Coronary Artery Disease in the Military Setting Lower Gensini Score in High-Rank Personnel Compared to Low-Rank and Civilian

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Coronary Artery Disease in the Military Setting: Lower Gensini Score in High-Rank Personnel Compared to Low-Rank and Civilian

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Abstract

Background: Studies had reported an increasing trend of coronary artery disease (CAD) cases in the military population. However, the severity of the CAD among different military rank is yet to be studied. The Gensini scoring system as a popular and developed objective method to quantify the CAD severity through the coronary an giographic findings.

Material and Method: In this retrospective cross-sectional study, researchers consecutively enrol a consecutive total of 171 patients referred to the Indonesian Navy Hospital of Dr Ramelan, who underwent elective coronary angiography from January to June 2019. Researchers divided the study population into three groups of low-rank military personnel, high-rank military personnel, and the civilian. Anthropometric, laboratory finding, and Gensini score were obtained from medical records.

Results: This research found that Post-hoc LSD test analysis showed the average score of Gensini Score of high-rank military personnel (18.39 ± 32.71) is significantly lower than both low-rank (32.76 ± 41.84; p=0.031) and civilian (36.08 ± 43.41; p=0.005).

Conclusions: High-rank military personnel was found to have lower Gensini score compared to low-rank and civilian.

Keywords: *Gensini Score, Military Rank*

Introduction

Coronary artery disease (CAD) is the principal causes of death and disability in the world, causing nearly half of the 36 million deaths as a noncommunicable disease. CAD had become a very problematic condition both in developed and developing countries and its incidence has reached 422 million cases and 17 million deaths globally in 2015.[1] In Europe, CAD causes almost 2 million deaths in the European Union (EU) and nearly 4 million deaths.[2] The rate of CAD incidence in developing countries is twice more than in developed countries. In India, around more than 30% of all deaths were due to CAD.[3–6] Indonesia as the most populated nation in South-East Asia, and home to 260 million people with over 10% of the population is living in abject poverty, CAD is accountable for 37% of all deaths.[7,8]Similar to

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the civilian population, the increased cardiovascular risk factors prevalence also affect the military population. Recent studies reported an increasing trend CAD prevalence in the military population.[9] Investigations revealed that most of the time, both low and high-rank military personnel are under high-pressure duty-related stress condition followed by physical and psychological issues, which may contribute as a risk factor for CAD development.[9–11] Hypertension, as other CAD risk factors, is also highly prevalent in the military personnel. In Indonesian Navy Hospital of Dr Ramelan, secondary hypertension incidence ranked at third and primary hypertension in the seventh of the top 10 out-patient clinic visitation, with 13,130 and 6,061 patients respectively.[12] The military system has a very rigid ranking hierarchy; thus, unpredictable changes in the rank structure are almost impossible[13], suggesting that each military rank may have distinct disease characteristics. However, the comparison of CAD severity between different military rank is yet to be investigated.

The Gensini scoring system is a popular and developed objective method to quantify the CAD severity through the coronary angiographic findings.[14] Many studies have confirmed its efficacy to identify CAD severity of the patient who underwent PCI.[15] Hence, in this research, we evaluate the severity of the CAD between different military rank and civilian by comparing their average Genisini score.

Material and Method

Study Population and Grouping: In this retrospective cross-sectional study, we randomly enrol a consecutive total of 171 elective coronary angiography patients from the Indonesian Navy Hospital of Dr Ramelan from January to June 2019. Included patients aged between 25 to 80 years old with complete medical record history. Patients with congenital heart disease, cardiomyopathy, heart valve disease, renal failure, active chronic inflammation, carcinoma, system dysfunction of immunology and haematology, or been medicated with immunosuppressive agents are excluded. Clinical and demographic characteristics of the patients (age, gender, military status, military rank, body mass index, coagulation test, diabetes mellitus, complete blood count, blood pressure, hypertension, hyperlipidemia, peripheral arterial disease, chronic kidney disease, left ventricle ejection fraction, treadmill stress test) were analysed by retrospective chart review.

Data Collection and Ethical Clearance: All data were collected from patients medical history. Researchers determined hypertension as ≥140/90 mmHg blood pressure or antihypertensive medication usage[16], hyperlipidemia as >130 mg/dL fasting low-density lipoprotein concentration or antihyperlipidemic medication usage[17], diabetes mellitus as ≥126 mg/dL fasting plasma glucose concentration or antidiabetic medication usage[18]. We divided patients into three groups, high-rank military personnel, low-rank military personnel, and civilian. High-rank military personnel consist of Ensign, Lieutenant Junior Grade, Lieutenant, Lieutenant Commander, Commander and Captain; while low-rank military personnel consist of Second Seaman, First Seaman, Able Seaman, Second Corporal, First Corporal, Chief Corporal, Petty Officer Second Class, Petty Officer First Class, Senior Chief Petty Officer and Master Chief Petty Officer.

Assessment of Coronary Angiography by Using Gensini score: Coronary angiography was evaluated by qualified nonpartisan cardiologists who were blinded to the patient's clinical features. Significant CAD was determined as ≥50% stenosis of lumen diameter in any of the major epicardial coronary arteries including the left main coronary artery, left circumflex artery, left anterior descending artery, right coronary artery, or one of their major branches. Researchers classified the distribution of the CAD as a one-vessel disease (1-VD) whose disease in one vessel only, two-vessel disease (2-VD) whose disease in two vessels or only in left main trunk without being accompanied by right coronary artery stenosis, and three-vessel disease (3-VD) whose disease in three vessels or in left main trunk accompanied by right coronary artery stenosis. We determine a significant left main disease as ≥50% stenosis of the left main trunk, with or without accompanying lesions in other arteries.[19]

We calculated The Gensini score by giving a severity score to every coronary artery narrowing for as much as 1 point for ≤25% stenosis, 2 points for 26-50% stenosis, 4 points for 51-75% stenosis, 8 points for 76-90% stenosis, 16 points for 91-99% stenosis, and 32 points for 100% stenosis. Afterwards, we multiply every severity score of the coronary artery stenosis by the accountable importance value of the coronary circulation lesion's position. The lesion position's importance values are gradual as follows: 1.0 for right coronary artery, posterolateral artery, distal segment of left anterior descending coronary artery, and obtuse marginal artery; 1.5 for mid-segment of left anterior

descending coronary artery; 2.5 for proximal segment of circumflex artery; 2.5 for proximal segment of left anterior descending coronary artery; 5 for left main coronary artery; and least of all, 0.5 for other segments. Eventually, we assessed the Gensini score by summing up every coronary artery stenosis severity scores.[20]

Statistical Analysis: Categorical variables were presented as frequencies and percentages while the continuous variables presented as mean ± standard deviation. One way ANOVA and LSD Post-Hoc test was used to compare the difference between groups. All statistical analyses were done using SPSS statistical software ver. 25.0.

Findings:

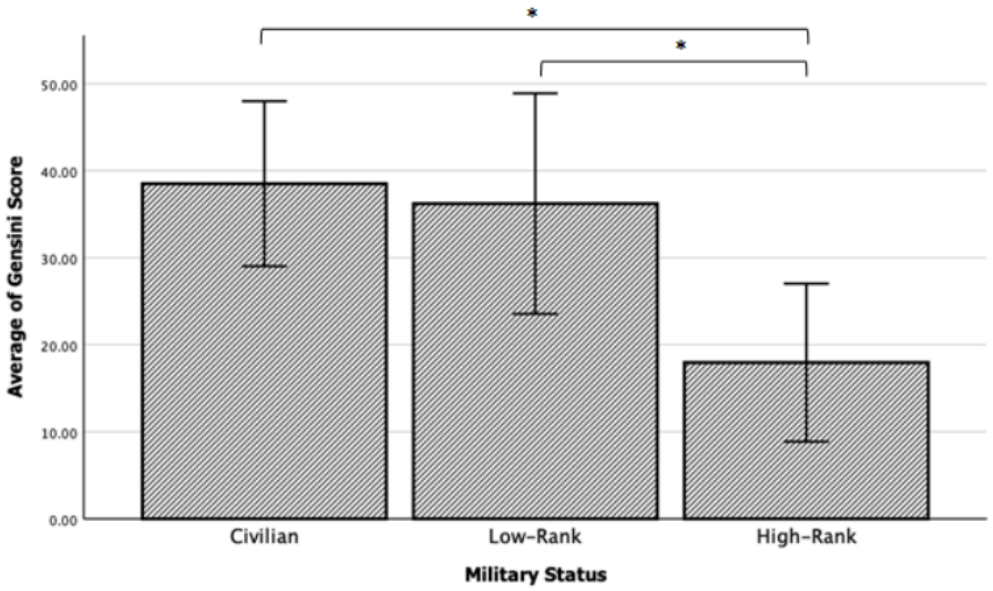
Study Population Characteristics: The average age of patients was 53.04±10.56 years. The number of patients classified as 1-VD, 2-VD, and 3-VD was 33 (19.3%), 28 (16.4%), and 47 (27.5%), respectively. We found that not only Gensini score to be significantly different between study population groups (p=0.015), but also the age (p=0.000), height (p=0.003), weight (p=0.017), random blood glucose (p=0.005) and blood urea nitrogen (p=0.016). Meanwhile, the rest of the study variable did not show a significant difference in between study population groups, as illustrated in Table 1, alongside with the summarized clinical characteristics of the whole study population.

Table 1. Characteristic of patients who underwent coronary angiography

Variable	Total	Civilian	Low-Rank	High-Rank	P
Gensini Score	32.30 ± 40.29	36.08 ± 43.41[c]	32.76 ± 41.84[c]	18.39 ± 32.71[a, b]	0.015*
Age (years)	53.03 ± 10.56	57.62 ± 9.74[b, c]	48.07 ± 8.84[a]	49.42 ± 10.10[a]	0.000*
Height (cm)	165.49 ± 6.66	163.82 ± 7.53[c]	165.71 ± 5.90	168.15 ± 4.57[a]	0.003*
Weight (kg)	70.25 ± 10.51	68.06 ± 10.77[b]	72.66 ± 10.18[a]	71.94 ± 9.78	0.017*
BMI (kg/m^2)	25.62 ± 3.28	37.71 ± 1.09[b]	33.14 ± 9.15[a, c]	34.22 ± 9.31[b]	0.050
SBP (mmHg)	127.50 ± 23.94	127.15 ± 25.02	130.95 ± 23.75	125.14 ± 22.31	0.787
DBP (mmHg)	75.67 ± 11.49	75.98 ± 13.02	75.71 ± 11.38	75.10 ± 8.63	0.812
RBG (mg/dL)	118.96 ± 45.27	129.47 ± 50.00[c]	117.20 ± 52.74	102.65 ± 24.22[a]	0.005*
BUN (mg/dL)	14.81 ± 7.47	16.60 ± 9.17[b, c]	12.63 ± 3.58[a]	13.63 ± 5.90[a]	0.016*
Cr (mg/dL)	1.13 ± 0.28	1.12 ± 0.33	1.15 ± 0.19	1.15 ± 0.27	0.081
WBC (x10^3/uL)	7.25 ± 1.90	7.17 ± 1.84	7.18 ± 1.92	7.62 ± 2.04	0.468
Hgb (g/dL)	14.13 ± 2.19	13.46 ± 1.60	14.78 ± 3.96	14.66 ± 1.19	0.519
Hct (%)	42.17 ± 4.04	40.53 ± 4.95	43.17 ± 3.98	43.83 ± 3.30	0.536
Plt (x10^3/uL)	264.38 ± 55.36	262.44 ± 61.91	269.59 ± 73.95	26.29 ± 49.64	0.500
LMD	7 (4.1)	4 (2.34)	2 (1.17)	1 (0.58)	
1-vessel CAD	18 (10.53)	8 (4.68)	6 (3.51)	4 (2.34)	
2-vessel CAD	12 (7.02)	9 (5.26)	1 (0.58)	2 (1.17)	
3-vessel CAD	14 (8.19)	6 (3.51)	3 (1.75)	5 (2.92)	

Values are presented as mean ± standard deviation or n (%)
a: significant difference compared to the civilian (p<0.05)
b: significant difference compared to the low-rank military personnel
c: significant difference compared to the high-rank military personnel
*: ANOVA test showed a significant difference at <0.05.
BMI: Body Mass Index. SBP: Systolic Blood Pressure. DBP: Diastolic Blood Pressure. RBG: Random Blood Glucose. BUN: Blood Urea Nitrogen. Cr: Creatinine. WBC: White Blood Cell. Hgb: Hemoglobin. Hct: Hematocrit. Plt: Platelet. LMD: Left Main Disease. CAD: Coronary Artery Disease.

Association between Gensini Score and Military Status: Post-hoc LSD test showed the average score of Gensini Score of high-rank military personnel (18.39 ± 32.71) is significantly lower than both low-rank (32.76 ± 41.84; p=0.031) and civilian (36.08 ± 43.41; p=0.005), as shown in Graph 1. However, no significant difference was found on the average Gensini Score of low-rank military personnel compared to civilian (p=0.761).



Error Bars: 95% CI

*: ANOVA Test showed significant difference at <0.05

Figure 1: Comparison of the average of Gensini score grouped by military status level

Discussion

Coronary artery disease (CAD) event happens differently among the patient population in the military setting.[11] In this study; researchers found that high-rank military personnel was proven to have lower Gensini Score compared to the civilian (p=0.005). This finding might be explained on the National Defence Medical Centre of Canadian Armed Forces research which showed that military personnel has a lower risk of CAD compared to civilian due to higher physical activity, lower-level state of anxiety and better psychosocial adjustment to illness.[11,21] Hence, lower CAD severity in the high-rank military personnel may be due to CAD risk reduction through higher physical activities, fewer anxieties, and better adaptation capability.

However, not all military personnel have reduced CAD severity. This research found that low-rank military personnel has more severe CAD marked by higher Gensini score compared to high-rank personnel (p=0.031). No significant difference was found between low-rank military personnel and civilian (p=0.761). This finding suggested that lower CAD severity may only occur on the high-rank military personnel. This phenomenon might be explained from the previous report, which showed that the low-rank military personnel tends to have difficulties in overcoming the harmful effects of a traumatic combat life. Meanwhile, those from more privileged backgrounds and acting as a leader in the high-rank military personnel, possess a distinct soft skill of psychological and a sense of control to buffer against combat life stress, while also less negatively or even positively affected by combat.[22,23] Previously, it also has been reviewed that distress might increase the risk of CAD development through the activation of sympathetic nervous function.[13] Autopsy result showed that significant CAD was found on 70% of young military personnel who were dead in Korea and Vietnam war.[24] These findings suggest that the distress in the low-rank military personnel might increase the risk of atherosclerosis development, causing more severe CAD. High-rank military personnel has also been reported to have less physical exhaustion compared to low-rank since low-rank military personnel tends to work as a standing guard or other physically exhausting jobs daily.[21] Hence, it is concluded that only high-rank military personnel have lower CAD severity.

This research data was limited from only a single centre. Hence, our findings are yet to be directly generalized for the Indonesian National Defence Forces population. Additionally, very little prior research on the

health status of the military personnel based on their rank. Hence, we found difficulties in comparing our findings with previous results. In the future, multicenter research should be conducted to obtain a more generalized result. Comparison of the distress level and other CAD risk factors between different military rank should be further investigated to determine their involvement in CAD severity.

Conclusion

High-rank military personnel have lower Gensini score compared to low-rank and civilian in the military setting who underwent elective coronary angiography.

Conflict of Interest: The authors declare no conflict of interest

Source of Funding: This research received no external funding

Ethical Clearance: The Ethics Committee has approved this research of the Indonesian Navy Hospital (No 06/EC/KERS/2019). This study and research were carried out under the principles of the Declaration of Helsinki, and all participating patients have provided written informed consent.

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