



Correlation Between Age, Gender, and Fasting Blood Sugar Levels with Peripheral Artery Disease Incidence in Patients with Type 2 Diabetes Mellitus

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Abstract. Diabetes mellitus is currently a major public health issue worldwide. The global prevalence of diabetes mellitus in 2019 was estimated at 9.3% and will increase to 10.9% in 2040. Peripheral arterial disease is an important complication of diabetes mellitus. Diabetes mellitus patients with peripheral arterial disease have a high morbidity and mortality rate. Therefore, early detection of peripheral arterial disease in diabetic patients is critical. This research aimed at detecting early peripheral arterial disease in patients at the Gatak Sukoharjo Health Center, Central Java. The subjects of this study were 65 prolans participants at the Gatak Sukoharjo Health Center, Central Java, consisting of 54 (83.1%) women and 11 (16.9%) men, with an average age of 62 years. The majority of these patients who develop peripheral arterial disease are women in the middle age with abnormal fasting blood sugar levels, putting them at risk of developing peripheral arterial disease. Patients and families show high enthusiasm when the researchers provided education concerning the results of the detection of peripheral arterial disease. This activity is beneficial in increasing diabetes mellitus patients' knowledge, particularly in terms of blood sugar control, prevention, and management of peripheral arterial disease.

Keywords: Age · Gender · Fasting Blood Sugar (GDP) · Peripheral Artery Disease (PAD) · Diabetes Mellitus · Atherosclerosis

1 Introduction

Diabetes mellitus (DM) is currently a global health threat and is a group of metabolic diseases characterized by hyperglycemia caused by abnormalities in insulin secretion. Diabetes mellitus incidence worldwide increased by 10.29% from 11,303,084 cases in 1990 to 22,935,630 cases in 2017.

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Diabetes mellitus can lead to numerous complications, including microvascular complications which can affect the eyes and kidneys, as well as macrovascular complications affecting the blood vessels, heart, brain and blood vessels of the lower limbs, namely Peripheral Artery Disease (PAD), a disease characterized by narrowing of the arteries, particularly in the legs, which is primarily caused by the atherosclerotic process.

The main risk factors for PAD include age, gender, smoking habit, obesity, hypertension, and diabetes mellitus as the GDP (Fasting Blood Sugar) increases (Perkeni 2019). The global prevalence of peripheral arterial disease (PAP) in 2015 was estimated more than 200 million people. This disease affects < 0.4 per 1000 people aged 35–45 and 6 in 1000 people over the age of 65. The Framingham Heart Study found that reaching the age ≥ 65 years increased the risk of PAD. Although PAD was also found at the age of ≤ 50 years, the number of cases was very small. The results of the study also found that people with an older age are 1,881 times more likely to develop PAD. The results of Said's research at the Poasia Kendari Health Center in December 2020 showed that there were more cases of PAD in women than men with a percentage of 78.6%. Poor glycemic control can increase the risk of PAD. Based on the above description, the researchers attempted to identify the factors that increase the risk of PAD among Prolanis DM patients at the Gatak Health Center so that pharmacological and non-pharmacological interventions can be carried out earlier to reduce the risk of amputation.

2 Method

This is a cross-sectional study conducted at the Gatak Sukoharjo Health Center, Central Java from July to September 2022. The research subjects were elderly patients with prolanis Diabetes mellitus and a risk of Peripheral Artery Disease (PAD) who were recorded and met the research criteria at the Health Center, Gatak Sukoharjo, Central Java. The inclusion criteria were elderly prolanis patients at the Gatak Sukoharjo Health Center, Central Java, who suffered from diabetes mellitus and were > 18 years old. The elderly Prolanis patients were excluded from this study if they had a history of limb amputation, had a history of diabetic ulcers, a history of Acute Coronary Syndrome (ACS), a history of stroke with sequelae, and a history of impaired kidney function. All patients who met the inclusion and exclusion criteria were included in the study. Then, the Prolanis participants filled out a questionnaire regarding their identity, medical history, and history of drug use, which was followed by an examination of GDP with a digital blood sugar checker (glucometer) using the enzymatic method colorimetric and PAD (Peripheral Artery Disease) by measuring the ABI Score using a vascular doppler device with a frequency of 5–10 MHz.

Descriptive data are presented in the form of mean, standard deviation, and proportion. All data were organized and statistically analyzed using the social science statistical package (IBM SPSS Statistics) version 25. The hypotheses of the study were tested using the Chi Square test. A p-value of less than 0.05 was considered statistically significant for all purposes. Ethical permission for this research was obtained from the Ethical Clearance Committee of the Faculty of Medicine, Universitas Muhammadiyah Surakarta No. 4667/B.1/KEPK-FKUMS/XI/2022.

3 Results and Discussion

The subjects of this study were 65 prolans participants at the Gatak Sukoharjo Health Center, Central Java, consisting of 54 (83.1%) women and 11 (16.9%) men with an average age of 62 years. Table 1 shows the baseline characteristics of the subject, including percentage or mean and standard deviation of age, sex, onset of DM, GDP, GDS, waist/abdominal circumference, BMI, HbA1c, microalbuminuria, creatinine, LDL, HDL, cholesterol, triglycerides, DM nephropathy, PAD, DM Neuropathy, DM Retinopathy, Cognitive Function, GFR, and Hypertension.

Table 1. Descriptive Table

Number of subject	Mean age \pm SD* (years old)		Chi Square
65	62.43 \pm 9.43		
Variables	Number	Percentage	p**
Gender (n = 65)			
Male	11	16.9%	0.786***
Female	54	83.1%	
Age (n = 65) 62.43 \pm 9.47			
Early (Early Mature)	0	0%	0.127***
Middle (Middle age)	28	43.1%	
Late (Elderly)	37	56.9%	
HbA1c (n = 65) 34.558 \pm 43.59			
Controlled	13	20%	0.253***
Not controlled	52	80%	
GDP (n = 65) 192.62 \pm 86.924			
Normal	18	27.7%	0.918***
Abnormal	47	72.3%	
BMI (n = 62)			
Normal	49	79%	0.668***
Fat	13	21%	
Hypertension (n = 63) (Systolic 148.24 \pm 19.449) (Diastolic 87.11 \pm 17.181)			
Normal	11	17.5%	0.691***
Hypertension	52	82.5%	
PAD (n = 65) 1.006 \pm 0.28			
Normal	39	60%	0.025****
PAD	21	32.3%	
Atherosclerosis	5	7.7%	

Table 2. Bivariate Table

Risk factor	PAD n or mean \pm SD		P
	0.9–1.3(Normal) n = 39	< 0.9 (PAD) n = 21	
Age	62.43 \pm 9.474	62.43 \pm 9.474	
Early (early adulthood): 18–39	0	0	0.222
Middle (Middle age): 40–60	15	11	
Late (elderly): > 60	24	10	
Gender			
Male	9	2	0.174
Female	30	19	
GDP	192.61 \pm 86.92	192.61 \pm 86.92	
Normal (<100)	10	5	0.568
Abnormal (>100)	29	16	

The results of the bivariate analysis of the basic characteristics of the research subjects are shown in Table 2.

The correlation between GDP and PAD yielded a total sample of 60, of which 21 people were detected to have PAD, with abnormal GDP of 16 people and normal GDP of 5 people. The 16 people with abnormal GDP showed that abnormal GDP also affected PAD. However, it was also found that people with abnormal GDP but did not experience PAD due to other factors, for example, the duration of diabetes mellitus. Based on these findings, there were more patients with PAD who had abnormal GDP than patients with normal GDP. However, no significant P-results were obtained from the statistical test using Chi-Square, resulting in a p-value of 0.568 for the relationship between GDP and PAD. Based on the existing theory, the higher the GDP, the greater the risk of PAD occurring. But we cannot rule out other risk factors that contribute in other pathophysiology of PAD such as hypertension, age, gender, smoking, obesity, dyslipidemia, etc. The results of the chi-square statistical test were indeed insignificant or inappropriate, with a p-value of < 0.05 expected, but indicated that Gatak Health Center patients have many abnormal GDP results compared to normal data, posing a risk of PAD if screening was not performed routinely.

The correlation between age and PAD resulted in a total sample of 60, with 11 patients having PAD at middle age (40–60 years) and 10 patients having PAD at elderly/late age (> 60 years). The results of statistical data showed more middle-aged prolans patients at the Gatak Health Center have PAD than elderly prolans patients, with a Chi-Square correlation of 0.22 indicating that young or elderly DM patients have already experienced macrovascular complications. It can be concluded from statistical data that age did not influence the incidence of PAD in Gatak Health Center prolans patients, because the p-value was > 0.05. This is consistent with research by Fowkes et al., 2017; Ostchega

et al., 2007, which found PAD risk increased with age and was highest at the age of over 40 years (Fowkes et al. 2017; Ostchega et al. 2007).

The correlation between gender and PAD prompted a total sample of 60, with prolans patients experiencing PAD were more female than male. The number of female PAD sufferers was 19 samples while PAD in men were 2 samples. From the comparison of the sample with the total sample between men and women, the percentage of women has more PAD was higher. This is most likely due to multifactorial, such as insulin regulation associated with the hormones estrogen and progesterone, use of hormonal contraception, food intake and nutritional status, and distribution of fat in the body associated with insulin resistance (Rosenberg et al., 2012), which can pose a higher risk of PAD with statistical results using a Chi-Square of 0.174. From the data collection process, there were also more female patients than male patients with a sample ratio of 1:5. Although the results of the Chi-Square statistic did not show any significant results. This in line with the results of research conducted by Asbath Said at the Poasia Kendari Health Center in December 2020, which revealed that there were more cases of PAD in women than men with a percentage of 78.6% (Novianti et al. 2021).

The subjects of this study were 65 prolans participants at the Gatak Sukoharjo Health Center, Central Java, consisting of 54 (83.1%) women and 11 (16.9%) men with an average age of 62 years. From these data, it was found that the incidence of macrovascular complications in prolans patients who appeared normal but after examination revealed that many had a risk of macrovascular complications. Given the magnitude of the benefits of this research in improving the health status of patients with diabetes mellitus, it is necessary to make efforts to ensure that it continues. Similar activities are required in populations with other macrovascular risk factors, such as hypertensive patients, smokers, obesity, dyslipidemia and others. It is necessary to monitor and evaluate the results of this Ankle Brachial Index examination on changes in the management of patients with diabetes mellitus so that the promotive and preventive goals can be achieved.

4 Conclusions and Suggestions

The results of the examination of prolans patients at the Gatak Health Center, Central Java show that there are still many patients who are at risk of macrovascular complications both from age, gender, fasting blood sugar, and other factors not previously known. Therefore, prolans patients should be referred regularly (once every 3–6 months) to a Health Service Provider (PPK) for complications management or screening even though they are already taking medication regularly.

It is necessary to evaluate the success of promotive and preventive efforts in patients with diabetes mellitus accompanied by complications of peripheral arterial disease, as well as curative and rehabilitative efforts for those who have complications of peripheral arterial disease within a specific period of time. The level of success can be assessed from the stability of ABI and the low incidence of acute ischemic disease in these diabetes mellitus patients. It is preferable to educate patients not only to prevent using drugs but also to control activities such as exercise, adequate nutritional intake, and engagement in healthy activities.

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