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ASSOCIATION OF HYPERTENSION AND DIABETES MELLITUS WITH HEART DISEASE AMONG OLDER ADULTS IN INDONESIA

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Abstract

Background: Cardiovascular disease remains a leading cause of morbidity and mortality among older adults, particularly in low- and middle-income countries experiencing rapid population aging. Hypertension and diabetes mellitus are common chronic conditions in later life and are well-established risk factors for heart disease. However, nationally representative evidence examining their associations with heart disease among older adults in Indonesia remains limited. Objective: This study aimed to examine the association between diagnosed hypertension and diagnosed diabetes mellitus with diagnosed heart disease among older adults in Indonesia. Methods: A descriptive correlational study with a cross-sectional design was conducted using secondary data from the 2023 Indonesian Health Survey (Survei Kesehatan Indonesia/SKI). The study included older adults aged ≥60 years with complete data on hypertension, diabetes mellitus, and heart disease. Data were analyzed using univariate analysis to describe variable distributions and bivariate analysis using the Chi-square test to assess associations. Statistical significance was set at $p < 0.05$. Results: Among 97339 older adults, the prevalence of hypertension was 21.9%, and diabetes mellitus was 6.1%. Heart disease was more prevalent among older adults with hypertension and diabetes mellitus compared to those without these conditions. Both hypertension and diabetes mellitus were significantly associated with heart disease ($p < 0.001$). Conclusion: Hypertension and diabetes mellitus are significantly associated with heart disease among older adults in Indonesia. These findings highlight the importance of integrated chronic disease prevention and management strategies targeting older populations to reduce the burden of cardiovascular disease.

Keywords: Diabetes Mellitus, Heart Disease, Hypertension, Indonesia Health Survey, Older Adults

Introduction

Cardiovascular disease remains a leading cause of morbidity and mortality worldwide, particularly among older adults, as populations continue to age rapidly. Hypertension and diabetes mellitus are two of the most prevalent chronic conditions in later life and are widely recognized as major modifiable risk factors for heart disease. Age-related physiological changes, combined with cumulative exposure to behavioral and metabolic risk factors, increase vulnerability to cardiovascular complications among older populations [1][2]. In low and middle-income countries such as Indonesia, the growing burden of non-communicable diseases presents a significant public health challenge, especially within aging populations that require long-term disease management.

Extensive research has established the role of hypertension in the development of heart disease through mechanisms such as arterial stiffness, endothelial dysfunction, and left ventricular

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hypertrophy [3][2]. Similarly, diabetes mellitus has been shown to substantially increase cardiovascular risk by accelerating atherosclerosis, promoting chronic inflammation, and impairing vascular function [4][5]. Recent global studies report that older adults with diabetes have a two- to four-fold higher risk of heart disease compared to those without diabetes [6]. Studies conducted in Southeast Asia also confirm that both hypertension and diabetes are strongly associated with cardiovascular morbidity among older adults [7][8].

In Indonesia, national health reports indicate a steady increase in the prevalence of hypertension, diabetes mellitus, and heart disease, particularly among individuals aged 60 years and older [9]. Data from the Indonesian Health Survey (Survei Kesehatan Indonesia/SKI) reveal that cardiovascular diseases are among the leading causes of death, with hypertension and diabetes identified as key contributing factors [10]. Although several studies have examined cardiovascular risk factors in the Indonesian population, most focus on general adult populations or specific regions, limiting their applicability to older adults at the national level.

Despite strong global evidence linking hypertension and diabetes mellitus to heart disease, there is a lack of nationally representative studies specifically examining these associations among older adults in Indonesia. Existing Indonesian studies often rely on regional data, small sample sizes, or do not focus exclusively on older populations, which may underestimate the true burden and interaction of chronic diseases in later life. Furthermore, limited recent studies utilize the latest national survey data to explore these associations, creating a gap in evidence needed to inform targeted cardiovascular disease prevention and management strategies for Indonesia's aging population. Therefore, this study aims to examine the association between diagnosed hypertension and diagnosed diabetes mellitus with diagnosed heart disease among older adults in Indonesia, using data from the 2023 Indonesian Health Survey [9]. By addressing this gap, the study seeks to provide updated, nationally representative evidence to support policy development and strengthen integrated chronic disease management for older adults in Indonesia.

Method

This study employed a descriptive correlational design with a cross-sectional approach, aiming to examine the association between diagnosed hypertension and diagnosed diabetes mellitus with diagnosed heart disease among older adults, based on data from the 2023 Indonesian Health Survey (Survei Kesehatan Indonesia/SKI 2023). This design was selected because it allows for the assessment of relationships between variables at a single point in time without direct intervention by the researcher.

The study population consisted of all older adults aged 60 years and above who participated as respondents in the SKI 2023. The study sample included older adults recorded in the SKI 2023 dataset who had complete data on the variables of diagnosed hypertension, diagnosed diabetes mellitus, and diagnosed heart disease. Respondents with incomplete data or critical missing values on the studied variables were excluded from the analysis. The sampling technique applied in SKI 2023 followed a stratified multistage cluster sampling method, in accordance with the official SKI 2023 protocol. The inclusion criteria for this study were: (1) respondents aged ≥ 60 years, (2) registered as participants in the SKI 2023, and (3) having complete data for all variables analyzed in this study.

This study utilized secondary data obtained from the Indonesian Health Survey 2023, a nationally standardized survey with established validity and reliability conducted by the Ministry of Health of the Republic of Indonesia. Data processing involved data cleaning to ensure accuracy and consistency, followed by data recoding to standardize variable categories, and cross-tabulation to describe the distribution and relationships among variables. Data analysis consisted of univariate analysis to describe the frequency distribution of each variable, and bivariate analysis using the Chi-

square test to examine the associations between diagnosed hypertension and diagnosed diabetes mellitus with diagnosed heart disease among older adults. Statistical significance was determined at a p-value < 0.05.

This study did not involve direct interaction with respondents, as it relied on anonymized secondary data; therefore, informed consent was not required. Nevertheless, all research procedures adhered to ethical standards for health research, particularly regarding data confidentiality. Ethical approval and data access permission were granted by the Center for Data and Information (Pusdatin), Ministry of Health of the Republic of Indonesia, as stated in the approval letter Number FRM/SMKI-PUSDATIN/70/0108/2024, with access ticket number 240675B7CC9C4327.

Results

Univariate Analysis Results

Table 1 Frequency Distribution of Hypertension Among Older Adults in Indonesia (n = 97339)

Variable	Category	Frequency	Precent
Hypertension	Yes	21351	21.9%
	No	75988	78.1%
Total		97339	100%

Source: SKI, 2023

Table 1 presents the frequency distribution of hypertension among older adults in Indonesia, based on a total sample of 97339 respondents. The findings indicate that hypertension is a common health condition in this population. A total of 21351 older adults were identified as having hypertension, representing (21.9%) of the study sample. In contrast, the majority of respondents, totaling 75988 individuals (78.1%), did not report having hypertension.

Table 2 Frequency Distribution of Diabetes Mellitus Among Older Adults in Indonesia (n = 97339)

Variable	Category	Frequency	Precent
Diabetes Mellitus	Yes	5927	6.1%
	No	91412	93.9%
Total		97339	100%

Source: SKI, 2023

Table 2 shows the frequency distribution of diabetes mellitus among older adults in Indonesia, based on a total sample of 97339 respondents. The results indicate that the prevalence of diabetes mellitus in this population is relatively low compared to other chronic conditions. A total of 5927 older adults were identified as having diabetes mellitus, accounting for (6.1%) of the study population. Meanwhile, the vast majority of respondents, totaling 91412 individuals (93.9%), did not have diabetes mellitus.

Bivariate Analysis Results

Table 3 Association of Hypertension and Diabetes Mellitus with Heart Disease Among Older Adults in Indonesia (n = 97339)

Variables	Heart Disease				Total		*p-value*
	Yes		No				
	n	%	n	%	n	%	
Hypertension							**0.001**
Yes	1760	1.8%	19591	20.1%	21351	21.9%	
No	1635	1.7%	74353	76.4%	75988	78,1%	
Total	**3395**	**3.5%**	**93944**	**96.5%**	**97339**	**100%**	
Diabetes							**0.001**
Yes	641	0.7%	5286	5.4%	5927	6,1%	
No	2754	2.8%	88658	91,1%	91412	93,9%	
Total	**3395**	**3.5%**	**93944**	**96.5%**	**97339**	**100%**	

Source: SKI, 2023

Table 3 presents the association between hypertension and diabetes mellitus with heart disease among older adults in Indonesia, based on a total sample of 97339 respondents. The analysis shows that both hypertension and diabetes mellitus were significantly associated with heart disease (p = 0.001). Among older adults with hypertension, 1760 individuals (1.8%) were diagnosed with heart disease, while 19591 individuals (20.1%) did not have heart disease. In contrast, among those without hypertension, 1635 respondents (1.7%) had heart disease, whereas 74,353 respondents (76.4%) did not. Overall, hypertension was present in 21351 respondents (21.9%), and the association between hypertension and heart disease was statistically significant (p = 0.001).

Similarly, diabetes mellitus was significantly associated with heart disease. Among older adults with diabetes mellitus, 641 individuals (0.7%) were diagnosed with heart disease, while 5286 individuals (5.4%) did not have heart disease. Among respondents without diabetes mellitus, 2754 individuals (2.8%) experienced heart disease, whereas 88658 individuals (91.1%) did not. The total prevalence of diabetes mellitus in this population was 6.1% (5927 respondents), and the association with heart disease was statistically significant (p = 0.001). Overall, heart disease was identified in 3395 older adults (3.5%), while 93,944 individuals (96.5%) did not have heart disease.

Discussion

This study examined the prevalence of hypertension and diabetes mellitus and their associations with heart disease among older adults in Indonesia using a large nationally representative sample. Empirically, the findings demonstrate that both hypertension and diabetes mellitus remain prevalent conditions and are significantly associated with heart disease among older adults. This result confirms that chronic non-communicable diseases continue to pose major public health challenges in aging populations, consistent with global cardiovascular risk profiles reported by international health authorities [11][12]. From the researchers' perspective, these findings indicate that cardiovascular risk accumulation in later life is already evident at the population level in Indonesia. The prevalence of hypertension among older adults in this study was 21.9%, indicating that more than one in five older individuals live with elevated blood pressure. This empirical finding aligns with the epidemiological transition theory, which explains the shift in disease patterns from infectious to chronic non-communicable diseases as a result of population aging, urbanization, and lifestyle changes [13]. Theoretically, hypertension increases with age due to arterial stiffening, endothelial dysfunction, and

prolonged exposure to behavioral risk factors such as physical inactivity and unhealthy dietary patterns (WHO, 2023). The prevalence observed in this study is consistent with previous studies conducted in Indonesia and other low- and middle-income countries, which reported hypertension prevalence ranging from 20% to 35% among older populations [14]. This conformity suggests that hypertension continues to be a dominant cardiovascular risk factor among Indonesian older adults.

The prevalence of diabetes mellitus among older adults was 6.1%, which, although lower than that of hypertension, remains clinically and epidemiologically significant. This finding supports existing evidence that diabetes prevalence increases with age but generally remains lower than hypertension prevalence in older populations [6]. Previous national and regional studies have reported diabetes prevalence among Indonesian older adults ranging between 5% and 10%, indicating that the present findings are consistent with earlier research [14][15]. The relatively lower prevalence compared to hypertension may be influenced by underdiagnosis, as diabetes mellitus can remain asymptomatic in its early stages, particularly in older individuals [6]. The most important finding of this study is the statistically significant association between hypertension and heart disease. Older adults with hypertension were more likely to experience heart disease compared to those without hypertension. This finding is strongly supported by cardiovascular disease theory, which identifies hypertension as a major modifiable risk factor for coronary heart disease through mechanisms such as left ventricular hypertrophy, atherosclerosis, and increased myocardial oxygen demand [12][11]. The results are consistent with numerous previous studies conducted globally and in Southeast Asia, which have consistently demonstrated hypertension as a strong predictor of heart disease [13]. No conflict with existing research was identified, reinforcing the robustness of this association.

Similarly, diabetes mellitus was significantly associated with heart disease among older adults. Individuals with diabetes had a higher proportion of heart disease compared to those without diabetes. This finding is in accordance with the pathophysiological theory that chronic hyperglycemia accelerates atherosclerosis, promotes endothelial damage, and increases inflammatory processes, all of which contribute to cardiovascular disease [12][15]. Previous studies have shown that older adults with diabetes have a two- to four-fold increased risk of developing heart disease, which supports the conformity of this study's findings with established evidence [6][13]. Taken together, the results confirm the hypothesis that hypertension and diabetes mellitus are significantly associated with heart disease among older adults. The consistency of these findings with previous research strengthens the evidence that integrated management of chronic conditions is essential in reducing cardiovascular disease burden in aging populations [11][12]. Importantly, this study contributes to the literature by providing large-scale evidence from Indonesia, where data on older adults and cardiovascular risk factors remain limited [14].

Limitations

Despite its strengths, this study has several limitations. First, the cross-sectional design limits the ability to establish causal relationships between hypertension, diabetes mellitus, and heart disease, as temporal sequence cannot be determined [13]. Second, the data relied on self-reported diagnoses, which may introduce recall bias or underreporting, particularly for conditions such as diabetes mellitus that may remain undiagnosed [6]. Third, potential confounding variables such as duration of illness, medication adherence, diet, physical activity, smoking status, and obesity were not included in the analysis, which may influence the observed associations [12].

Conclusion

This study concludes that hypertension and diabetes mellitus are significantly associated with heart disease among older adults in Indonesia, underscoring the critical role of chronic non-communicable diseases in shaping cardiovascular health outcomes in later life. As populations age, the accumulation of metabolic and vascular risk factors increasingly contributes to the development of heart disease, making older adults particularly vulnerable. The findings confirm that both hypertension and diabetes mellitus function not merely as coexisting conditions but as interconnected contributors to cardiovascular pathology. These results support the broader epidemiological understanding that chronic disease clustering in older age substantially elevates the risk of heart disease and reinforces the importance of early detection and long-term disease control.

The study addresses its primary research objective by providing nationally representative evidence that strengthens the existing conceptual framework linking hypertension and diabetes mellitus with heart disease. By focusing specifically on older adults, the findings offer a more precise understanding of cardiovascular risk in this age group, which is often underrepresented in national-level analyses. The observed associations reflect underlying biological mechanisms, including vascular damage, endothelial dysfunction, and metabolic dysregulation, which collectively accelerate cardiovascular deterioration over time. In this context, the study contributes empirical support to the concept that effective management of hypertension and diabetes should be viewed as a cornerstone of cardiovascular disease prevention in aging populations rather than as isolated clinical priorities.

Importantly, the findings highlight the need to shift from fragmented disease management toward an integrated chronic care approach for older adults. Heart disease in later life should be understood as the cumulative outcome of long-term exposure to uncontrolled blood pressure and impaired glucose metabolism. By confirming these relationships using recent national data, this study fills a critical evidence gap and provides a robust foundation for strengthening public health strategies aimed at reducing cardiovascular morbidity and mortality among Indonesia's growing older population. The conclusions drawn from this study are intended to inform health system planning, support evidence-based decision-making, and guide future research that explores longitudinal pathways and intervention effectiveness. The findings of this study have important public health and clinical implications. The significant associations between hypertension, diabetes mellitus, and heart disease highlight the need for integrated chronic disease prevention and management programs targeting older adults (WHO, 2023). Routine screening for blood pressure and blood glucose should be strengthened at primary healthcare facilities, especially for aging populations (Riskesdas, 2018). Health promotion strategies focusing on healthy lifestyle behaviors, early diagnosis, and effective disease control may reduce the burden of heart disease (WHO, 2022). Policymakers should prioritize cardiovascular risk reduction in national aging and non-communicable disease programs.

References

[1] WHO, "Cardiovascular diseases (CVDs)," 2023. [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-%28cvds%29

[2] S. S. Virani *et al.*, "Heart Disease and Stroke Statistics—2023 Update," *Circulation*, vol. 143, no. 8, pp. e254–e743, Feb. 2021, doi: 10.1161/CIR.0000000000000950.

[3] et al. Mills, K. T., "Global disparities of hypertension prevalence and control," *Circulation*, vol. 141, no. 9, pp. 777–793, 2020.

[4] F. Cosentino *et al.*, "2019 ESC Guidelines on diabetes, pre-diabetes, and cardiovascular diseases developed in collaboration with the EASD.," *Eur. Heart J.*, vol. 41, no. 2, pp. 255–323, Jan. 2020, doi: 10.1093/eurheartj/ehz486.

[5] G. A. Roth *et al.*, "Global Burden of Cardiovascular Diseases and Risk Factors, 1990-2019: Update From the GBD 2019 Study.," *J. Am. Coll. Cardiol.*, vol. 76, no. 25, pp. 2982–3021, Dec. 2020, doi: 10.1016/j.jacc.2020.11.010.

[6] International Diabetes Federation, "IDF Diabetes Atlas. Edition 10," Bruseels, 2021. [Online]. Available: https://diabetesatlas.org/media/uploads/sites/3/2025/02/IDF_Atlas_10th_Edition_2021.pdf

[7] D. S. Arsyad *et al.*, "Modifiable risk factors in adults with and without prior cardiovascular disease: findings from the Indonesian National Basic Health Research.," *BMC Public Health*, vol. 22, no. 1, p. 660, Apr. 2022, doi: 10.1186/s12889-022-13104-0.

[8] W. J. Wong *et al.*, "Hypertension in Adults With Diabetes in Southeast Asia: A Systematic Review.," *J. Clin. Hypertens. (Greenwich).*, vol. 27, no. 1, p. e14936, Jan. 2025, doi: 10.1111/jch.14936.

[9] Ministry of Health Indonesia; Health Development Policy Agency (BKPK), "Survei Kesehatan Indonesia (SKI) 2023," Jakarta.

[10] Pusdatin Kemenkes RI, "Indonesia non-communicable disease profile," Jakarta, 2023.

[11] WHO, "Hypertension," World Health Organization. [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/hypertension?utm_source=chatgpt.com

[12] E. J. Benjamin *et al.*, "Heart Disease and Stroke Statistics—2019 Update: A Report From the American Heart Association," *Circulation*, vol. 139, no. 10, pp. e56–e528, Mar. 2019, doi: 10.1161/CIR.0000000000000659.

[13] S. Yusuf *et al.*, "Modifiable risk factors, cardiovascular disease, and mortality in 155 722 individuals from 21 high-income, middle-income, and low-income countries (PURE): a prospective cohort study.," *Lancet (London, England)*, vol. 395, no. 10226, pp. 795–808, Mar. 2020, doi: 10.1016/S0140-6736(19)32008-2.

[14] Ministry of Health of the Republic of Indonesia, "Basic Health Research (RISKESDAS) 2018," National Institute of Health Research and Development, Jakarta, 2019.

[15] WHO, "Diabetes," World Health Organization. [Online]. Available: https://www.who.int/news-room/fact-sheets/detail/diabetes