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A Comparison of The Incidence of Coronary Heart Disease In Police Based In Urban And Rural Areas: A Study of East Java Regional Police

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ABSTRACT

Coronary heart disease (CHD) poses significant risks to health, especially among police officers, a high-risk occupational group due to their demanding work conditions. Factors such as high workloads, occupational stress, poor eating habits, lack of exercise, shift work, and sleep disturbances contribute to CHD risks. This study examined differences in CHD prevalence and risk factors between urban and rural police officers in East Java as part of an evaluation for preventive strategies. A cross-sectional study involving 766 police officers (383 urban, 383 rural) was conducted during 2024 medical check-ups at Bhayangkara State Police Hospital Surabaya. Data collection included physical exams, ECG, treadmill tests, and laboratory analyses of cholesterol and fasting blood sugar. CHD was identified through ischemic ECG changes, treadmill test symptoms, or medical history of cardiac events. Results showed CHD prevalence significantly higher among urban officers (89.7%) compared to rural counterparts (10.3%) (p=0.000). Total cholesterol was significantly associated with CHD risk (p=0.003). These findings highlight the greater vulnerability of urban police officers to CHD, emphasizing the need for proactive prevention strategies. Regular clinical and echocardiographic follow-ups, combined with lifestyle modifications and treatment, are critical to mitigating CHD risks and improving health outcomes for police officers in both urban and rural settings.

Keywords: *Coronary Heart Disease, risk factors, urban police officers, rural police officers.*

INTRODUCTION

Coronary heart disease (CHD) represents a significant health challenge worldwide, exerting a profound impact on morbidity, mortality, and healthcare expenditure. It stands as the leading cause of death in both 2000 and 2019, marking the largest surge in fatalities—exceeding 2 million—over the past two decades. According to the World Health Organization (WHO), CHD ranks as the second leading cause of death globally, with Indonesia recording 95.68 deaths per 100,000 population in 2019. This underscores the urgent need for comprehensive approaches to address the burden of CHD, spanning prevention, management, and healthcare delivery initiatives.

CHD risk factors such as hypertension, smoking, obesity, unhealthy diet, increased fasting blood sugar, and dyslipidemia among young adults have increased consistently from year to year.[2] Dyslipidemia is characterized by an increase in total cholesterol, low-density lipoprotein

cholesterol (LDL-C), and triglycerides (TG), accompanied by a decrease in high-density lipoprotein cholesterol (HDL-C).[3] Meta-analyses state that lipid profiles predict major cardiovascular outcomes and all-cause mortality in patients with CHD. Increasing total cholesterol levels can affect the constriction and obstruction of vessels in the heart, which are significantly correlated with the risk of CHD.

Not only occurs in the general population, but many studies suggest that police are at high risk of CHD.[5] Based on law number 2 of 2022 that the police have a very heavy task, namely realizing domestic security which includes maintaining public security, order and law enforcement, providing protection, services to the community, and fostering public peace by respecting human rights.[6] Police are a high-risk occupational group due to their activities. Police work is thought to be associated with high workload, occupational stress, disordered eating, lack of exercise, limited food options at work, overtime and shift work, and sleep disturbances compared to the general population. They must not be tired anywhere in all regions of Indonesia, both in rural and urban areas, regardless of the time of day.[7,8]

Urban or rural police have their own stress levels.[9] They working in stressful environments and enduring long working hours tend to be at risk of dyslipidemia. The long working hours, intense physical stress, and unpredictable emergencies in their daily work, which are associated with high health risks, can disrupt circadian rhythms, increasing cortisol.[10,11] Stress also induces modifications in sympathetic nervous system activity, hormonal activity in the hypothalamic-pituitary-adrenal axis, cytokine proinflammatory factors, and endothelin-A.[12] Chronic increases in the hormone cortisol cause hypertension, impaired vascular remodeling, increased TG, and insulin resistance, which are risk factors for CHD.[11]

An investigation conducted by Zimmerman in 2012 found an increased cardiovascular risk in police officers in three cities in the United States. These police officers also had a high prevalence of traditional risk factors, including hypertension, hyperlipidemia, metabolic syndrome, smoking, and a sedentary lifestyle.[13] Meanwhile study in Indonesia showed significant differences in the atherogenic index of plasma, total cholesterol, LDL-C, and TG between police and civilian groups ($p<0.05$). In the police group, most had high total cholesterol (61.8%) and TG (54.2%). Atherogenic index of plasma, an index consisting of TG and HDL-C, is a strong predictor of CHD.[14]

There are many studies on risk factors and cardiovascular events in police. However, until now there has been no research related to the comparison of the incidence of CHD between urban and rural police. Therefore, the authors aim to determine the differences in CHD incidence and risk factors between urban and rural police officers in the East Java Regional Police, serving as an evaluation and strategic preventive measure for CHD.

METHOD

A total of 383 urban police officers and 383 rural police officers were enrolled as participants using the Slovin formula in this cross-sectional study. Data for this study uses secondary data collected concurrently during medical check-ups conducted in 2024 at Bhayangkara State Police Hospital Surabaya. Ethics for this study was approved by the Bhayangkara State Police Hospital ethics committee with decision number 11/V/2024/KEPK/RUMKIT on Mei 27, 2024.

All study participants met the inclusion criteria, which required them to be police officers stationed in either urban or rural areas, to have undergone the complete examination process, and have worked for at least one year (according to the Population Administration Law that citizens who move and live in the destination area for more than one year are supposed to be categorized as having migrated). The independent variables examined included coronary heart disease (CHD) and several associated risk factors, including total cholesterol and fasting blood sugar levels. CHD was assessed by ischaemic changes in ECG and/or symptoms during treadmill testing, pre-existing evidence from medical history eg previous cardiac events (MI, angina) angiography. The urban and rural classification criteria were based on the Regulation of the Head of Badan Pusat Statistik 2010, Number 37, concerning the classification of urban and rural areas in Indonesia.

Dyslipidemia, according to American Heart Association criteria, is defined as an increase in total cholesterol >200 mg/dL, LDL-C >130 mg/dL, and TG >150 mg/dL, followed by a decrease in HDL-C <40 mg/dL. Fasting blood sugar cutoff values were categorized as <6.1 mmol/L as normal and >6.1 mmol/L as high. Blood samples were collected after overnight (8 hours) fasting and analyzed in the laboratory at Bhayangkara State Police Hospital Surabaya.

Statistical tests were conducted using IBM SPSS Statistics version 26. This study employed univariate analysis, which is a descriptive analysis to observe the frequency distribution of each variable (independent and dependent variables). Bivariate analysis was used to examine the relationship between the independent variable and the dependent variable individually, using the chi-square test at the 95% confidence level ($p<0.05$). Finally, a non-parametric Mann-Whitney U test was used to determine the differences in CHD incidence between urban and rural police officers.

RESULTS AND DISCUSSION

A total of 766 participants were obtained, consisting of 383 urban police officers and 383 rural police officers. The participants were predominantly men (87.1%) compared to women (12.9%). More than 70% of the participants had normal fasting blood glucose and total cholesterol levels. In comparing urban and rural police officers, the urban police officers' group had a higher prevalence of CHD (8.0%) compared to rural police officers (0.9%). More details about the participants are presented in **Table 1**.

Table 1. Frequency and Percentage of Variables in urban and rural police officers

Variable	Group	
	Urban police officers N=383	Rural police officers N=383
Sex		
- Women	68 (8,9%)	31 (4,0%)
- Men	315 (41,1%)	352 (46,0%)

Coronary heart disease		
- Normal	322 (42,0%)	376 (49,1%)
- High	61 (8,0%)	7 (0,9%)
Fasting blood glucose		
- Normal	357 (46,6%)	345 (45,0%)
- High	26 (3,4%)	38 (5,0%)
Total Cholesterol		
- Normal	196 (25,6%)	261 (34,1%)
- High	187 (24,4%)	122 (15,9%)

The research results show that there is a significant relationship between total cholesterol and CHD with p = 0.003 (p-value < 0.05), with an odds ratio of 2.132 (**Table 2**). There is a significant difference in CHD, sex, and total cholesterol with p < 0.05 between urban and rural police officers. Urban police tend to have higher results in those significant factors (CHD and total cholesterol) compared to rural groups. However, there is no significant difference in fasting blood glucose levels between urban and rural police officers (**Table 3**).

Table 2. Relationship between these three risk factors that play a role in CHD

Risk Factors of Coronary heart disease	OR (95% CI)	p value
Sex	1,338 0,676 – 2,649	0,402
Total Cholesterol	2,132 1,288 – 3,529	0,003
Fasting blood glucose	1,783 0,839 – 3,789	0,128

Table 3. Mann Whitney Test analysis results

	Mean Rank	p value
Coronary heart disease		
- Rural	410,50	0,000
- Urban	356,50	
Sex		
- Rural	402,00	0,000
- Urban	365,00	
Total Cholesterol		
- Rural	416,00	0,000
- Urban	351,00	
Fasting blood glucose		
- Rural	377,50	0,117
- Urban	389,50	

Discussion

The study found that the majority of participants were men in both groups. A cohort study indicates an annual increase in the prevalence of each cardiovascular risk factor among men between 2017 and 2020.[15] This disparity can be attributed to the different biological and physiological characteristics of females, males, and intersex persons, including chromosomes, reproductive organs, and the presence of the hormone estrogen in women.[16] The increased levels of estrogen in women during active menstruation contribute to vascular tissue repair and vascular elasticity in the tunica media layer, thereby lowering LDL levels and increasing HDL levels.[17]

This study found that the urban police officers group exhibited a higher prevalence of CHD and elevated total cholesterol levels compared to the rural police officers, with results showing 61 cases (8.0%) of CHD and 187 cases (24.4%) of high total cholesterol, respectively. This finding is supported by a study in Turkey that found the prevalence of diagnosed diabetes, hypercholesterolemia, and hypertension to be lower in rural areas compared to urban communities.[18] Meta-analysis of studies of moderate quality also showed significantly higher total cholesterol levels in urban areas compared to rural areas.[19] Potential explanations for the urban-rural differences in blood lipids include variations in socioeconomic status, diet, and occupational activities.[20,21]

There is a significant difference in CHD, sex, and total cholesterol with $p < 0.05$ between urban and rural police officers. Urban police tend to have higher levels of these significant factors (CHD and total cholesterol) compared to rural groups. However, there is no significant

difference in fasting blood glucose levels between urban and rural police officers. A study in Indonesia demonstrated significant differences in total cholesterol and triglycerides between police and civilian groups ($p < 0.05$). In the police group, the majority had high total cholesterol (61.8%) and triglycerides (54.2%). Triglycerides and HDL-C can affect the constriction and obstruction of vessels in the heart and are strong predictors of CHD.[4,14] This is supported by a study in Genoa that found a relationship between total cholesterol and CHD in police officers.[22]

In this study, there is a significant relationship between total cholesterol and CHD with $p = 0.003$ (p-value < 0.05), with an odds ratio of 2.132. Additionally, another study showed that operational police had a higher cardiovascular risk compared to non-operational police.[23] These contrasts slightly with the study by Strauss et al., 2020, which reported no significant differences in HDL-C, triglycerides, blood pressure, and BMI between female police officers and office workers.[24]

Study Limitations

This study has a relatively small sample size and employs simple random sampling. Additionally, smoking habits, stress factors, and other risk factors for CHD were not recorded. A cohort study design is recommended for future research to comprehensively describe other risk factors associated with the disease.

CONCLUSION

Cardiovascular disease (CVD) risk was identified in both groups. However, the prevalence of CHD was significantly higher among urban police officers compared to rural police officers. Based on the findings of this study, it is recommended that members of the East Java Regional Police and the community at large increase their awareness of CHD. Proactive measures should be taken to control risk factors from the outset, particularly through dietary management and the adoption of a healthy lifestyle.

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