



MADAGO NURSING JOURNAL

p-ISSN: 274-9271/ e-ISSN: 2746-9263

Vol.7, No.1, Tahun 2026, page 35-43

DOI: <https://doi.org/10.33860/mnj.v7i1.4343>

Website: <https://jurnal.poltekkespalu.ac.id/index.php/MNJ/index>

Publisher: Poltekkes Kemenkes Palu



Physical Activity and Smoking Habits Associated with Coronary Heart Disease Among Outpatients: A Cross-Sectional Study

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ARTICLE INFO

Article History:

Received: 2026-05-17

Accepted: 2026-05-25

Published: 2026-05-27

Keywords:

Coronary heart disease; physical activity; smoking habits; cardiovascular risk factors.

ABSTRACT

Background: Coronary Heart Disease (CHD) remains one of the leading causes of morbidity and mortality worldwide, including in Indonesia. Modifiable lifestyle factors, particularly physical inactivity and smoking habits, play a substantial role in the development of CHD. Although previous studies have investigated these risk factors separately, evidence examining both physical activity and smoking habits simultaneously among CHD patients in Indonesian healthcare settings remains limited. This study aimed to determine the association between physical activity and smoking habits and the occurrence of Coronary Heart Disease among outpatients at Hospital X.

Methods: This quantitative study employed a cross-sectional design. A total of 302 outpatients were recruited using purposive sampling. Physical activity was assessed using the Global Physical Activity Questionnaire (GPAQ), while smoking habits were measured using the Glover-Nilsson Smoking Behavioral Questionnaire (GN-SBQ). Coronary Heart Disease status was determined based on physicians' diagnoses documented in medical records. Data were analyzed using the Chi-square test with a significance level of $p < 0.05$.

Results: The majority of respondents demonstrated high levels of physical activity (46.7%), primarily related to occupational activities rather than structured exercise, and mild nicotine dependence (41.4%). However, the highest proportion of CHD cases was observed among respondents with heavy nicotine dependence (33.1%). Chi-square analysis revealed a significant association between physical activity and CHD occurrence ($\chi^2 = 20.30$; $p = 0.0001$) and between smoking habits and CHD occurrence ($\chi^2 = 12.15$; $p = 0.007$).

Conclusion: Physical activity patterns and smoking habits were significantly associated with Coronary Heart Disease among outpatients at Hospital X. These findings emphasize the importance of promoting regular structured physical activity and smoking cessation programs as key strategies for preventing cardiovascular disease. Future studies using longitudinal designs and multivariable analyses are recommended to further explore causal relationships and control for potential confounding factors.



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INTRODUCTION

Coronary Heart Disease (CHD) is one of the most prevalent non-communicable diseases (NCDs) and continues to increase in both developed and developing countries. CHD occurs due to obstruction of the coronary arteries caused by the accumulation of atherosclerotic plaques, which can ultimately lead to myocardial necrosis and acute myocardial infarction. As a major

cardiovascular condition, CHD is associated with substantial morbidity and mortality and remains a significant public health concern worldwide ([Muliantino et al., 2024](#)).

According to the World Health Organization (WHO), cardiovascular diseases remain the leading cause of death globally. In 2022, approximately 19.8 million deaths were attributed to cardiovascular diseases, with nearly 85% resulting from heart attacks and stroke ([WHO, 2025](#)). The burden of cardiovascular disease is expected to increase further in Asia, where ischemic heart disease is projected to become the leading cause of mortality by 2050, accounting for approximately 115 deaths per 100,000 population. Furthermore, cardiovascular mortality across Asia is predicted to increase by 91.2% between 2025 and 2050, with Central Asia experiencing the highest mortality rates among Asian regions ([Goh et al., 2025](#)).

Indonesia is among the countries with a substantial burden of cardiovascular disease. Despite various health promotion and education programs, the prevalence of CHD continues to increase. This trend suggests that general health education alone may not be sufficient to produce meaningful behavioral changes, particularly in relation to physical activity and smoking habits, which have become deeply embedded in daily lifestyles ([Oktaviono., 2023](#)). Technological advancements, sedentary lifestyles, social influences, and high tobacco consumption further contribute to the persistence of these risk factors. According to the Indonesian Health Survey, the prevalence of physician-diagnosed heart disease among all age groups was 0.85% in 2023 ([Kemenkes, 2023](#)). In addition, Jakarta reported a prevalence of 1.9%, placing it among the provinces with the highest burden of heart disease in the country ([Kemenkes, 2018](#)).

Medical records from Hospital X indicate a substantial increase in the number of outpatients diagnosed with CHD over the past four years. The number of CHD cases increased from 508 patients in 2020 to 1,271 patients in 2021, 1,601 patients in 2022, and 1,887 patients in 2023, before declining to 1,407 patients in 2024. This persistent increase highlights the need to identify modifiable behavioral factors associated with CHD, particularly physical activity and smoking habits. Notably, many CHD patients at Hospital X belong to the productive working-age population, who are frequently exposed to occupational stress, insufficient physical exercise, and smoking-related behaviors.

Insufficient physical activity has been recognized as an important risk factor for cardiovascular disease. Physical inactivity contributes to obesity, Type 2 Diabetes Mellitus, and Coronary Heart Disease through adverse effects on metabolic function. Reduced physical activity is associated with decreased levels of high-density lipoprotein (HDL), increased levels of low-density lipoprotein (LDL), impaired glucose metabolism, reduced insulin sensitivity, elevated blood lipid concentrations, and hypertension ([Merbawani, 2022](#)). Conversely, regular physical activity improves cardiovascular fitness, enhances blood circulation, lowers blood pressure, and contributes to healthier lipid profiles.

Smoking is another major modifiable risk factor for CHD. Cigarette smoke contains numerous harmful substances, including nicotine, carbon monoxide, tar, and free radicals, which contribute to endothelial dysfunction, oxidative stress, inflammation, and accelerated atherosclerosis. Smoking promotes the oxidation of low-density lipoproteins and impairs coronary vasodilation, thereby increasing the severity and extent of coronary artery obstruction ([Salehi et al., 2021](#)). Consequently, smokers are at substantially greater risk of developing CHD than non-smokers.

Previous studies have demonstrated significant associations between physical activity and CHD as well as between smoking behavior and cardiovascular outcomes. [Rondonuwu et al. \(2020\)](#) reported that low levels of physical activity were associated with an increased risk of Coronary Heart Disease, while [Oshunbade et al. \(2021\)](#) found that smoking contributes to inflammation, endothelial dysfunction, oxidative stress, and atherosclerosis, all of which are strongly linked to CHD. Similarly, [Sriwahyuni \(2023\)](#) identified a significant relationship between smoking habits and CHD occurrence ($p = 0.040$), whereas [Irawan et al. \(2024\)](#) reported a significant association between smoking behavior and recurrent CHD events ($p = 0.001$).

Although previous studies have examined physical activity and smoking habits separately, evidence simultaneously investigating both behavioral factors among CHD patients in Indonesian healthcare settings remains limited. Understanding the combined influence of these modifiable

lifestyle factors is essential for developing effective preventive and health promotion strategies aimed at reducing the burden of cardiovascular disease. Therefore, this study aimed to examine the association between physical activity and smoking habits and the occurrence of Coronary Heart Disease among outpatients at Hospital X.

METHODS

Study Design and Setting

This study employed a quantitative analytic design using a cross-sectional approach to examine the association between physical activity, smoking habits, and the occurrence of Coronary Heart Disease (CHD). The study was conducted at the outpatient cardiac clinic of Hospital X, Jakarta, Indonesia, from May to June 2025. A cross-sectional design was selected because it allows the simultaneous assessment of exposure and outcome variables within a defined population.

Population and Sample

The study population consisted of all patients diagnosed with Coronary Heart Disease who attended the outpatient clinic of Hospital X between January and December 2024, totaling 1,407 patients. A non-probability sampling method with a purposive sampling approach was used to recruit participants. The sample size was calculated using the finite population formula proposed by (Anggreni, 2022), resulting in a minimum sample of 302 respondents. Participants were selected based on predefined eligibility criteria.

The inclusion criteria were: (1) outpatients diagnosed with Coronary Heart Disease based on a physician's medical diagnosis documented in hospital records, and (2) willingness to participate in the study by signing informed consent. The exclusion criteria included patients with cognitive impairment, speech difficulties, or memory disorders that could interfere with questionnaire completion and communication during data collection. Respondent recruitment was conducted directly at the outpatient cardiac clinic. Eligible participants were identified according to the inclusion and exclusion criteria and were invited to participate after receiving an explanation regarding the study objectives and procedures. To minimize selection bias, recruitment was carried out on different clinic days and at various consultation hours throughout the study period.

Variables and Instruments

The independent variables were physical activity and smoking habits, while the dependent variable was Coronary Heart Disease status. Physical activity was assessed using the Global Physical Activity Questionnaire (GPAQ), which consists of 16 items evaluating physical activity across work-related activities, transportation, and recreational activities. Physical activity levels were categorized based on Metabolic Equivalent Task (MET) scores as follows:

1. Low physical activity: < 600 MET-minutes/week
2. Moderate physical activity: 600–3000 MET-minutes/week
3. High physical activity: > 3000 MET-minutes/week

Smoking habits were measured using the Glover-Nilsson Smoking Behavioral Questionnaire (GN-SBQ), consisting of 11 items that assess behavioral nicotine dependence. Smoking dependence was categorized as:

1. Mild dependence: score < 12
2. Moderate dependence: score 12–22
3. Severe dependence: score 23–33
4. Very severe dependence: score > 33

Both instruments had been translated into Indonesian by a certified sworn translator prior to data collection. Previous studies demonstrated satisfactory psychometric properties of the GPAQ, with a Cronbach's alpha coefficient of 0.732 (Eliawati et al., 2024). The Indonesian version of the GN-SBQ showed excellent content validity and reliability, with I-CVI values ≥ 0.80 , S-CVI of 0.93, KMO value of 0.860, significant Bartlett's Test ($p < 0.001$), factor loadings ranging from 0.625 to 0.855,

and a Cronbach’s alpha coefficient of 0.767 (Widodo, 2025). Coronary Heart Disease status was determined based on physicians’ diagnoses documented in patients’ medical records.

Data Collection and Analysis

Data were collected using both printed questionnaires and electronic Google Forms. Eligible participants completed the GPAQ and GN-SBQ questionnaires after providing informed consent. Clinical information regarding Coronary Heart Disease diagnosis was obtained from medical records. Descriptive statistics were used to summarize respondents’ demographic characteristics, physical activity levels, smoking habits, and CHD status. Frequencies, percentages, means, and standard deviations were calculated as appropriate. Bivariate analysis was performed using the Chi-square test to determine the association between physical activity and CHD status as well as between smoking habits and CHD status. All assumptions for the Chi-square test were satisfied, including expected cell frequencies greater than five and independent observations. Statistical significance was established at $p < 0.05$ with a 95% confidence level. Because this study was limited to bivariate analysis, potential confounding variables such as hypertension, diabetes mellitus, obesity, hyperlipidemia, and family history of cardiovascular disease were not controlled.

Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee under approval number 1102/KEPK-FIK/V/2025. All participants provided written informed consent prior to participation. Participation was entirely voluntary, and respondents were informed of their right to withdraw from the study at any time without consequences. Confidentiality and anonymity were maintained throughout the research process by ensuring that all personal information and medical records were accessible only to the research team and used solely for research purposes.

RESULTS

A total of 302 outpatients participated in this study. Participants were recruited using purposive sampling and met all eligibility criteria. The demographic characteristics of respondents, physical activity levels, smoking habits, and Coronary Heart Disease (CHD) status are presented below.

Table 1. Characteristics of Respondents (n = 302)

Characteristics	Frequency (n)	Percentage (%)
Sex		
Male	179	59.3
Female	123	40.7
Employment Status		
Employed	182	60.3
Unemployed	120	39.7
Smoking Status		
Smoker	195	64.6
Non-smoker	107	35.4

Age (years): Mean = 46.91 ± 9.72 ; Range = 27–59

Most respondents were male (59.3%), employed (60.3%), and current smokers (64.6%). The mean age of participants was 46.91 years, indicating that the majority belonged to the productive adult age group.

Table 2. Distribution of CHD Status, Physical Activity, and Smoking Habits (n = 302)

Variable	Frequency (n)	Percentage (%)
CHD Status		
CHD	224	74.2
Non-CHD	78	25.8
Physical Activity Level		

Low	55	18.2
Moderate	106	35.1
High	141	46.7
Smoking Dependence		
Mild	125	41.4
Moderate	56	18.5
Severe	100	33.1
Very Severe	21	7.0

Among the 302 respondents, 224 (74.2%) had a diagnosis of Coronary Heart Disease. Nearly half of the participants reported high levels of physical activity (46.7%), while mild nicotine dependence was the most common smoking category (41.4%). However, the highest proportion of CHD cases was observed among respondents with severe nicotine dependence (33.1%). Interestingly, the relatively high proportion of respondents reporting high physical activity may reflect occupational physical activity rather than structured exercise. High-intensity work-related physical activity without adequate cardiovascular fitness may not provide the same protective effects as regular exercise. In addition, some respondents may have increased their physical activity after being diagnosed with CHD and receiving medical advice, which should be considered when interpreting these findings.

Table 3. Association Between Physical Activity, Smoking Habits, and CHD Status (n = 302)

Variable	Chi-Square Value	df	p-value
Physical Activity and CHD Status	20.30	2	0.0001
Smoking Habits and CHD Status	12.15	3	0.007

The Chi-square analysis demonstrated a statistically significant association between physical activity and CHD status ($\chi^2 = 20.30$, $df = 2$, $p = 0.0001$). A significant association was also found between smoking habits and CHD status ($\chi^2 = 12.15$, $df = 3$, $p = 0.007$). These findings indicate that both physical activity patterns and smoking habits were significantly associated with Coronary Heart Disease among outpatients at Hospital X. The larger Chi-square value observed for physical activity suggests a stronger association with CHD status compared with smoking habits in this study population.

DISCUSSION

This study examined the association between physical activity, smoking habits, and Coronary Heart Disease (CHD) among outpatients at Hospital X. The findings demonstrated significant associations between physical activity and CHD status ($p = 0.0001$) and between smoking habits and CHD status ($p = 0.007$). These results suggest that lifestyle-related behaviors remain important factors associated with cardiovascular health outcomes. The majority of respondents were male, employed, and within the productive age group, with a mean age of approximately 47 years. Increasing age is a well-established risk factor for CHD because prolonged exposure to cardiovascular risk factors contributes to progressive atherosclerotic changes and reduced vascular elasticity ([Duggan et al., 2022](#)). The predominance of male participants in this study is consistent with previous research indicating that men are generally at higher risk of developing CHD due to greater exposure to behavioral risk factors such as smoking, occupational stress, and unhealthy lifestyle patterns ([Usri et al., 2022](#)).

A significant association was observed between physical activity and CHD status. Physical activity plays an essential role in maintaining cardiovascular health by improving cardiac efficiency, enhancing blood circulation, regulating blood pressure, and promoting favorable lipid profiles ([Raimondo et al., 2020](#)). Regular physical activity increases high-density lipoprotein (HDL) cholesterol while reducing low-density lipoprotein (LDL) cholesterol and triglyceride levels, thereby lowering the risk of atherosclerosis and coronary artery obstruction ([Hattu et al., 2020](#); [Merbawani., 2022](#))

Interestingly, a relatively large proportion of respondents reported high levels of physical activity. However, this finding should be interpreted cautiously because the reported activity was predominantly related to occupational demands rather than structured exercise ([Anggraini & Ria, 2026](#)). Previous studies have suggested that physically demanding work does not necessarily provide the same cardiovascular benefits as planned and regular exercise ([Anggraeni et al., 2025](#)). In some cases, prolonged occupational physical strain may even increase cardiovascular stress, particularly among individuals with inadequate physical fitness or underlying cardiovascular conditions ([Franklin et al., 2020](#)). Furthermore, the cross-sectional nature of this study raises the possibility of reverse causality, whereby some patients may have increased their physical activity after receiving a CHD diagnosis and medical advice.

The findings of this study are consistent with those reported by [Rondonuwu et al. \(2020\)](#), who found that insufficient physical activity was significantly associated with Coronary Heart Disease. Nevertheless, some studies have reported inconsistent findings regarding this relationship. Such differences may be attributed to variations in study populations, measurement methods, sample sizes, and the presence of uncontrolled confounding factors such as hypertension, diabetes mellitus, obesity, and dyslipidemia. Smoking habits were also significantly associated with CHD status. Cigarette smoke contains numerous toxic substances, including nicotine, carbon monoxide, tar, and free radicals, which contribute to endothelial dysfunction, oxidative stress, inflammation, and accelerated atherosclerosis. These pathological processes promote coronary artery narrowing and increase the risk of ischemic cardiovascular events ([Salehi et al., 2021](#)).

Although mild nicotine dependence was the most common category among respondents, the highest proportion of CHD cases was observed among participants with severe nicotine dependence. This finding supports the biological plausibility that greater exposure to tobacco products is associated with more severe cardiovascular damage ([Wahidah & Harahap, 2021](#)). Similar findings were reported by [Oshunbade et al. \(2021\)](#), who demonstrated that active smokers had more than twice the risk of developing CHD compared with non-smokers. Likewise, [Sriwahyuni, \(2023\)](#) and [Irawan et al. \(2024\)](#) reported significant associations between smoking behavior and both the occurrence and recurrence of Coronary Heart Disease. Despite the significant findings, CHD is a multifactorial disease influenced by numerous biological, behavioral, and environmental factors ([Rondonuwu et al. 2020](#)). Several established cardiovascular risk factors, including hypertension, diabetes mellitus, obesity, hyperlipidemia, family history of cardiovascular disease, dietary habits, and psychosocial stress, were not specifically analyzed in this study. These variables may have acted as confounding factors and should be considered in future investigations ([Rosalina et al., 2023](#)).

The findings of this study have important implications for public health practice and nursing care. Healthcare professionals should prioritize lifestyle modification programs that encourage regular structured physical activity and smoking cessation. Nurses play a strategic role in assessing health behaviors, providing individualized counseling, implementing evidence-based smoking cessation interventions such as the 5A approach (Ask, Advise, Assess, Assist, and Arrange), and referring patients to cardiovascular rehabilitation programs. Integrating smoking cessation education and physical activity promotion into routine outpatient services may contribute to reducing the burden of Coronary Heart Disease ([Nurhijriah et al., 2022](#)).

This study has several limitations. First, only two behavioral variables physical activity and smoking habits were examined, whereas other cardiovascular risk factors were not included in the analysis. Second, the study was conducted at a single healthcare facility, which may limit the generalizability of the findings. Third, the cross-sectional design precludes causal inference and does not allow the temporal relationship between exposure and outcome to be established. Fourth, self-reported measures of physical activity and smoking behavior may be subject to recall bias and social desirability bias. Finally, the study did not report effect sizes or confidence intervals, which are important for evaluating the clinical significance of the findings ([Gibran & Nurulhuda, 2023](#)).

Future studies should employ longitudinal or cohort designs to better assess causal relationships between physical activity, smoking habits, and Coronary Heart Disease. Researchers

are also encouraged to include additional cardiovascular risk factors and apply multivariable statistical analyses to identify the most influential determinants of CHD. Such approaches would provide a more comprehensive understanding of cardiovascular risk and inform the development of targeted prevention strategies.

CONCLUSION

This study demonstrated significant associations between physical activity, smoking habits, and Coronary Heart Disease (CHD) among outpatients at Hospital X. Physical activity was significantly associated with CHD status ($p = 0.0001$), while smoking habits were also significantly associated with CHD status ($p = 0.007$). These findings indicate that modifiable lifestyle behaviors play an important role in cardiovascular health outcomes.

The majority of respondents reported high levels of physical activity, which were primarily related to occupational activities rather than structured exercise, and most participants exhibited mild nicotine dependence. However, the highest proportion of CHD cases was observed among individuals with severe nicotine dependence. These findings suggest that both the quality and context of physical activity, as well as the degree of tobacco dependence, should be considered when developing cardiovascular disease prevention strategies.

The results reinforce existing evidence that lifestyle modification remains a key component of Coronary Heart Disease prevention and management. Health promotion programs should emphasize regular structured physical activity, smoking cessation, and comprehensive cardiovascular risk reduction strategies. Nurses and other healthcare professionals have an important role in assessing health behaviors, providing evidence-based counseling, and supporting long-term behavioral change among individuals at risk of cardiovascular disease.

Future studies are recommended to incorporate additional cardiovascular risk factors, including hypertension, diabetes mellitus, obesity, dyslipidemia, dietary habits, and psychosocial stress, to provide a more comprehensive understanding of CHD determinants. Longitudinal studies and multivariable analyses are also needed to clarify causal relationships and identify the most influential predictors of Coronary Heart Disease.

Author Contributions: The first author contributed to the study conceptualization, research design, data collection, data analysis, manuscript preparation, and manuscript revision. The second author contributed to manuscript writing and preparation. The third author contributed to data analysis and interpretation of the study findings.

Conflict of Interest: The authors declare that there are no conflicts of interest related to this study.

Source of Funding Statements: This research did not receive any specific grant from government agencies, private organizations, commercial entities, or non-profit institutions. All research activities were independently conducted by the researchers.

Acknowledgments: The authors would like to express their sincere gratitude to the educational institution and Hospital X for granting permission to conduct this study. The authors also extend their appreciation to all respondents who willingly participated in the research. Special thanks are given to all individuals and organizations who provided support, guidance, and assistance throughout the research process and the preparation of this manuscript.

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