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Relationship Between the Jakarta Cardiovascular Score and Physical Activity: Screening of Cardiovascular Risk Factors in Older Adults

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ABSTRACT

Cardiovascular disease (CVD) remains a leading cause of morbidity and mortality worldwide, including in Indonesia, with low physical activity (PA) as an important modifiable risk factor. The Jakarta Cardiovascular Score (JAKVAS), adapted from the Framingham Risk Score, incorporates PA to better reflect cardiovascular risk in the Indonesian population. This study evaluated the relationship between PA level and cardiovascular risk based on JAKVAS among adults in a rural community in West Sumatra, Indonesia. This cross-sectional study included 40 adults participating in a community health screening. Data were collected using structured questionnaires for JAKVAS components and the International Physical Activity Questionnaire. Participants were classified into low–moderate PA (LMPA) and high PA (HPA) groups. Differences between groups were analyzed using the Mann–Whitney U test. HPA was more common among males (83.3%; p=0.003). Smoking and menopausal status were significantly associated with PA level (both p=0.003), whereas hypertension and diabetes mellitus were not. Median JAKVAS was higher in the LMPA group than in the HPA group (6 [0–15] vs. 4 [1–8]; p=0.066). Higher PA tended to be associated with lower cardiovascular risk, although the association was not statistically significant.

Keywords: cardiovascular disease, cardiovascular risk, Jakarta Cardiovascular Score, physical activity, sedentary lifestyle

INTRODUCTION

Cardiovascular disease (CVD) remains the leading cause of mortality and a major cause of disability worldwide. According to the Global Burden of Disease (GBD) 2023, CVD accounted for approximately 19.2 million deaths and 437 million disability-adjusted life years (DALYs) globally in 2023, with the greatest burden occurring in low- and middle-Socio-demographic Index settings. The increasing global burden of CVD has been driven not only by population growth and aging but also by persistent exposure to modifiable cardiovascular risk factors, including low physical activity (Collaborators, 2025). In Indonesia, physical inactivity remains an important cardiovascular risk factor. Previous analysis of the Indonesian population showed that the proportion of individuals with low physical activity increased from 18.2% in 2007 to 39.6% in 2014, and individuals with low physical activity had a 2.11-fold higher likelihood of having a high 10-year CVD risk compared with physically active individuals (Mahfud et al., 2022). These findings

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emphasize the importance of physical activity as a modifiable target for primary cardiovascular prevention.

Older adults represent a particularly important population for cardiovascular prevention because increasing age is accompanied by the accumulation of cardiovascular risk factors, while population aging itself contributes substantially to the growing global burden of CVD (Collaborators, 2025). Maintaining adequate physical activity may therefore be particularly relevant in this population. This issue is also important in rural communities such as Bungus, West Sumatra, where community-based cardiovascular screening provides an opportunity to identify cardiovascular risk factors and promote preventive interventions before overt cardiovascular disease develops. Evaluating physical activity and cardiovascular risk in this rural older population may provide locally relevant information for developing more targeted community-based prevention strategies.

For cardiovascular risk assessment in the Indonesian population, the Jakarta Cardiovascular Score (JAKVAS) was introduced as a modification of the Framingham Risk Score and was designed as a simple and practical cardiovascular risk-stratification tool suitable for developing-country settings (Kusmana, 2006). JAKVAS incorporates age, sex, blood pressure, smoking status, diabetes mellitus, body mass index, and physical activity, allowing several major cardiovascular risk factors to be evaluated using readily obtainable clinical information. Although physical activity is incorporated as one of the components of JAKVAS, evidence specifically examining the relationship between objectively categorized physical activity levels and overall JAKVAS scores remains limited. Moreover, to the best of our knowledge, no previous study has specifically evaluated this relationship among older adults living in a rural Indonesian community. This represents an important evidence gap because physical activity is potentially modifiable and may provide a practical target for community-level cardiovascular prevention.

Therefore, this study aimed to evaluate the relationship between physical activity level and cardiovascular risk assessed using JAKVAS among older adults in the rural community of Bungus, West Sumatra, Indonesia. The findings are expected to provide preliminary evidence regarding the relationship between physical activity and cardiovascular risk in this population and to support the development of community-based cardiovascular prevention strategies.

METHOD

This study employed an analytical cross-sectional design. The research was conducted in Bungus Village, West Sumatra, during a community health screening program organized by the Department of Cardiology and Vascular Medicine, Faculty of Medicine, Universitas Andalas. All participants provided written informed consent prior to enrolment, and the study protocol was approved by the institutional Health Research Ethics Committee.

The target population comprised residents of Bungus Village aged >60 years who participated in the health screening program. Sampling was performed using a consecutive sampling technique, in which all eligible participants meeting the inclusion criteria during the survey period were recruited until the required sample size was achieved (n = 21). The inclusion criteria were: (1) age $\geqslant$60 years, (2) residence in Bungus Village for at least six months, (3) ability to read and understand the questionnaire, and (4) willingness to participate. Exclusion criteria included pregnancy, acute illness interfering with questionnaire completion, or severe physical or neurological disability limiting activity without assistive devices.

The primary variables were cardiovascular risk score, assessed using the Jakarta Cardiovascular Score (JAKVAS), and physical activity level. JAKVAS consists of seven components: sex, age, blood pressure, smoking status, diabetes mellitus, body mass index (BMI), and weekly physical activity. Cardiovascular risk categories were defined as low to moderate (1-4; 10 – 20%), and high (≥5; >20%). Physical activity was classified as low, moderate, or high based on frequency, duration, and total metabolic equivalent (MET)-minutes per week, in accordance with established guidelines.

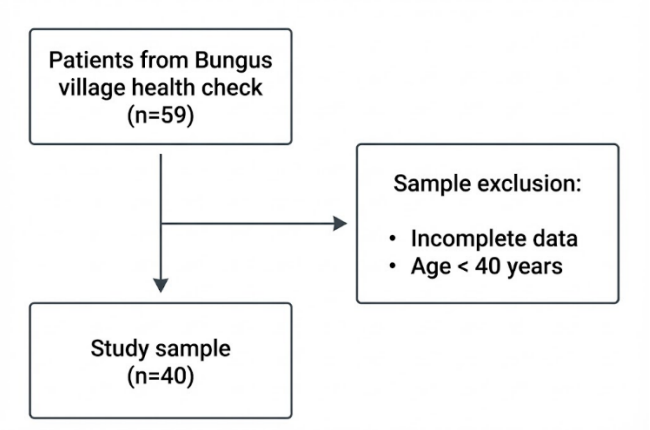


Figure 1. Flowchart of Participant Screening and Selection

Data collection was conducted through structured interviews using a demographic questionnaire and JAKVAS components. Blood pressure was measured using a validated oscillometric device following the 2019 American Heart Association recommendations, after 3–5 minutes of rest in the seated position. Two measurements were obtained at 1–2 minute intervals, and the average value was recorded. Body weight and height were measured using calibrated scales and a stadiometer to calculate BMI. Histories of hypertension and diabetes mellitus were confirmed through prior diagnoses by healthcare professionals or current use of related medications.

Data were analyzed descriptively using mean (± standard) deviation or median (range) for continuous variables, and proportions for categorical variables. Normality was assessed using the Shapiro–Wilk test. The relationship between the jakarta cardiovascular score and physical activity score was analyzed using the independent t-test for normally distributed data and the Mann–Whitney U test for non-normally distributed data. A p-value <0.05 was considered statistically significant. Statistical analyses were performed using SPSS version 26, with results reported alongside 95% confidence intervals.

RESULTS

A total of 21 participants were included in the analysis. The majority of respondents in the high physical activity group were male (83.3%), whereas the low–moderate physical activity group was predominantly female (67.9%). This difference was statistically significant (p = 0.003). The mean age of participants in the high physical activity group was slightly higher (66.05 ± 5.81 years) compared with the low–moderate physical activity group (60.90 ± 9.74 years), although this difference did not reach statistical significance (p = 0.052). Systolic blood pressure tended to be higher in the high physical activity group (149.10 ± 22.36 mmHg) than in the low–moderate activity group (136.47 ± 17.33 mmHg), with a p-value of 0.052, indicating a trend toward statistical significance. No significant differences were observed in body mass index [median 24 (range 16–37) vs. 21 (range 17–

32); p = 0.105] or blood glucose levels [median 107 (range 83–366) vs. 122 (range 91–441); p = 0.236] between the two groups.

Table 1. Respondent characteristic

Variable	Low to Moderate level Activity	High level Activity	*P* value
Sex			
Male	2 (16,7%)	10 (83,3%)	0,003[a]
Female	19 (67,9%)	9 (32,1%)	
Body Mass Index	24 (16-37)	21 (17-32)	0,105[c]
Age	60,90 (±9,74)	66,05 (±5,81)	0,052[b]
Systolic Blood Preasure	136,47 (±17,33)	149,10 (±22,36)	0,052[b]
Blood Glucoes	107 (83-366)	122 (91-441)	0,236[c]

a. Chi square. b.T-independent. c.mann-withney

Overall, most respondents without hypertension tended to have low–moderate physical activity, whereas individuals with hypertension were more frequently observed in the high physical activity group. However, this difference was not statistically significant (p = 0.342), indicating no significant association between hypertension status and physical activity level in this population. Similarly, respondents with diabetes mellitus appeared to have a higher proportion of high physical activity compared with non-diabetic participants, but this difference was also not statistically significant (p = 0.226). These findings suggest that diabetes status in the study population did not directly influence physical activity levels.

Table 2. Comorbid and risk factors

Variable	Low to Moderate level Activity	High level Activity	*P* value
Hypertension			
No Hypertension	12 (60,0%)	8 (40,0%)	0,342[a]
Hypertension	9 (45,0%)	11 (55,0%)	
Diabetes Mellitus			
No Diabetes Mellitus	19 (57,6%)	14 (42,4%)	0,226[b]
Diabetes Mellitus	2 (28,6%)	5 (71,4%)	
Smoking			
Non Smoker	20 (66,6%)	10 (33,3%)	0,003[b]
Smoker	1 (10,0%)	9 (90,0%)	

a. Chi-square, b. Fisher exact-test

In contrast, statistically significant associations were observed between smoking status (p = 0.003) and menopausal status (p = 0.003) with physical activity level. Smokers were proportionally more likely to have high physical activity compared with non-smokers. Regarding menopausal status, premenopausal respondents were more frequently categorized in the low–moderate physical activity group.

Tabel 3 JAKVAS Score difference betwen activity level

Physcal activitiy	Median	Minimun-Maximum	*P* value
Low to Moderate level Activity	6	0-15	0,066
High level Activity	4	1-8	

The analysis demonstrated that the median JAKVAS score was higher in the low–light physical activity group (median = 6; range 0–15) compared with the moderate–vigorous activity group (median = 4; range 1–8). Although this difference did not reach statistical significance (p = 0.066), a clinically relevant trend was observed, suggesting that higher levels of physical activity were associated with lower cardiovascular risk scores as assessed by JAKVAS.

DISCUSSION

Cardiovascular disease (CVD) remains a major cause of morbidity and mortality worldwide, including in Indonesia. Physical inactivity is an important modifiable cardiovascular risk factor, and contemporary guidelines consistently recommend regular physical activity and reduction of sedentary behavior as key components of primary cardiovascular prevention (Arnett et al., 2019; Bull et al., 2020; Visseren et al., 2021) . In Indonesia, low physical activity has also been associated with a higher estimated 10-year CVD risk (Mahfud et al., 2022)

In the present study, participants with high physical activity had a lower median Jakarta Cardiovascular Score (JAKVAS) than those with low–moderate physical activity (4 [1–8] vs. 6 [0–15]). However, this difference did not reach statistical significance (p = 0.066). Despite the non-significant result, the direction of the association is consistent with previous evidence showing that higher levels of physical activity are associated with lower cardiovascular events and mortality. This finding should nevertheless be interpreted cautiously because JAKVAS is a composite risk score incorporating several variables in addition to physical activity, including age, sex, blood pressure, smoking, diabetes mellitus, and body mass index (Kusmana, 2006; Lear et al., 2017) .

Several mechanisms may help explain the relationship between physical activity and cardiovascular risk, although these mechanisms were not directly assessed in this study. Regular physical activity has been associated with improved endothelial function, more favorable blood pressure regulation, reduced systemic inflammation, and improved cardiometabolic profiles (Fedewa et al., 2017; Kim et al., 2019; Liang et al., 2024; Magni, 2025). Exercise may also promote favorable vascular adaptations through improved endothelial signaling and reduced sympathetic activity (Arnett et al., 2019; Visseren et al., 2021) . Because blood pressure, body mass index, and diabetes status contribute to JAKVAS, these effects may partly explain the tendency toward lower scores among participants with higher physical activity. However, these pathways remain hypothetical in the context of the present study.

Smoking status differed significantly between physical activity groups (p = 0.003), with smoking more frequently observed among participants with higher physical activity. This finding is important because smoking independently promotes endothelial dysfunction, inflammation, and prothrombotic changes and may therefore counteract some of the cardiovascular benefits associated with physical activity (Messner & Bernhard, 2014) . Previous evidence also suggests that smoking and physical inactivity may have additive adverse effects on cardiovascular and mortality risk (Yang et al., 2022) . Thus, cardiovascular prevention should combine promotion of physical activity with smoking cessation rather than considering these interventions separately.

Menopausal status was also significantly associated with physical activity level (p = 0.003). Menopause is accompanied by hormonal and metabolic changes that may contribute to increased cardiovascular risk, while higher physical activity among postmenopausal women has been associated with a more favorable cardiovascular risk profile (Chen et al., 2021) . Differences in sex and menopausal status between physical activity groups may therefore have influenced the distribution of JAKVAS scores. Previous population studies have similarly demonstrated important sex differences in physical activity patterns (Chen et al., 2021) .

The absence of a statistically significant difference in JAKVAS between physical activity groups should be interpreted in the context of the relatively small sample size (n = 40). Limited statistical power may have reduced the ability to detect a modest difference between groups. In addition, the cross-sectional design prevents determination of temporal or causal relationships between physical activity and cardiovascular risk. Reverse causality is also possible, as individuals with known cardiovascular risk factors may have modified their physical activity after receiving medical advice. Furthermore, sedentary time was not independently evaluated, although prolonged sedentary behavior may contribute to cardiovascular risk even among individuals who achieve recommended levels of physical activity (Bull et al., 2020; Onagbiye et al., 2024) .

Overall, the present findings suggest a tendency toward lower estimated cardiovascular risk among participants with higher physical activity, although the association was not statistically significant. Given the modifiable nature of physical activity and its established role in cardiovascular prevention, community-based strategies promoting regular activity remain relevant, particularly when integrated with smoking cessation and management of other conventional cardiovascular risk factors. Larger prospective studies are needed to clarify the relationship between physical activity level and JAKVAS and to determine whether this association remains significant after adjustment for potential confounding factors.

CONCLUSION

Higher levels of physical activity tend to be associated with lower cardiovascular risk scores based on the Jakarta Cardiovascular Score (JAKVAS), although the association did not reach statistical significance. These findings underscore the importance of promoting physical activity as a preventive strategy against cardiovascular disease at the community level.

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