



## Risk Factors of Acute Coronary Syndrome in Adam Malik General Hospital

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### ABSTRACT

**Background:** Coronary Artery Disease (CAD) has been nominated as the world's biggest killer due to its participation in 16% of mortality cases globally. Unstable Angina Pectoris (UAP), Non ST-Elevation Myocardial Infarction (NSTEMI), and ST-Elevation Myocardial Infarction (STEMI) are parts of CAD that united into a term called Acute Coronary Syndrome (ACS). Several risk factors have been linked to ACS phenomenon and categorized into modifiable and in-modifiable risk factors. **Objective :** This study aims to discover the existing risk factors in ACS patients at Adam Malik General Hospital within 2022-2023 period. **Method :** This study is a descriptive with cross-sectional design and retrospective approach. The data is a secondary data from medical record that fullfils the criteria. **Result :** Among the 190 patients, 170 patients (89,5%) were >45 years old, 114 patients (75,8%) were male, 104 patients (54,7%) were smokers, 118 patients (62,1%) had hypertension, 71 patients (37,4%) had diabetes, 65 patients (34,2%) were obese, and 114 patients (60%) had dyslipidemia. **Conclusion :** The unmodifiable risk factors in this study were age and gender, whilst the modifiable risk factors were smokers, hypertension, diabetes, obese, and dyslipidemia. The most frequently risk factor was hypertension which was found in 60% of the patients.

**Keyword:** Modifiable risk factors, Unmodifiable risk factors, Acute Coronary Syndrom

### ABSTRAK

**Latar Belakang:** Penyakit Jantung Koroner (PJK) dimobatkan sebagai penyebab kematian terbesar di dunia akibat perannya pada 16% kasus kematian secara global. Angina Pektoris Tidak Stabil (APTS), Non-ST levation Myocardial Infarction (NSTEMI), dan ST-Elevation Myocardial Infarction (STEMI) adalah bagian dari PJK yang disatukan dalam Sindroma Koroner Akut (SKA). Beberapa faktor risiko telah dihubungkan dengan kejadian SKA dan dikategorikan menjadi faktor risiko yang tidak dapat dimodifikasi dan faktor risiko yang dapat dimodifikasi. **Tujuan :** Penelitian ini bertujuan untuk menelusuri faktor risiko yang terjadi pada pasien SKA di RSUP Haji Adam Malik pada periode 2022-2023. Data yang digunakan adalah data sekunder dari rekam medik yang memenuhi kriteria. **Hasil :** Dari 190 pasien, 170 pasien (89,5%) berusia >45 tahun, 114 pasien (75,8%) adalah laki-laki, 104 pasien (54,7%) adalah perokok, 118 pasien (62,1%) penderita hipertensi, 71 pasien (37,4%) penderita diabetes, 65 pasien (34,2%) obesitas, 114 pasien (60%) penderita dislipidemia. **Kesimpulan :** Faktor risiko yang tidak dapat dimodifikasi pada penelitian ini adalah usia dan jenis kelamin, sementara faktor risiko yang dapat dimodifikasi adalah perokok, hipertensi, diabetes, obesitas, dan dislipidemia. Faktor risiko yang paling banyak terjadi adalah hipertensi yang didapatkan pada 60% pasien

**Keyword:** Faktor risiko yang dapat dimodifikasi, Faktor risiko yang tidak dapat dimodifikasi, Sindroma Koroner Akut



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## 1. Introduction

World Health Organization (WHO) named CAD as the world's biggest killer due to its contribution in 16% mortality cases globally [1]. In the past 3 decades, mortality cases due to cardiovascular disease have been increased from 5,6 million to 10,8 million. In 2019, CAD was the second leading cause of death in Indonesia

with a death rate 95,68 per 100.000 population [2]. Research in Adam Malik General Hospital showed there were 661 CAD patients in 2022 [3].

The main underlying mechanism of CAD is atherosclerosis due to endothelial dysfunction and LDL accumulation in tunica intima [4]. Inflammation process increases atherosclerosis plaque fragility and leads to plaque rupture. Afterwards, the plaque rupture and erosion will trigger coagulation process and thrombus formation. The thrombus will occlude the vessel either partially or totally and then disrupt the blood perfusion of the heart. Oxygen deprivation more than 20 minutes will eventually cause myocardial necrosis [5]. ACS is a term that refers to CAD category and consists of UAP, NSTEMI, STEMI.

Some factors have been studied could predispose ACS. Those factors are divided into modifiable risk factors and unmodifiable risk factors. Age, gender, and family history are some of unmodifiable risk factors of ACS, meanwhile smoking, alcohol, hypertension, diabetes, and dyslipidemia are some of modifiable risk factors. Therefore, due to the high prevalence of ACS and its morbidity cases, research about ACS risk factors is needed so that ACS can be avoided and anticipated, especially in vulnerable groups.

**2. Method**

This research was an observational analytical study with cross sectional design and retrospective approach. The samples were collected from medical record with consecutive sampling. There were 190 patients diagnosed with ACS in 2022-2023 period included in this research. Incomplete medical record was the criteria to exclude the sample. Risk factors that found in this study were age, gender, smoking, hypertension, diabetes, obese, and dyslipidemia. The data was analyzed using SPSS statistic 2023 to describe the risk factor in ACS.

**3. Result and Discussion**

Table 1. Unmodifiable Risk Factors of ACS Patients

Characteristic	Frequency	Percentage
<b>Age</b>		
≤45 years old	20	10,5%
>45 years old	170	89,5%
<b>Gender</b>		
Male	144	75,8%
Female	46	24,2%

Out of 190 patients, 170 patients (89,5%) were >45 years old and 144 (75,8%) patients were male. The average age was 59 years old with the youngest age was 24 years old and the oldest age was 85 years old

Table 2. Modifiable Risk Factors of ACS Patients

Risk Factors	Frequency	Percentage
<b>Smoking</b>		
Yes	104	54,7%
No	86	45,3%
<b>Hypertension</b>		
Yes	118	62,1%
No	72	37,9%

<b>Diabetes Melitus</b>		
<b>Yes</b>	71	37,4%
<b>No</b>	119	62,6%
<b>Obesity</b>		
<b>Yes</b>	65	34,2%
<b>No</b>	125	65,8%
<b>Dyslipidemia</b>		
<b>Yes</b>	114	60%
<b>No</b>	76	40%

Table 2 describes smoking, hypertension, diabetes melitus, obesity, and dyslipidemia were the modifiable risk factors found in this study. Out of 190 patients, 104 of them (54,7%) were smokers, 118 of them (62,1%) had history of hypertension, 71 (37,4%) of them had diabetes melitus, 65 of them (34,2%) were obese, and 114 of them (60%) had dyslipidemia. Hypertension was discovered as the most frequently risk factor.

This research shows 170 patients (89,5%) were >45 years old and 144 patients were male. Research in Palangkaraya also showed that CAD predominantly occurred in >45 years old age group and 55,4% of them were male[6]. There are some mechanisms that have been linked with ACS pathophysiology in elderly, such as fibrosis, inflammation, arterial and ventricular stiffnes, elevated oxidative stress, and endothelial dysfunction. Comorbidities and other risk factors also play a role in the high prevalence of ACS in elderly[7] At a young age, women are less susceptible to ACS compared to men. But, overtime, as women enter the menopause phase, they are more likely to have ACS. This phenomenon has been extensively linked to decline level of estrogen in menopause women. Estrogen has cardio-beneficial effect such as antioxidant, synthesis of nitric oxide, inhibition of LDL oxidation and platelet agregation [8,9].

Table above shows 104 patients (54,7%) were smokers. Research in Padang discovered 63% of ACS patients had a smoking history[10]. An epidemiological study in Malaysia described 37,1% of ACS patients were smokers and 17% among them were ex-smokers. Chemical substances in cigarette such as nicotine, tar, and carbonmonoxide play a big role in myocardial contraction dysfunction, inflammation, endothelial injury, thrombus formation, and decline in HDL-C level. Reactive oxygen species in tobacco lead to oxidative stress and upregulate inflammation reaction. These mechanisms are considered as primary cause of endothelial injury in smokers that impairs synthesis and activity of vasodilator[11]. Nicotin will increase epinephrine and norepinephrine release which stimulates vasoconstriction and increases blood pressure[12]. Atherosclerosis plaque formation and its fragility may be induced by MMP (Matrix Metalloproteinases-9) activation due to inflammation[13].

In this study, 118 patients (62,1%) had history of hypertension. Research in Manado found 60% ACS patients had a history of hypertension[14]. High blood pressure will increase artery stress and stiffness which lead to coronary perfusion impairment. Hyperactivation of renin-angiotensin system in hypertensive patients can induce celullar prolifeation, migration and fibrosis. Hypertension has been linked to atherosclerosis progresivity by several mechanisms such as initiation of endothelial injury, LDL accumulation in intima, and adherence of monocyte to endothelial cell[15]. Overstimulation of sympathetic in hypertension has been linked to atherogenesis through G-protein coupled adrenergic receptor. Left ventricular hypertrophy, one of end-points of hypertension, increases cardiac wall stress which leads to rise of oxygen demand and susceptibility to ischemia condition[16]

Among 190 patients, 71 patients (37,4%) had a history of diabetes. This result is parallel with research in Lampung and China which show 34% and 37,6% of ACS patients had diabetes, respectively[17] Hyperglycemia is one of the crucial factors that induces atherogenesis by altering the structure and function of vascular smooth muscle, platelets and endothelium. Hyperglycemia also induces ischemic condition, escalates infarct size, upregulates catecholamine, oxidative stress and inflammation[18]. Diabetic patient at a young age

were 5 to 14 times more vulnerable to myocardial infarction. ACS patients with diabetes usually have a more severe angina due to microvascular and metabolic alteration in hyperglycemic state[19]. Diabetic patients also tend to have other comorbidities such as hypertension, dyslipidemia and obesity which aggravate the risk of ACS[12].

According to tabel above, 65 patients (34,2%) in this study were obese. Research in Jakarta also demonstrated a similar result which is 32,9% ACS patients were obese[20]. Each 10 kg gain in body weight was said to increase CAD risk by 12%, systolic blood pressure by 33 mmHg and diastolic blood pressure by 2.3 mmHg[21] High levels of adipokine and inflammatory cytokines in obese patients will induce oxidative stress, inflammation, and atherogenic dyslipidemia. These conditions lead to endothelial dysfunction, atherosclerosis plaque formation and pro-thrombosis state[22].

This study shows that 114 ACS patients (60%) had dyslipidemia. Research in Kupang found 72,5% ACS patients had dyslipidemia[23]. Dyslipidemia status in this study was defined by elevating LDL-C, triglycerides, total cholesterol, and/or declining HDL-C. LDL-C were studied as the main trigger in atherosclerosis process by stimulating endothelial cells to produce inflammatory cytokines, inhibiting vasodilation, and enhancing foam cell formation[24]. Triglyceride and its metabolite have a role in inflammation and oxidative stress within atherosclerosis. HDL-C is crucial as anti-thrombotic and anti atherogenic by inhibiting monocyte recruitment and LDL oxidation[25,26].

#### 4. Conclusion

In this study, ACS patients were dominated by male and >45 years old patients. The existing unmodifiable risk factors in this study were aging and gender. Meanwhile the modifiable risk factors were smoking, hypertension, diabetes, obesity, and dyslipidemia. The most frequently modifiable risk factors was hypertension.

#### References

- [1] The Lancet Regional Health – Europe. Navigating disparities in cardiovascular disease outcomes across Europe: a call to action. *The Lancet Regional Health - Europe*2023;33.
- [2] Salsabyala, Wulandari. Permodelan Regresi Logistik Biner terhadap Analisis Penderita Penyakit Jantung Koroner di RSUD Dr SOEGIRI Lamongan. *JURNAL SAINS DAN SENI ITS* 2023;12(1):1.
- [3] Fahriza M, Siregar YF. Karakteristik Pasien Penyakit Jantung Koroner yang Menjalani Bedah Pintas Arteri Koroner di Medan 2022. *SCRIPTA SCORE Scientific Medical Journal* 2024;5(2):113–20.
- [4] Davignon J, Ganz P. Role of endothelial dysfunction in atherosclerosis. *Circulation*2004;109(23 SUPPL.).
- [5] PERKI. Panduan Tata Laksana Sindroma Koroner Akut. 4th ed. Jakarta: 2018.
- [6] Melyani M, Tambunan LN, Baringbing EP. Hubungan Usia dengan Kejadian Penyakit Jantung Koroner pada Pasien Rawat Jalan di RSUD dr. Doris Sylvanus Provinsi Kalimantan Tengah. *Jurnal Surya Medika* 2023;9(1):119–25.
- [7] Lucà F, Andreotti F, Rao CM, Pelaggi G, Nucara M, Ammendolea C, et al. Acute Coronary Syndrome in Elderly Patients: How to Tackle Them? *J Clin Med*2024;13(19).
- [8] Parashar S, Reid KJ, Spertus JA, Shaw LJ, Vaccarino V. Early menopause predicts angina after myocardial infarction. *Menopause* 2010;17(5):938–45.
- [9] Zhang Y, Liu B, Zhao R, Zhang S, Yu X yong, Li Y. The Influence of Sex on Cardiac Physiology and Cardiovascular Diseases. *J Cardiovasc Transl Res*2020;13(1):3–13.
- [10] Tiara Pramadias A, Fadil M, Mulyani H. Hubungan Faktor Risiko Terhadap Kejadian Sindroma Koroner Akut pada Pasien Dewasa Muda di RSUP Dr. M. Djamil Padang [Internet]. 2016. Available from: <http://jurnal.fk.unand.ac.id>
- [11] Kondo T, Nakano Y, Adachi S, Murohara T. Effects of tobacco smoking on cardiovascular disease. *Circulation Journal*2019;83(10):1980–5.
- [12] Varghese, Kumar. Predisposing Risk Factors of Acute Coronary Syndrome (ACS): A Mini Review. 2019; Available from: [www.merckmanuals.com/professional/cardiovascular](http://www.merckmanuals.com/professional/cardiovascular)
- [13] Aminuddin A, Cheong SS, Roos NAC, Ugusman A. Smoking and Unstable Plaque in Acute Coronary Syndrome: A Systematic Review of The Role of Matrix Metalloproteinases. *Int J Med Sci*2023;20(4):482–92.
- [14] Mawardy A, Pangemanan J, Djafar D. Gambaran Derajat Hipertensi Pada Pasien Sindrom Koroner Akut (SKA). *Kardiologi Fakultas Kedokteran Universitas Sam Ratulangi* 2014;

- [15] Ning B, Chen Y, Waqar AB, Yan H, Shiomi M, Zhang J, et al. Hypertension Enhances Advanced Atherosclerosis and Induces Cardiac Death in Watanabe Heritable Hyperlipidemic Rabbits. *American Journal of Pathology* 2018;188(12):2936–47.
- [16] Konstantinou K, Tsioufis C, Koumelli A, Mantzouranis M, Kasiakogias A, Doumas M, et al. Hypertension and patients with acute coronary syndrome: Putting blood pressure levels into perspective. *J Clin Hypertens* 2019;21(8):1135–43.
- [17] Hakim A, Muhani N. Hubungan Dislipidemia, Hipertensi, Riwayat Diabetes Melitus terhadap Kejadian Sindroma Koroer Akut pada Pasien Poli Jantung di RSUD Ahmad Yani Metro Lampung 2019. 2020.
- [18] HN T. Cardio-diabetology: New subspecialty and collaborative work to defeat the burden of deadly duo. *Journal of Cardiovascular Medicine and Cardiology* 2018;081–4.
- [19] Ding Q, Funk M, Spatz ES, Whittemore R, Lin H, Lipska KJ, et al. Association of diabetes mellitus with health status outcomes in young women and men after acute myocardial infarction: Results from the virgo study. *J Am Heart Assoc* 2019;8(17).
- [20] Syahryan Gibran M, Nurulhuda U. Hubungan Obesitas Dengan Kejadian Penyakit Jantung Koroner. *JHCN Journal of Health and Cardiovascular Nursing* 2023;3(2).
- [21] Csige I, Ujvárosy D, Szabó Z, Lorincz I, Paragh G, Harangi M, et al. The Impact of Obesity on the Cardiovascular System. *J Diabetes Res* 2018;2018.
- [22] Volpe M, Gallo G. Obesity and cardiovascular disease: An executive document on pathophysiological and clinical links promoted by the Italian Society of Cardiovascular Prevention (SIPREC). *Front Cardiovasc Med* 2023;10.
- [23] Naomi W, Picauly I, Toy S. Faktor Risiko Kejadian Penyakit Jantung Koroner (Studi Kasus di RSUD Prof. Dr. W. Z. Johannes Kupang). *Media Kesehatan Masyarakat* 2021;3(1).
- [24] Gaggini M, Gorini F, Vassalle C. Lipids in Atherosclerosis: Pathophysiology and the Role of Calculated Lipid Indices in Assessing Cardiovascular Risk in Patients with Hyperlipidemia. *Int J Mol Sci* 2023;24(1).
- [25] Zhang BH, Yin F, Qiao YN, Guo SD. Triglyceride and Triglyceride-Rich Lipoproteins in Atherosclerosis. *Front Mol Biosci* 2022;9.
- [26] Barter P. The role of HDL-cholesterol in preventing atherosclerotic disease. In: *European Heart Journal, Supplement*. 2005.