

Original Research

Ankle Brachial Index (ABI) Score in Patient with Type 2 Diabetes Mellitus



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Article Info	Abstract
Article history: Received: 30 June 2022 Accepted: 22 July 2022	<i>Introduction:</i> Unstable blood glucose levels in patient with Type 2 Diabetes Mellitus (DM) can cause various complications, one of which is peripheral neuropathy. Peripheral neuropathy is caused by atherosclerosis. The incidence of atherosclerosis can be seen by assessing the Ankle Brachial Index (ABI). This study aims to describe the ABI score in type 2 DM patients.
Keywords: ankle brachial index, atherosclerosis, peripheral neuropathy, type 2 DM	<i>Methods:</i> The design of this study is a descriptive observational located at the Wirasatya Army Hospital, Singaraja in April 2022. The subjects were 81 patients with type 2 DM. The sampling technique used is purposive sampling. Measurement of the ABI score is carried out using an Oscillometric Sphygmomanometer. Descriptive analysis is used in this study and presented by frequency distribution. <i>Results:</i> This study found that 33.3% of subjects aged 44-55 years, 63.0% of subjects of male, 77.8% of subjects suffering from type 2 DM between 1 to 5 years, 32.1% working as entrepreneurs, and 78.2% having ABI scores between 1.0-1.4 so that they are included in the normal category. <i>Conclusion:</i> Patients with type 2 DM in the age group of 44-55 years, male, suffering from type 2 DM between 1 to 5 years, working as self-employed and more have normal ABI scores.

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INTRODUCTION

Diabetes Mellitus type 2 (DMT2) is a chronic disease because the body is unable to use the insulin that produced effectively [1]. Unstable blood glucose levels in patients with type 2 DM can cause various complications, one of which is peripheral neuropathy [2]. Poor DM management can lead to cause acute and chronic complications. One of the chronic complications of DM is peripheral circulation disorders. This complication is caused by atherosclerosis [3]. The incidence of atherosclerosis is associated with low ABI values [4]. ABI assessment of type 2 DM patients need to be carried out to determine early the occurrence of peripheral neuropathy, especially on the soles of the feet [5].

The incidence of DM globally is increasing every year. DM cases in 2021 were reported to reach 537 million people in the population aged 20-79 years. The number of cases is projected to increase in 2030 to reach 643 million people and will increase significantly in 2045 to reach 784 million people. This condition is triggered by a massive increase in urbanization flows in 2045 [6]. Indonesia occupies the seventh position in the highest number of DM cases in the world in 2020. The prevalence of DM patients in Indonesia is reported at 6.2% or 10.8 million people from the total population aged 20-79 years. This data shows that 1 in 25 Indonesians experience DM. The incidence of DM in Indonesia is projected to increase by 2045 to reach 16.7 million people [7]. The projected incidence of DM in Bali from the diagnosis results of medical personnel was

found to be 1.7% (from the entire population aged 15 years and over) [8]. The Wirasatya Singaraja Army Hospital reported that there were 520 DM patients who made inpatient and outpatient visits in 2021. DM ranks first in the highest disease reported at the Wirasatya Singaraja Army Hospital. The incidence of DM is estimated to increase if the management is not optimal.

More than 50% of cases of diabetic peripheral neuropathy appear without showing initial symptoms [9]. The prevalence of diabetic peripheral neuropathy in the world reaches 66 % [10]. The prevalence of diabetic peripheral neuropathy of dm type 2 was 50.8 % and DM type 1 was 25.6 % [11]. The prevalence of diabetic peripheral neuropathy in women was 26.4% and in men was 20.0%. The prevalence of diabetic peripheral neuropathy was higher in urban areas by 75.3 % [12]. The prevalence of neuropathy pain incidence in patients with type 2 DM was 26.4% [13]. These data indicate a high complication of diabetic peripheral neuropathy. This complication results from atherosclerosis [3].

The incidence of atherosclerosis is associated with a low ABI Value [4]. Low ABI values that give rise to vascular disorders influenced by multi-factors such as increasing age, duration of suffering from DM, poor glycemic control, obesity, improper consumption of anti-hyperglycemic drugs, low levels of physical activity, suboptimal foot care and a DM diet that has not been carried out obediently [14] [15].

Research conducted by Santosa and Listino in 201 [16] found the relationship between peripheral arterial disease (PAD)

clinical symptoms with low ABI values in type 2 DM patients with a value of $r = 0.952$, so it was concluded that the more severe the PAD symptoms complained of, the lower the ABI value. Research by Rahmaningsih (2016) [17] found a relationship between the ABI value and the incidence of diabetic foot ulcers with a p value obtained of 0.003 which means that the lower of ABI score, the higher the risk of suffering from diabetes foot ulcers. The purpose of this study was to describe the ABI value in type 2 DM patients at the TNI AD Wirasatya Hospital Singaraja.

METHODS

This research is a descriptive observational study. The study was carried out at the TNI AD Wirasatya Singaraja Hospital, Bali in April 2022. The sample of this study was 81 people who suffered type 2 DM. The sampling technique used was purposive sampling with subject criteria; suffering from DM for at least one year, doing DM diet according to instructions and taking anti-hyperglycemic drugs regularly. The measurement of the ABI score was carried out using a Digital Sphygmomanometer. The ABI score was obtained from the highest systolic pressure in the leg (ankle) blood pressure divided by the

highest systolic pressure in the arm (brachial). Descriptive analysis was used in this study and presented by frequency distribution.

Ethical Considerations

This research has received an ethical permit from the Ethics Committee for health research, Faculty of Medicine, Udayana University, Denpasar, Bali, Indonesia with number of certificate 333/UN14.2.2.VII.14/LT/2022 dated February 23, 2022.

RESULTS

Based on table 1, the subject characteristic data obtained were: the age of the subjects was between the ages of 46 to 55 years (33.3%), the male was 51 people (63.0%), the length of time suffering from DM type 2 between the range of 1 to 5 years was 63 people (77.8%), the work found that most of the subjects worked as self-employed as many as 25 people out of (30.9%). Based on table 2, it was found that 59 (38.2%) subjects had an ABI value between 1.0-1.4 so they were included in the normal category.

Table 1
Characteristics of respondents

Characteristic	Frequency (n)	Percentage (%)
Age		
36-45 years old	24	29,6
46-55 years	27	33,3
56-65 years old	18	22,2
>65 years	12	14,8
Gender		
Man	51	63,0
Woman	30	37,0
Length of time suffering from DM		
1-5 years	63	77,8
6-10 years	16	19,8
>10 years	2	2,5
Work		
Self employed	25	30,9
PNS	18	22,2
Laborer	18	22,2
Farmer	9	11,1
Not working/IRT	11	13,6
Total	81	100,0

Table 2
Overview of ABI Score in Type 2 DM Patients

ABI Value	Frequency (n)	Percentage (%)
>1,4	9	11,1
1,0-1,4	59	78,2
0,9-1,0	9	11,1
0,8-0,9	1	1,2
0,5-0,8	2	2,5
<0,5	1	1,2
Total	81	100,0

Annotation:

>1,4 : Hardening of blood vessels
1,0-1,4 : Normal
0,9-1,0 : Tolerated
0,8-0,9 : Lightweight PAD
0,5-0,8 : Medium PAD
<0,5 : PAD Weight

DISCUSSION

This study found that more people aged 44-55 years were found to have type 2 DM. The results of this study are in accordance with ADA (2019) which explains that the

individuals suffering the most from DM are in the age range of 40-75 years. During that age, a person will experience a decrease in the working power of body organs so that they are at risk of causing various kinds of degenerative diseases, including type 2 DM.

The results of this study are also in accordance with the consensus of PB Perkeni also reported that a person who is ≥ 45 years old has a high risk of DM and severe DM complications [18].

The research also corresponds to one of the domestic studies found. Cross-sectional research conducted by Arista (2019) [19] in Klungkung Bali also found that the age of people with type 2 DM was mostly between 62-76 years old. Based on these findings, it is necessary to prevent and control DM early in the adult population. Currently, the adult population is the largest population, especially in Indonesia. This is a demographic bonus obtained by Indonesia as one of the countries with the largest population in the world. Special attention needs to the adult population, especially through various education and empowerment so that the incidence of DM at the age of 44-55 years can be prevented or controlled.

The study found that more male subjects were found to have DM. These findings are in line with the theory that the male population experiences more DM because it is associated with the biological condition of the body. In general, the male population is more resistant to insulin and the distribution of fat in the body tends to be stored in [20]. Based on these findings, preventive efforts and proper early detection of the male population are needed if early signs of DM are found through the DM triassic. This aims to prevent an increase in the incidence of DM in the male population. If it is found that individuals who experience symptoms of DM, especially men, are expected to be carried out a comprehensive examination and if diagnosed

with DM, they must be given appropriate and optimal management, it aims to control DM appropriately so as to prevent the occurrence of severe DM complications that can affect the ABI value [18].

Suffering from type 2 DM over 5 years is more at risk of experiencing a decrease in ABI values and also has the potential to increase the incidence of diabetic ulcers in the legs [21] [21] The results of Chevtchouk's study (2017) Chevtchouk, Silva and Nascimento (2017) with a subject of 150 people with type 2 DM, found as many as 86 respondents aged over 60 years and 69 respondents among them suffered from type 2 DM over 10 years. Research conducted by Atista (2019) [19] also found that the average duration of DM sufferers in Klungkung Regency, Bali was 7.26 years.

Based on validation with the findings of previous studies, the longer the time to suffer from DM, the risk or potential for disease complications and organ damage becomes higher. This is due to prolonged insulin resistance and will damage and affect body organs so that it can rise to other diseases in the body that are interrelated with DM [22]. Based on these findings, it is necessary to pay special attention to individuals who experience DM. Education related to the management and management of DM needs to be intensified so that sufferers can manage their illness independently [23]. In addition to education, work also affects a person's activities so that it affects health.

Work is one of the risk factors of a worker that is closely related to the level of education. People whose level of education is high usually work more in offices with limited

physical activity. Meanwhile, people with low levels of education become more laborers and farmers with heavy physical activity [24]. Individuals who are still actively working also tend to still have optimal body conditions so that the functions of the organs in the body are still actively working to perform their duties and functions optimally. DM is a disease that is affected by activity. Individuals who are lazy to engage in physical activity are at higher risk of developing DM. This causes the pancreas to experience a slowdown in the absorption of glucose to be circulated throughout the body cells ADA (2019).

The results of this study found that most respondents worked as entrepreneurs. A self-employed person usually works more in an office with limited physical activity. This will affect physical condition because individuals who are lazy to do physical activity can cause abnormalities in body organs, one of which is a decrease in pancreatic performance [24]. Based on these findings, an effort to prevent and control DM through a multidisciplinary approach is needed. Collaboration and cooperation between related parties are needed in providing education by health workers, both formal and non-formal, to support the management of DM prevention in the community [25].

This study found that 78.2% of respondents had an ABI value between 1.0-1.4 so that it was included in the normal category. Researchers assumed that the findings of normal ABI values in type 2 DM patients were caused by several factors including the average age of respondents still productive (46-55 years). Age is a risk factor for the value of such ABI. In addition, the

respondents studied on average suffered from type 2 DM in the range of 1-5 years. Low ABI values are usually found after 5 to 10 years of suffering from DM. Patients who have a low ABI value will complain of intermittent pain which is a sign of the presence of PAD (Laurel, 2005).

This study found that respondents with low ABI scores were quite a few. 1.2% of respondents had an ABI value between 0.8-0.9 (light PAD), 2.5% of respondents had an ABI value between 0.5-0.8 (medium PAD) and 1.2% of respondents had an ABI value of <0.5 (heavy PAD). The results of this study are in line with research by Chandrashekar and Kalaivani (2018) which found that only 29.3% of respondents had low ABI values (<0.9), of respondents who had low ABI scores of 22% of respondents experienced mild PAD, 6.1% experienced moderate PAD and 1.2% of respondents experienced severe PAD. This study was also in line with research conducted by Arista (2019) [19] which found that only 32.9% of DM type 2 sufferers in Klungkung Regency, Bali had low ABI values so they experienced vascular disorders.

Low ABI values in patients with type 2 DM are associated with atherosclerosis, thus affecting the circulation of arterial perfusion towards the distal extremities [4]. This decrease in perfusion is usually characterized by loss of peripheral pulsation, intermittent claudication (pain in walking time, and improvement at rest) as well as the ease of infection and ulceration [27]. Kumar (2018) Kumar et al. (2018) suggests that a low ABI value will lead to vascular disorders. Low ABI is affected by irregularities in consuming anti-hyperglycemic drugs, irregularities in

physical activity, irregularity in performing foot treatments and irregularities in carrying out a DM diet [15].

CONCLUSION

Most of the subjects were in the age group of 44-55 years, namely 27 people (33.3%), male, 51 people (63.0%), suffering from type 2 DM between 1 to 5 years, namely 63 people (77.8%) and working as self-employed as many as 25 people (30.9%). Most of the respondents (78.2%) had an ABI value between 1.0-1.4 so they were included in the normal category.

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