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Association of Physical Activity and Coffee Consumption with Hypertension Incidence Among Productive-Age Adults in Godong I Community Health Center, Grobogan Regency

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Abstract: Hypertension is a major non-communicable disease that increasingly affects individuals of productive age and contributes to cardiovascular complications such as stroke and heart failure. This study aimed to examine the association between physical activity, coffee consumption, and hypertension incidence among productive-age adults at the Godong I Community Health Center, Grobogan Regency. Objective is to find the relationship between physical activity and coffee consumption with the incidence of hypertension. A quantitative cross-sectional study was conducted among 99 respondents. Data were collected through questionnaires and blood pressure measurements. Statistical analysis was performed using Spearman's rank correlation test with a significance level of $p<0.05$. Physical activity ($p=0.001$) and coffee consumption ($p=0.008$) showed significant associations with hypertension incidence. Both physical activity and coffee consumption are significantly associated with hypertension among the productive-age population.

Keywords: Physical activity, hypertension, coffee consumption, productive age.

1. Introduction

Hypertension is one of the most prevalent non-communicable diseases and a major contributor to global morbidity and mortality. According to the World Health Organization (WHO, 2023), approximately 1.28 billion adults aged 30–79 years are diagnosed with hypertension, with the majority living in low- and middle-income countries. Hypertension is often referred to as the silent killer because many individuals remain unaware of their condition until severe complications such as stroke, coronary heart disease, or kidney failure occur.

In Indonesia, the prevalence of hypertension reached 34.1% according to the Basic Health Research (Riskesdas, 2022) and increases with age. However, hypertension is also frequently observed among productive-age individuals. Lifestyle factors such as insufficient physical activity, excessive coffee consumption, and high salt intake play crucial roles in elevating blood pressure levels.

Based on data from the Godong I Community Health Center in Grobogan Regency (2024), the prevalence of hypertension in the productive age group reached 93.40% or 13,433 patients, making it the area with the highest number of cases in the regency. This high prevalence highlights the urgent need for preventive efforts that focus on modifiable lifestyle behaviors among this population group.

Most prior research, however, has focused on elderly populations, while few have examined hypertension risk factors among productive-age adults in rural community health settings. Understanding these relationships is essential for developing early prevention and lifestyle modification programs targeting younger populations. Therefore, this study aimed to analyze the relationship between physical activity, coffee consumption, and hypertension incidence among productive-age adults at the Godong I Community Health Center, Grobogan Regency.

This study aimed to examine the association between physical activity, coffee consumption, and the occurrence of hypertension among individuals of productive age at the Godong I Community Health Center, Grobogan District.

2. Methods

This quantitative cross-sectional study was conducted in March 2025 in the working area of the Godong I Community Health Center, Grobogan Regency. The study population consisted of all productive-age adults registered at the health center. A purposive sample of 99 respondents was selected based on the following inclusion criteria: productive-age adults (18–59 years old) and willingness to participate. Exclusion criteria included refusal to participate or absence during data collection. Ethical approval was obtained from the Ethics Committee of An Nuur University. All respondents provided informed consent before participation.

Data were collected using a researcher-developed questionnaire that had undergone validity and reliability testing. The questionnaire measured three main variables: physical activity, coffee consumption. Validity testing was conducted using Pearson's product–moment correlation with 20 degrees of freedom (df = 20) and a significance level of 0.05 (two-tailed), yielding an r-table value of 0.444. The r-calculated values ranged from 0.454 to 0.729 for physical activity, 0.496 to 0.728 for coffee consumption. indicating that all items were valid. Reliability testing using Cronbach's alpha showed coefficients of 0.740 for physical activity, 0.750 for coffee consumption, confirming that all instruments were reliable ($\alpha > 0.7$).

Blood pressure was measured using a validated digital sphygmomanometer following standardized procedures. Univariate analysis was used to describe respondent characteristics and the frequency distribution of each variable. Bivariate analysis was performed using Spearman's rank correlation test to examine the association between physical activity, coffee consumption, and hypertension incidence, with a significance level set at $p < 0.05$. Data analysis was conducted using SPSS version 25.0.

3. Results

This section presents the findings regarding the association between physical activity, coffee consumption, and hypertension incidence among productive-age adults at the Godong I Community Health Center, Grobogan Regency. Descriptive statistics summarize respondent characteristics, followed by inferential analysis using Spearman's rank correlation test.

Table 1 Frequency distribution based on the age of respondents

Age		
Category	**Frequency**	**Percentage**
< 21 years	30	30.3

21-25 years old	12	12.1
26-30 years	8	8.1
31-35 years old	16	16.2
36-40 years old	9	9.1
41-45 years	12	12.1
>45 years old	12	12.1
Total	**99**	**100**

The majority of respondents were under 21 years old (30.3%), while the smallest proportion was in the 26–30-year age group (8.1%).

Table 2. Frequency distribution based on the gender of respondents

Gender		
Category	**Frequency**	**Percentage**
Male	48	48.5
Female	51	51.5
Total	**99**	**100**

Based on Table 2, the distribution by gender shows that there were 51 female respondents (51.5%) and 48 male respondents (48.5%).

Table 3. Frequency distribution based on the respondents' highest level of education

Education		
Category	**Frequency**	**Percentage**
No schooling	3	3.0
Elementary	11	11.1
Junior High School/Equivalent	11	11.1
High School/Equivalent	63	63.6
Bachelor's Degree	11	11.1
Total	**99**	**100.0**

Based on Table 3, Most respondents (63.6%) completed high school, while only 3 respondents (3.0%) had no formal education

Table 4. Frequency distribution based on respondents' occupations

Occupation		
Category	**Frequency**	**Percentage**
Civil Servant	1	1.0
Midwife	1	1.0
Nurse	2	2.0
Private	19	19.2
Migrant Workers	4	4.0

Housewife	31	31.3
Student	31	31.3
Farmers	7	7.1
Merchant	3	3.0
Total	**99**	**100.0**

Based on Table 4, the frequency distribution of respondents based on occupation shows that the highest number of respondents were housewives and students, totaling 31 respondents (31.3%), while the lowest number of respondents were civil servants and midwives, totaling 1 respondent (1.0%).

Table 5. Frequency Distribution Based on Respondents' Physical Activity

Coffee Consumption		
Category	**Frequency**	**Percentage**
Heavy physical activity	6	6.1
Moderate physical activity	28	28.3
Light physical activity	65	65.7
Total	**99**	**100**

Based on Table 5, the frequency distribution of respondents based on physical activity shows that 6 respondents (6.1%) engage in heavy physical activity, 28 respondents (28.3%) engage in moderate physical activity, and 65 respondents (65.7%) engage in light physical activity.

Table 6. Frequency Distribution Based on Coffee Consumption

Coffee Consumption		
Category	**Frequency**	**Percentage**
heavy coffee consumption	1	1
Moderate coffee consumption	31	31.3
Light coffee consumption	67	67.7
Total	**99**	**100**

Based on Table 6, the frequency distribution of respondents based on coffee consumption shows that 1 respondent (1.0%) consumed heavy amounts of coffee, 31 respondents (31.1%) consumed moderate amounts of coffee, and 67 respondents (67.7%) consumed light amounts of coffee.

Table 7. Frequency Distribution of Hypertension Incidence

Hypertension		
Category	**Frequency**	**Percentage**
Normal	52	52.5
Abnormal	47	47.5
Total	**99**	**100.0**

Based on Table 7, the frequency distribution of respondents was normal for 52 respondents (52.5%), while the lowest was abnormal for 47 respondents (47.5%).

Table 8. Relationship Between Physical Activity and Hypertension Incidence

	Hypertension						
	Normal		Not Normal		Total		P Value
	F	%	F	%	F	%	
Light Physical Activity	4	4.04	10	10.1	14	14.1	0.001
Moderate Physical Activity	34	34.3	35	35.3	35	69.7	
Heavy Physical Activity	14	14.1	2	2.0	2	16.1	
Total	52	52.5%	47	47.4%	99	100	

The analysis revealed a significant association between physical activity and the occurrence of hypertension (p = 0.001). Respondents with low levels of physical activity experienced hypertension more often than those with moderate or high levels of activity. This suggests that people who are less physically active are more likely to develop hypertension. Engaging in regular physical activity helps keep blood vessels flexible, improves circulation, and supports healthy blood pressure levels. These results align with previous studies and existing theories emphasizing that staying active is an important factor in preventing hypertension.

Table 9. Relationship Between Coffee Consumption and Hypertension Incidence

		Hypertension						
		Normal		Abnormal		Total		P Value
		F	%	F	%	F	%	
Light Coffee Consumption		4	4.0	10	10.1	10	14.1	0.008
Moderate Coffee Consumption		37	37.3	34	34.3	71	71.7	
Heavy Coffee Consumption		11	11.1	3	3.0	14	14.1%	
Total		52	52.5%	47	47.4%	99	100	

A significant association was also found between coffee consumption and hypertension incidence (p = 0.008). Respondents with light to moderate coffee consumption had a higher proportion of abnormal blood pressure compared to heavy consumers. This suggests that the relationship between coffee consumption and blood pressure may not be linear. Habitual coffee drinkers might develop tolerance to caffeine, leading to less pronounced blood pressure responses. Moreover, factors such as coffee type and preparation (e.g., unsweetened or low-caffeine variants) may influence the observed outcomes. These findings align with previous research indicating that caffeine's effects on blood pressure vary according to dosage, coffee type, and individual sensitivity.

4. Discussion

The findings of this study demonstrated that both physical activity and coffee consumption were significantly associated with the incidence of hypertension among productive-age adults at the

Godong I Community Health Center. Respondents with lower levels of physical activity were more likely to experience hypertension compared to those who engaged in moderate or heavy physical activity.

Physical Activity and Hypertension

Individuals with light physical activity—such as slow walking, standing, or light housework—tend to experience hypertension more frequently because these activities do not provide adequate cardiovascular benefits when performed without sufficient intensity or duration. These findings are consistent with the study by Khafifah (2019), which reported that low physical activity significantly increased the risk of hypertension among menopausal women ($p = 0.030$), with a 3.4-fold greater likelihood of developing hypertension.

Moderate and regular physical activity contributes to improved endothelial function, vascular elasticity, and reduced peripheral resistance, thereby stabilizing blood pressure levels. According to WHO (2020) and Pescatello et al. (2019), moderate-to-vigorous exercise effectively lowers blood pressure through improved cardiovascular efficiency and peripheral circulation. Similarly, Pitanga and Lessa (2020) and Cleven et al. (2020) found that consistent physical activity substantially reduces the risk of hypertension, supporting the role of exercise as a protective factor. Furthermore, some respondents with light activity but normal blood pressure may have benefited from a healthy diet—particularly low sodium and fat intake—and other lifestyle factors such as non-smoking behavior and adequate stress management. These factors can mitigate the adverse impact of physical inactivity on blood pressure regulation.

Coffee Consumption and Hypertension

This study also found a significant association between coffee consumption and hypertension incidence ($p = 0.008$). However, the relationship was not linear. Respondents with light to moderate coffee consumption showed varying blood pressure levels, suggesting that caffeine's impact depends on individual tolerance, the type of coffee consumed, and other lifestyle behaviors. Respondents who consumed small to moderate amounts of coffee but maintained normal blood pressure were likely to have balanced diets, exercised regularly, and maintained ideal body weight. Low caffeine intake (<100 mg/day) may not significantly raise blood pressure, particularly in individuals who are accustomed to caffeine or who consume low-sodium diets. In contrast, respondents with light coffee intake but abnormal blood pressure may have been exposed to caffeine from other sources (e.g., tea, soda, chocolate) or had high salt and fat intake, which can elevate blood pressure.

According to Martiani (2019), caffeine interacts with adenosine receptors and activates the sympathetic nervous system, increasing catecholamine levels and cortisol secretion. This mechanism causes vasoconstriction and elevated peripheral resistance, ultimately leading to increased blood pressure. Among respondents who consumed moderate amounts of coffee, many maintained normal blood pressure, possibly due to regulated drinking habits—such as consuming coffee in the morning or early afternoon rather than near bedtime. Zhang Zhenzhen et al. (2019) suggested that habitual moderate coffee drinkers may develop physiological tolerance, minimizing caffeine's hypertensive effects. Conversely, excessive consumption, especially with added sugar and creamer, can increase obesity and insulin resistance risk, both of which are closely related to hypertension.

Respondents with heavy coffee consumption exhibited mixed outcomes. Some maintained normal blood pressure due to protective lifestyle factors such as balanced diets, sufficient physical activity, and the use of low-sugar or unsweetened coffee. In contrast, those with abnormal blood pressure likely consumed coffee with added sugar or fat-rich creamers. Individuals with high caffeine sensitivity or irregular coffee habits may experience sympathetic nervous system activation, leading to vasoconstriction and elevated heart rate. Over time, this mechanism contributes to higher blood pressure levels.

These findings align with Noordzij et al. (2018), who reported that long-term coffee drinkers exhibit reduced hypertensive responses due to caffeine tolerance. The study also supports the idea that caffeine's effect on blood pressure is multifactorial—modulated by genetic predisposition, habitual intake, diet, and overall health behavior.

Integration of Findings

Overall, the results reinforce the multifactorial nature of hypertension, where both physical activity and coffee consumption interact with lifestyle and genetic factors. In productive-age populations—who should ideally maintain optimal health—lifestyle modification remains a key preventive strategy. Promoting regular physical activity and encouraging mindful coffee consumption without excessive additives could help reduce hypertension prevalence, particularly in rural settings like Grobogan Regency.

Study Limitations

This study was limited by its cross-sectional design, which prevents the establishment of causal relationships. Additionally, self-reported measures of physical activity and coffee consumption may have introduced recall bias or social desirability bias. Future research using longitudinal designs, objective physical activity monitoring, and biochemical markers of caffeine intake is recommended to strengthen the findings.

5. Conclusions

A significant correlation was found between physical activity, coffee consumption, and the occurrence of hypertension among productive-age individuals at the Godong I Community Health Center, Grobogan District. Individuals with lower physical activity levels and irregular coffee consumption patterns were more likely to experience elevated blood pressure. These findings highlight the importance of maintaining an active lifestyle and adopting moderate coffee consumption habits to support cardiovascular health. Nursing Implication: Health workers, particularly community nurses, should promote regular physical activity and monitor caffeine intake as part of community-based hypertension prevention programs. Integrating lifestyle education into routine health promotion activities can help reduce hypertension risk among productive-age adults and enhance overall community health outcomes.

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