP than non-DM patients. DM patients experience changes in the elasticity of blood vessel capillaries, thickening of blood vessel walls and plaque or thrombus formation, which usually results in ABI values in DM patients lower than normal ranges.*

Low ABI values in people with diabetes are caused by several factors, namely blood sugar, insulin therapy, diet therapy, physical activity, and age. DM sufferers over the age of 45 are at risk of experiencing disorders, especially in blood circulation, one of which is PAP. The main signs and symptoms are pain in the leg area that has narrowed blood vessels, as well as diabetic foot exercises that can improve blood circulation and can be one way to prevent DM complications (Pramesti, 2019).

ABI measurements can assess the condition of the limbs and whether DM patients have impaired circulation in the peripheral areas of the legs. The more often you do leg exercises or routinely do them, the ABI score shows average values. This is to the research of Prihatin, T.W (2019), which shows that diabetic foot exercises affect changes in ABI values in DM patients, which is characterized by an increase in ABI

between 0.09 before foot gymnastics ABI values are at 0.88 (*borderline perfusion*) and after foot exercises, ABI values are at 0.97 (normal ABI).

Thus, foot gymnastics as a preventive measure for peripheral artery disease in the leg area, which, if left unchecked, can be at risk of developing into diabetic foot ulcers and ABI as an indicator of assessment of peripheral vascularization disorders. So, from all the discussion above, it can be concluded that foot gymnastics can significantly increase the value of ABI in people with diabetes mellitus accompanied by comorbidities or not accompanied by comorbidities (complications).

Researchers are aware of limitations in the implementation of research. The limitation is that this study did not examine the length of suffering from diabetes in the demographic questionnaire, so it is expected that future studies can complete the demographic questionnaire of suffering from diabetes in the Persadia Community. All respondents were not controlled for their activities, and respondents were not studied to follow diabetic foot exercises regularly.

5. CONCLUSION

Based on the study's results, data on the characteristics of respondents in the Persadia community who underwent diabetic foot exercises showed that the average respondent was female, with an average age of 50.03. IRT employment is 47.5%, with a recent high school education rate of 59.3%. The ABI score in the Persadia community undergoing diabetic foot exercises is an average value of 1.02.

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