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Overview of the Ankle Brachial Index Value of Patients with Type II Diabetes Mellitus at Santa Elisabeth Hospital Medan 2025

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Abstract. Type II Diabetes Mellitus is one of the chronic diseases whose prevalence continues to increase and has become a global health issue. A common complication in patients with Type II Diabetes Mellitus is peripheral circulatory disorders, which can be identified through the Ankle brachial index (ABI) examination a non-invasive method used to detect peripheral artery disease. ABI testing is essential for early detection and prevention of serious complications such as diabetic ulcers. This study aims to describe the Ankle brachial index values in patients with Type II Diabetes Mellitus at Santa Elisabeth Hospital Medan in 2025. This research used a descriptive quantitative method with purposive sampling technique. The study sample consisted of 52 respondents from a total population of 109 patients diagnosed with Type II Diabetes Mellitus. Data collection was conducted through observation sheets and measurement of systolic blood pressure in the upper and lower extremities using a sphygmomanometer and stethoscope. The ABI value was calculated based on the ratio between the highest ankle systolic pressure and the highest brachial systolic pressure. Data were analyzed using tabulation techniques and presented in tables and diagrams. The results showed that the majority of respondents had normal ABI values (>0.90), totaling 33 individuals (63.5%), while 19 individuals (36.5%) experienced abnormal ABI values (≤0.90). Conclusion: The study concludes that most patients with Type II Diabetes Mellitus at Santa Elisabeth Hospital Medan had ABI values within the normal range. However, a considerable proportion with abnormal ABI indicates the necessity of routine ABI screening as a preventive measure against peripheral vascular complications in diabetic patients. This study is expected to serve as a reference in developing nursing interventions aimed at improving the quality of life for patients with Type II Diabetes Mellitus.

Keywords: ABI Values; Ankle Brachial Index; Nursing; Peripheral Artery Disease; Type II Diabetes Mellitus.

1. INTRODUCTION

Type II diabetes mellitus is a chronic disease that occurs when glucose levels in the blood rise because the body cannot produce enough insulin or the body cannot use the hormone insulin effectively. Insulin is an important hormone produced in the body's pancreatic gland, and transports glucose from the bloodstream to the body's cells where glucose is converted into energy. Lack of insulin or the inability of cells to respond to insulin leads to high blood glucose levels, or hyperglycemia, which is a hallmark of diabetes mellitus (Nurjannah & Asthiningsih, 2023; Cintantya et al., 2024).

Diabetes mellitus (DM) is a chronic disease in the form of metabolic disorders characterized by blood sugar levels exceeding normal. The prevalence of DM is estimated to increase as the population ages to 19.9% or 111.2 million people aged 65-79 years. The number is predicted to continue to increase until it reaches 578 million in 2030 and 700 million in 2045. The International Diabetes Federation (IDF) has identified the 10 countries with the largest number of people with diabetes mellitus in the world. Indonesia is ranked 7th among these 10 countries, being the only country in Southeast Asia on the list, so it can be estimated that Indonesia's contribution to the prevalence of DM cases in Southeast Asia can be estimated (Infodatin, 2020).

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Based on an initial survey conducted in the study on October 20, 2023 at Putri Hijau Kindergarten II Hospital, data on patients with diabetes mellitus in 2021 amounted to 149 people, and there was an increase in 2022 in patients with type II diabetes mellitus amounting to 325 people and there was another increase in 2023 amounting to 326 people (Tambunan, 2024). Diabetes Mellitus is still a global health problem because the number of sufferers is still high around the world (Megawati et al., 2020) The International Diabetes Federation (IDF) in 2021 recorded 537 million adults (ages 20-79) or 1 in 10 people living with diabetes worldwide.

Complications in DM patients, especially in adults and the elderly, usually occur due to uncontrolled blood sugar for a long time and due to a decrease in immunity. Individuals with diabetes have a higher risk of disability and the threat of health problems than individuals without diabetes mellitus continuous glucose levels will result in serious diseases affecting the heart, blood vessels, eyes, kidneys, and nerves. Individuals with diabetes will also be at high risk of developing infections (Tursinawati et al., 2020; Febrianty et al., 2025).

Diabetes also causes 6.7 million deaths or 1 in every 5 seconds in the world. China is the country with the highest number of adults with diabetes. 140.87 million of China's population were living with diabetes in 2021. Furthermore, India is recorded as having 74.19 million diabetics, Pakistan 32.96 million, and the United States 32.22 million. Indonesia is in fifth position with 19.47 million people with diabetes. With a population of 179.72 million, this means that the prevalence of diabetes in Indonesia is 10.6% (Tursinawati et al., 2020).

Ankle brachial index is a non-invasive examination of blood vessels that functions to detect clinical signs of ischemia, decreased peripheral perfusion that can result in angiopathy and diabetic neuropathy. The ankle brachial index is a simple method by measuring blood pressure in the ankle (leg) and brachial (hand) regions using aneroid sphygmomsnometer and vascular Doppler then the value taken is the highest systolic value in both legs divided by the highest systolic blood pressure of both hands (Artikaria & Machmudah, 2022).

According to Harmilah et al. (2021) efforts can be made to recognize peripheral vascular flow problems by examining ABI values in individuals with diabetes mellitus are very important for patients with diabetes mellitus to understand the importance of early detection by estimating the systolic values of the arms and legs to assess peripheral vascular disease. According to Kartikadewi et al. (2022) ankle brachial index (ABI) is a non-invasive measure to assess the risk of decreased circulation to peripheral arteries to prevent diabetic ulcers. Nurses and health workers need problems that occur in the lower extremities of patients with diabetes mellitus, it is hoped that routine ABI measurements to identify early blood vessel

problems can also be the legs of people with diabetes mellitus and as a countermeasure to the incidence of diabetic foot injuries according to (Tursinawati et al., 2020).

Nurses and health workers need problems that occur in the lower extremities of diabetic mellitus patients, it is hoped that routine ABI measurements to identify early blood vessel problems can also be part of the legs of diabetic patients and as a countermeasure to the incidence of diabetic foot injuries according (Tursinawati et al., 2020).

According to a preliminary survey conducted by the authors at Santa Elisabeth Hospital Medan in 2025, 109 diabetes mellitus patients by 2025, from January to February 2025. Based on the background that has been described, the author is interested in conducting a study titled Overview of Ankle Brachial Index Values in Patients with Type 2 Diabetes Mellitus at Santa Elisabeth Hospital Medan in 2025.

2. LITERATURE REVIEW

Diabetes mellitus (DM) is a chronic disease that occurs due to the pancreas not producing insulin optimally. Diabetes mellitus (DM) is also accompanied by disorders in carbohydrate, fat, and protein metabolism which is associated with protein insulin deficiency because the body cannot expel or use insulin (Nurjannah & Asthiningsih, 2023). Diabetes mellitus (DM) causes a disturbance in the body's metabolism where the pancreas cannot produce the hormone insulin for the body's needs so that blood sugar levels increase (Nurjannah & Asthiningsih, 2023; Eliza et al., 2026).

Prevention of type 2 diabetes mellitus (DM) in at-risk individuals can be done by implementing a healthy lifestyle, such as exercising regularly, maintaining an ideal weight, and eating nutritious foods. Recommended physical activity includes regular exercise at least 3-4 times a week or at least 150 minutes per week, which can increase HDL levels as well as help reduce insulin resistance, especially in individuals with prediabetes.

Ankle Brachial Index (ABI) is a non-invasive screening method used to detect Peripheral Arterial Disease (PAD) recommended by the American Heart Association (AHA) (Kartikadewi, Wahab & Andikaputri, 2022). The Ankle Brachial Index (ABI) works on the same principle as blood pressure, which is the result of multiplying between cardiac output and peripheral resistance. In patients with diabetes mellitus who experience ineffective peripheral tissue perfusion, increased cardiac output and peripheral blood resistance may lead to increased blood pressure. Ankle Brachial Index (ABI) is considered normal when the blood pressure in the legs is proportional to brachial blood pressure, which indicates blood flow to the periphery, including the legs, remains effective. Ankle brachial index (ABI) also reflects the condition of

vascularization of the lower extremities, where the lower the value of the ankle brachial index (ABI) (< 0.91), the worse the vascularization that occurs (Simanjuntak et al., 2020).

3. RESEARCH METHOD

The type of research design used is a descriptive study to find out the Overview of the Ankle Brachial Index Value of Patients with Type II Diabetes Mellitus at Santa Elisabeth Hospital Medan in 2025. The population in this study is patients with type II diabetes mellitus at Santa Elisabeth Hospital Medan. In this proposal, the population analyzed is patients with type 2 diabetes mellitus at Santa Elisabeth Hospital Medan, with a total population of 109 individuals.

Overall sampling in this study uses the purposive sampling technique, which is a sampling technique where the number of samples is equal to the population (Nursalam, 2020). The number of samples was obtained 52 patients. Good research instruments must meet reliability (consistent results), validity (accurately measuring variables), and sensitivity (sensitivity to changes), so that research results can be scientifically accounted for.

The Ankle Brachial Index (ABI) measurement was carried out by measuring systolic blood pressure in the ankle (dorsalis pedic artery) and arm (brachial artery), then comparing the highest values of both. The formula is a comparison of the highest ankle systolic pressure with the highest brachial systolic pressure. Interpretation of ABI values: Normal: > 0.90 and Interference: 0.00–0.90.

This research was conducted at Santa Elisabeth Hospital Medan which is located on Jalan Haji Misbah number 7 Medan. The research time has been carried out on July 03-11, 2025. This research has also been ethically feasible from the health research commission of STIKes Santa Elisabeth Medan with letter number No: 104/KEPK-SE/PE-DT/ VI/2025.

4. RESULT AND DISCUSSIONS

Demographic Data of Respondents in Diabetes Mellitus Patients at Santa Elisabeth Hospital Medan in 2025

Table 1. Frequency Distribution and Presentation Based on Demographic Data of Diabetic Mellitus Patients at Santa Elisabeth Hospital Medan 2025.

Characteristic	*F*	(%)
Gender		
Women	28	53.8
Male	24	46.2
Total	52	100.0

Age		
26-35 (Early adult)	12	23.1
36-45 (Late adult)	6	11.5
46-55 (Early Seniors)	15	28.8
56-65 (Late seniors)	15	28.8
> 65 (*Manula*)	4	7.7
Total	52	100.0

Table 1. shows that out of 52 respondents, there were more female genders as many as 28 respondents (53.8%) and male gender as many as 24 respondents (46.2%). Based on age, the majority of 56-65 (final elderly) data was obtained as many as 15 respondents (28.8%), and the minority aged 26-35 as many as 12 respondents (23.1%).

ABI Values in Diabetic Mellitus Patients at Santa Elisabeth Hospital Medan in 2025

Table 2. Frequency Distribution and Presentation Based on ABI Values in Patients with Diabetes Mellitus at Santa Elisabeth Hospital Medan 2025.

ABI Value	F	%
Normal	33	63.5
Trouble	19	36.5
Total	52	100.0

Table 2 shows that out of 52 respondents, the majority of normal ABI values were determined by 33 respondents (63.5%), and by 19 respondents (36.5%).

Discussion

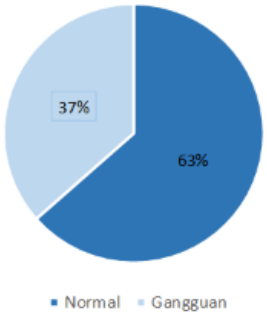

Figure 1. Frequency Distribution and Presentation Based on ABI Values in Patients with Diabetes Mellitus at Santa Elisabeth Hospital Medan 2025.

Based on the results of a study on 52 respondents with type II diabetes mellitus at Santa Elisabeth Hospital Medan, it was found that the majority of respondents had a normal Ankle Brachial Index (ABI) value of 33 people (63.5%), while those with ABI disorders were 19 people (36.5%). Based on the results of the study, the researcher put forward the assumption that the high proportion of normal ABI values in respondents is most likely influenced by their habits of doing regular physical activity. The physical activity in question does not have to be strenuous, but can be in the form of daily activities such as morning walking or gardening that are carried out consistently. This type of activity is beneficial in reducing central fat,

maintaining muscle mass, and improving insulin sensitivity in people with type II diabetes. This assumption is in line with the findings Putra (2020), which show that there is a significant increase in ABI values after the implementation of structured physical activity interventions. The study revealed that physical activity therapy has high effectiveness in improving peripheral blood circulation. This working mechanism occurs through the stimulation of physical movements which plays a role in optimizing blood flow, thus having an impact on improving ABI values. This assumption is also supported by research Lariwu et al. (2022) where the results show that regular physical activity is able to produce two main benefits: (1) improve blood circulation in the lower extremities, and (2) act as a protective factor against the development of complications of Peripheral Arterial Disease (PAD). The combination of these positive effects ultimately contributes to an increase in the Ankle brachial index (ABI) value in people with type II DM.

Furthermore, the researchers also argued that normal ABI values in respondents may be influenced by the habit of doing special exercises. Gymnastics performed regularly has been shown to improve peripheral blood circulation and prevent muscle stiffness. This assumption is supported by research conducted by Utama (2021), which shows the effectiveness of foot exercises in increasing ABI scores. The results of the study revealed an increase in the ABI value from 0.88 to 0.90 after the foot gymnastics intervention. The physiological mechanism underlying this phenomenon involves stimulation of the gastrocnemius and soleus muscles through focused physical exercise on the lower extremities. This effective contraction of the calf muscles results in a calf muscle pump mechanism that plays an important role in: (1) facilitating venous return, (2) improving venous circulation, and (3) improving the hemodynamic efficiency of the lower extremities. Empirical evidence suggests that structured physical exercise can significantly increase peripheral blood pressure in the leg area, which directly impacts improved ABI values. This assumption is also supported by research conducted by Mustika (2022), where the results of the study show that foot exercises are effective in increasing the value of the Ankle Brachial Index in patients with Type 2 Diabetes Mellitus. Foot exercises are beneficial for strengthening the calf and thigh muscles, reducing joint movement limitations, and preventing deformities. In addition, this activity also helps to improve blood circulation and provides a relaxing effect.

On the other hand, researchers assumed that the ABI disorder found in 36.5% of respondents was suspected to be related to several factors. First, the age factor, where the aging process physiologically results in blood vessels being more at risk of atherosclerosis. Inflammatory, endothelial, and smooth muscle cells of blood vessels in old age differ from

younger ages. This assumption is supported by research conducted by Suyanto (2020) which revealed that ABI value disorders are more commonly found in patients with type 2 diabetes mellitus who have entered old age. The study showed that the prevalence of Peripheral Artery Disease (PAD) can reach 20% in the elderly group and is closely related to an increased risk of cardiovascular morbidity. This phenomenon can be explained through physiological changes that occur with age, where there is a gradual decrease in physical activity while sugar consumption patterns often remain high. This condition is exacerbated by a decrease in the function of the pancreas in producing insulin, so that glucose metabolism becomes not optimal. As a result, this accumulation of blood sugar that is not properly metabolized further increases the risk of peripheral vascular damage and the development of diabetes mellitus in the elderly age group. These findings reinforce the importance of regular monitoring of ABI values, especially in elderly type 2 diabetes mellitus patients, accompanied by therapeutic adjustments and lifestyle modifications that are appropriate to age conditions.

The second factor is the lack of physical activity, where insufficient physical activity causes a decrease in insulin response and fat metabolism so that it causes disturbances in the ABI value. This assumption is supported by research conducted by Kartikadewi et al. (2022) which revealed a significant relationship between physical activity levels and Ankle Brachial Index (ABI) values. The results of the study showed that ABI value abnormalities were more common in the respondent group with low levels of physical activity. The physiological explanation for this phenomenon includes several important mechanisms. First, regular physical activity has been shown to improve insulin sensitivity and improve glucose tolerance in the body. Second, physical activity provides comprehensive benefits to the metabolic system, including optimization of fat metabolism, stabilization of blood pressure, and regulation of lipid distribution in blood vessels. This combination of benefits synergistically plays a role in the prevention of cardiovascular disease, one of the early indicators of which can be observed through abnormalities in ABI values. These findings further confirm the importance of maintaining a physical activity routine as an integral part of the management of type 2 diabetes mellitus, particularly in efforts to prevent peripheral vascular complications.

Furthermore, the author assumes that the impairment of ABI values in patients with type II diabetes mellitus is influenced by the period of time they suffer from diabetes mellitus. Where the longer a person has type II diabetes mellitus, the greater the chance of disturbances in the ABI score. This assumption is supported by research conducted by Kartikadewi et al. (2022) where the results of the study show that disturbances in ABI values are mostly found in patients suffering from diabetes mellitus for a period of more than 5 years. This assumption is

also supported by research conducted Rhee. (2015), where the results of the study show that many people with diabetes mellitus will experience disturbances in ABI values after suffering from diabetes mellitus for more than 5 years. This condition occurs because having glucotoxicosis for a long time will cause the appearance of atherosclerosis, which is caused by endothelial dysfunction.

5. CONCLUSION AND SUGGESTIONS

Based on the results of the study, the number of samples of 52 respondents regarding "Overview of the Value of Ankle Brachial Index in Patients with Type II Diabetes Mellitus at Santa Elisabeth Hospital Medan 2025". The ABI value of type II diabetes mellitus patients at Santa Elisabeth Hospital Medan in 2025 is Normal as many as 33 respondents (63.5%).

For information and input for health education institutions to provide student knowledge about the Ankle Brachial Index Value of Patients with Type II Diabetes Mellitus so that they can carry out good supervision of patients and improve services in the practice field.

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