Research Paper

Cardiovascular Risk Profile in Peripheral Artery Disease Inpatients: A Retrospective Observational Study at Dr. M. Djamil Padang Hospital

Maudia Azhara Raisa[1], Eka Fithra Elfi[2], Fadrian[3], Rita Hamdani[2], Roza Mulyana[3], Lili Irawati[4]

[1]Faculty of Medicine, Andalas University, Padang, West Sumatera, Indonesia
[2]Department of Cardiology and Vascular, Andalas University, Padang, West Sumatera, Indonesia
[3]Departement of Internal Medicine, Andalas University, Padang, West Sumatera, Indonesia
[4]Departement of Physiology, Andalas University, Padang, West Sumatera, Indonesia

Corresponding Author: Maudia Azhara Raisa

ABSTRACT

Peripheral artery disease (PAD) is a manifestation of systemic atherosclerosis characterized by inadequate tissue perfusion due to arterial narrowing or occlusion. Cardiovascular risk factors such as smoking, diabetes, hypertension, obesity, dyslipidemia, and chronic kidney disease contribute to accelerated atherogenesis and adverse clinical outcomes. This study aimed to describe the cardiovascular risk profile of hospitalized patients with PAD at Dr. M. Djamil General Hospital Padang. This retrospective descriptive study analyzed 61 medical records of PAD inpatients treated between January 2021 and August 2022. Patients were selected using a total sampling technique. Data on demographics, clinical characteristics, and cardiovascular risk factors were collected and analyzed using univariate descriptive statistics. The mean patient age was 60 years, with a predominance of males (57.4%). Acute limb ischemia was the most frequent clinical presentation (65.6%). Most patients had prehypertensive blood pressure and were classified as overweight. Hypertension was the most prevalent cardiovascular risk factor (67.2%), followed by diabetes mellitus (57.4%), smoking (50.8%), and obesity (42.6%). Dyslipidemia (8.2%) and chronic kidney disease (9.8%) were less frequent. PAD inpatients were predominantly elderly males with acute limb ischemia, and hypertension, diabetes mellitus, and smoking were the most common cardiovascular risk factors. These findings emphasize the need for early risk factor identification and aggressive management to prevent further complications.

Keywords: peripheral arterial disease, cardiovascular risk profile, hypertension, diabetes mellitus, smoking

INTRODUCTION

Peripheral arterial disease (PAD) is a condition characterized by the obstruction of blood flow in the arteries, particularly in the upper or lower extremities. This obstruction is primarily caused by atherosclerosis or thromboembolism, leading to reduced blood supply to tissues, which can result in ischemia and, in severe cases, necrosis or gangrene.[1] PAD is considered the third most common manifestation of atherosclerosis after coronary artery disease and stroke. Globally, PAD affects a significant portion

of the population, particularly among the elderly, and is often underdiagnosed due to its asymptomatic nature in many patients.[2] In Indonesia, the prevalence of PAD reaches 13,807 cases per one million population, and this incidence continues to rise, making PAD a potential global health concern in the 21st century.[3] The most common clinical presentation of PAD is intermittent claudication, characterized by muscle pain or discomfort during physical activity that improves with rest. The incidence of intermittent claudication is reported at <0.4 per 1,000 people aged 35–45 years and 6 per 1,000 people over 65 years.[4] Without proper treatment, PAD may progress to critical limb ischemia, which can lead to amputation. This progression significantly impacts patients' functional capacity, quality of life, and increases the risk of cardiovascular morbidity and mortality.[1] Several cardiovascular risk factors contribute to the development of PAD by accelerating atherogenesis, including smoking, diabetes mellitus, hypertension, and dyslipidemia. Smoking and diabetes mellitus are reported to increase PAD risk by two to threefold.[5] Other identified risk factors include age >74 years, obesity, and chronic kidney disease.[4] According to WHO, Indonesia ranks third globally in the number of smokers after China and India.[6] It also ranks fourth in diabetes mellitus cases after India, China, and the United States.[7] The Indonesian National Health Survey (Riskesdas) reports that over 63 million Indonesians suffer from hypertension, while 35.9% of individuals aged ≥15 years have elevated cholesterol levels (≥200 mg/dL). Furthermore, obesity prevalence in Indonesia reached 21.8% in 2018.[8] These data indicate a high and increasing prevalence of cardiovascular risk factors in Indonesia, suggesting that PAD may be increasingly encountered in clinical practice. The control and management of cardiovascular risk factors are essential for preventing PAD in at-risk individuals and reducing complications in patients with established disease, ultimately improving patient outcomes.[9] This study aims to describe the cardiovascular risk profile among patients with peripheral arterial disease treated at Dr. M. Djamil General Hospital Padang. The findings are expected to provide a better understanding of the risk factors associated with PAD and serve as a basis for effective management and prevention strategies in Indonesia.

MATERIALS & METHODS

This study was a retrospective descriptive study conducted using medical records of patients treated at Dr. M. Djamil General Hospital Padang between January 2021 and August 2022. A total of 61 patients diagnosed with peripheral artery disease (PAD), including intermittent claudication, acute limb ischemia (ALI), and critical limb ischemia (CLI), were included using a total sampling technique. Patients with incomplete medical records were excluded. The collected variables included patient demographics (age and gender), clinical characteristics (PAD diagnosis, blood pressure, and body mass index), laboratory results (blood glucose, lipid profile, urea, and creatinine), and cardiovascular risk factors (history of smoking, diabetes mellitus, hypertension, obesity, dyslipidemia, and chronic kidney disease). This study received ethical approval from the Health Research Ethics Committee of Dr. M. Djamil General Hospital Padang (Approval No: LB.02.02/5.7/82/2023).

STATISTICAL ANALYSIS

Descriptive statistics were used to summarize patient characteristics and cardiovascular risk factors. Categorical variables were presented as frequencies and percentages, while continuous variables were expressed as mean ± standard deviation. Data analysis was conducted using SPSS software version 15.0.

RESULT

A total of 61 patients with peripheral artery disease (PAD) were included in this study. The mean patient age was 60.1 ± 14.5 years,

and more than half were aged over 60 years (50.8%). Males were predominant (57.4%). Acute limb ischemia (ALI) was the most common clinical presentation (65.6%), followed by critical limb ischemia (34.4%), and no patients presented with intermittent claudication. Most patients had normal blood pressure (42.6%) at admission, while 32.8% were classified as hypertensive (grade 1 or 2) and 24.6% as prehypertensive. The mean body mass index (BMI) was 24.0 ± 4.4 kg/m², with 54.1% of patients categorized as overweight or obese (Table 1).

Table 1. Baseline characteristic of PAD inpatients (n=61)

Variable	n (%)	Mean ± SD
Age		60.1 ± 14.5
< 50 years	15 (24.6)	
50 – 60 years	15 (24.6)	
>60 years	31 (50.8)	
Gender		
Male	35 (57.4)	
Female	26 (42.6)	
Clinical diagnosis		
Acute limb ischemic	40 (65.6)	
Critical limb ischemic	21 (34.4)	
Blood pressure category		SBP 127.2 ± 23 / DBP 76.8 ± 14
Normal	26 (42.6)	
Prehypertension	15 (24.6)	
Hypertension grade 1	17 (27.9)	
Hypertension grade 2	3 (4.9)	
BMI category (kg/m²)		24 ± 4.4
Underweight	6 (9.8)	
Normal	22 (36.1)	
Overweight	7 (11.5)	
Obesity I	18 (29.5)	
Obesity II	8 (13.1)	

Laboratory findings showed that patients had elevated fasting blood glucose and renal function markers, while lipid profile demonstrated low HDL levels. The mean blood glucose level was 157.3 ± 90.4 mg/dL. HDL cholesterol averaged 39.1 ± 15.0 mg/dL, while LDL cholesterol averaged 106 ± 39 mg/dL. Triglycerides and total cholesterol were within normal ranges on average, while the mean urea and creatinine levels were elevated at 62.4 ± 56.1 mg/dL and 2.5 ± 2.1 mg/dL, respectively (Table 2).

Table 2. Laboratory results of PAD inpatients (n = 61)

Laboratory parameter	Mean ± SD
Blood glucose (mg/dL)	157.3 ± 90.4
HDL (mg/dL)	39.05 ± 15.0
LDL (mg/dL)	106 ± 39
Triglycerides (mg/dL)	155.4 ± 83.3
Total cholesterol (mg/dL)	172.2 ± 50.5
Urea (mg/dL)	62.4 ± 56.1
Creatinine (mg/dL)	2.5 ± 2.1

Among the cardiovascular risk factors assessed, hypertension was the most prevalent (67.2%), followed by diabetes mellitus (57.4%) and smoking (50.8%). Obesity was observed in 42.6% of patients, while dyslipidemia and chronic kidney disease were less frequent, affecting 8.2% and 9.8% of patients, respectively (Table 3).

These findings highlight that modifiable risk factors remain highly prevalent in PAD inpatients

Table 3. Cardiovascular risk factors in PAD inpatients (n=61)

Risk Factor	n (%)
Smoking history	31 (50.8)
Diabetes mellitus	35 (57.4)
History of hypertension	41 (67.2)
Obesity	26 (42.6)
Dyslipidemia	5 (8.2)
Chronic Kidney Disease	6 (9.8)

DISCUSSION

This study provides an overview of the cardiovascular risk profile of hospitalized patients with peripheral artery disease (PAD) at Dr. M. Djamil General Hospital Padang. PAD predominantly affected elderly males, with acute limb ischemia (ALI) as the most common clinical presentation, and hypertension, diabetes mellitus, and smoking as the major cardiovascular risk factors.

Demographics and Clinical Presentation

More than half of the patients were older than 60 years (50.8%), confirming that PAD is primarily a disease of the elderly. Aging induces vascular degeneration through inflammation, oxidative stress, mitochondrial dysfunction, telomere shortening, and impaired autophagy, leading to endothelial dysfunction and arterial stiffening.[10] Our findings are consistent with Criqui et al., who reported that PAD prevalence rises to >10% in individuals aged 60–70 and exceeds 20% in those older than 80.[3] Male predominance (57.4%) was observed, similar to Tessa (2014), who reported 57% male PAD cases.[8] Sex-based differences in PAD are linked to hormonal and lifestyle factors. Endothelial dysfunction typically develops in men around age 40, whereas women are relatively protected until menopause due to estrogen's vasoprotective effects.[8,11] Greater exposure of men to smoking and occupational risks further accelerates atherosclerosis progression. Clinically, ALI

was the most frequent presentation (65.6%), followed by critical limb ischemia (CLI), and no cases of intermittent claudication (IC) were observed. This suggests delayed detection and underdiagnosis of early-stage PAD in Indonesia. Most epidemiologic studies report IC as the most common PAD manifestation, but asymptomatic and mild cases often remain unrecognized, particularly in the absence of routine ankle-brachial index (ABI) screening in primary care.[12] This delay contributes to late presentations with limb-threatening ischemia, as reflected in our cohort.

Cardiovascular Risk Factors

Hypertension was the most prevalent risk factor (67.2%). Chronic high blood pressure promotes endothelial injury, oxidative stress, and vascular remodeling, accelerating atherosclerosis.[13] This aligns with epidemiological reports showing 50–92% of PAD patients have hypertension.[14] Fudim et al. (2020) highlighted that hypertension, especially in combination with metabolic comorbidities, substantially increases major adverse cardiovascular and limb events (MACEs and MALEs).[15] Diabetes mellitus was found in 57.4% of patients, consistent with studies showing a 2- to 4-fold higher PAD risk in diabetics.[16] Diabetes accelerates PAD progression to CLI through endothelial dysfunction, smooth muscle dysregulation, and chronic hyperglycemia-induced oxidative stress.[17] Neuropathy may mask symptoms like rest pain and IC, contributing to delayed diagnosis and severe presentation.[18] Smoking history was present in 50.8% of patients. Smoking is a well-established major modifiable risk factor, inducing nitric oxide depletion, platelet activation, and systemic inflammation, which accelerate atherothrombosis.[18] Pabon et al. reported similar prevalence and emphasized that smoking cessation reduces PAD progression and limb loss risk.[11] Obesity (42.6%) indicates a role for metabolic syndrome in PAD. Adipose tissue contributes to systemic inflammation, insulin resistance, and dyslipidemia,

promoting atherosclerosis and impaired tissue perfusion.[19] Dyslipidemia (8.2%) and chronic kidney disease (CKD, 9.8%) were less common but clinically relevant. Low HDL levels reduce vasoprotective capacity, and CKD accelerates vascular calcification via phosphate-calcium imbalance and inflammation.[20,21] Matsushita et al. demonstrated that CKD increases PAD risk 1.5–4 fold, with higher amputation rates in advanced stages.[12]

Laboratory Findings
Laboratory results showed elevated urea (62.4 ± 56.1 mg/dL) and creatinine (2.5 ± 2.1 mg/dL), indicating impaired renal function. Similar findings by Sohal et al. reported mean urea 66.4 ± 33 mg/dL and creatinine 3.5 ± 1.4 mg/dL in PAD patients.[20] These abnormalities may facilitate vascular calcification and further reduce limb perfusion. HDL cholesterol was decreased (39.1 ± 15.0 mg/dL), consistent with Fowkes and Aday et al., who reported low HDL in PAD patients.[2,15] Low HDL impairs endothelial repair and enhances plaque formation. LDL, triglycerides, and total cholesterol were mostly within normal limits in this cohort, although prior studies linked each 5 mg/dL decrease in HDL-C and 40 mg/dL increase in total cholesterol to a significant rise in PAD risk.[15]

Clinical Implications
Our findings emphasize the need for early PAD detection and aggressive management of modifiable cardiovascular risk factors, particularly hypertension, diabetes, and smoking. Comprehensive prevention and treatment strategies could reduce the incidence of critical limb ischemia and prevent MACEs and MALEs. Public health programs promoting smoking cessation, glycemic control, and blood pressure management are especially relevant for high-risk populations in Indonesia.[4]

Study Limitations
This study is limited by its retrospective single-center design, small sample size, and incomplete lipid profile data, which may limit generalizability. Lifestyle and medication history were unavailable, restricting a comprehensive risk assessment. Selection bias may exist, as the hospital serves as a tertiary referral center. Future multicenter prospective studies with larger cohorts and complete metabolic and lifestyle data are needed to validate and expand these findings.

CONCLUSION
This study found that peripheral artery disease (PAD) inpatients at Dr. M. Djamil General Hospital Padang were predominantly elderly males presenting with acute limb ischemia. Hypertension, diabetes mellitus, smoking, and obesity were the most prevalent cardiovascular risk factors, while dyslipidemia and chronic kidney disease were less common. These findings emphasize the importance of early detection and aggressive management of modifiable risk factors to prevent critical limb complications and cardiovascular events in PAD patients.

REFERENCES
1. Lilly, Leonard S. Pathophysiology of Heart Disease: A Collaborative Project of Medical Students and Faculty Lippincott Williams & Wilkins, 2016. https://internationalintegrated.lwwhealthlibrary.com/book.aspx?bookid=1573&sectionid=0.
2. Fowkes FGR, Rudan D, Rudan I, Aboyans V, Denenberg JO, McDermott MM, et al. Comparison of global estimates of prevalence and risk factors for peripheral artery disease in 2000 and 2010: A systematic review and analysis. Lancet [Internet]. 2013;382(9901):1329–40. Available from: http://dx.doi.org/10.1016/S0140-6736(13)61249-0
3. Criqui MH, Aboyans V. Epidemiology of Peripheral Artery Disease. Circ Res. 2015;116(9):1509–26.

4. Criqui MH, Matsushita K, Aboyans V, Hess CN, Hicks CW, Kwan TW, et al. Lower Extremity Peripheral Artery Disease: Contemporary Epidemiology, Management Gaps, and Future Directions: A Scientific Statement from the American Heart Association. Circulation. 2021;E171–91.

5. SEATCA. Tobacco Industry Monitor [Internet]. 2020. Available from: https://timonitor.seatca.org/indonesia/#:~:text =Out of the 10 countries,third after China and India.

6. WHO. Diabetes Country Profiles [Internet]. 2016. Available from: https://www.who.int/diabetes/country-profiles/idn_en.pdf.

7. Kemenkes RI. Laporan Nasional RKD 2018 [Internet]. Badan Penelitian dan Pengembangan Kesehatan. 2018. Available from: http://labdata.litbang.kemkes.go.id/images/do wnload/laporan/RKD/2018/Laporan_Nasional _RKD2018_FINAL.pdf.

8. Thendria T, Toruan IL, Natalia D. Hubungan Hipertensi dan Penyakit Arteri Perifer Berdasarkan Nilai Ankle-Brachial Index. eJournal Kedokt Indones. 2014;2(1):38, 41–2.

9. Shu J, Santulli G. Update on peripheral artery disease: Epidemiology and evidence-based facts. Atherosclerosis. 2018;275:1–3.

10. Wang S, Hu S, Mao Y. The mechanisms of vascular aging. Aging Med. 2021;4(2):153–8.

11. Pabon M, Cheng S, Altin SE, Sethi SS, Nelson MD, Moreau KL, et al. Sex Differences in Peripheral Artery Disease. Circ Res. 2022;130(4):496–511.

12. Conte SM, Vale PR. Peripheral Arterial Disease. Hear Lung Circ [Internet]. 2018;27(4):427–32. Available from: http://dx.doi.org/10.1016/j.hlc.2017.10.014.

13. Griendling KK, Camargo LL, Rios FJ, Alves-Lopes R, Montezano AC, Touyz RM. Oxidative Stress and Hypertension. Circ Res. 2021; 128:995–1007.

14. Simatupang M, Pandelaki K, Panda L. Faktor Risiko Kardiovaskular. e-CliniC(eCl). 2013;1(1):7–12

15. Fudim M, Hopley CW, Huang Z, Kavanagh S, Rockhold FW, Baumgartner I, et al. Association of Hypertension and Arterial Blood Pressure on Limb and Cardiovascular Outcomes in Symptomatic Peripheral Artery Disease: The EUCLID Trial. Circ Cardiovasc Qual Outcomes. 2020;13(9):E006512

16. Soyoye DO, Abiodun OO, Ikem RT, Kolawole BA, Akintomide AO. Diabetes and peripheral artery disease: A review. World J Diabetes. 2021 Jun;12(6):827–38.

17. Thiruvoipati T. Peripheral artery disease in patients with diabetes: Epidemiology, mechanisms, and outcomes. World J Diabetes. 2015;6(7):961 (17 awal) Sohal PM, Bhagat A, Sandhu JS. Research Article Peripheral Arterial Disease in Chronic Kidney Disease : a Prospective Clinical Study. Barthjournals Publisher. 2015;4(3):165–70.

18. Davies RSM, Wall ML. Diabetes and peripheral artery disease. Dalam: [Nama editor]. Vasc Surg Princ Pract Fourth Ed. Vascular Surgery: Principles and Practice, Fourth Edition: CRC Press; 2017. p. 351–70 (18 awal) Messner B, Bernhard D. Smoking and cardiovascular disease: Mechanisms of endothelial dysfunction and early atherogenesis. Arterioscler Thromb Vasc Biol. 2014;34(3):509–15.

19. Fowkes FGR, Aboyans V, Fowkes FJI, McDermott MM, Sampson UKA, Criqui MH. Peripheral artery disease: Epidemiology and global perspectives. Nat Rev Cardiol [Internet].2017;14(3):156–70. Available from: http://dx.doi.org/10.1038/nrcardio.2016.179.

20. Sohal PM, Bhagat A, Sandhu JS. Research Article Peripheral Arterial Disease in Chronic Kidney Disease : a Prospective Clinical Study. Barthjournals Publisher. 2015;4(3):165–70

21. Park YS, Ryu GW, Choi M. Multiple metabolic comorbidities and their consequences among patients with peripheral arterial disease. PLoS One [Internet]. 2022;17(5 May):1–13. Available from: http://dx.doi.org/10.1371/journal.pone.026820 1.

******