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Determinants of depression among individuals aged 15 years and older with hypertension (Analysis of Indonesian Health Survey Data 2023)

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Abstract

Background: Depression among hypertension patients leads to low medication adherence and increases morbidity and suicidal ideation.

Purpose: To analyze the determinants of depression among hypertension patients.

Method: A secondary data analysis study used data from the Indonesian Health Survey in 2023 with a cross-sectional design. The population in this study was hypertensive patients aged 15 years and above in Indonesia. Data analysis was performed using SPSS using the Complex Sample Chi-Square and Logistic Regression statistical tests.

Results: The prevalence of depression in hypertension patients was 2.9% (95% CI: 2.6% - 3.3%). Statistically significant variables were age 15-45 years [Adj. POR = 1.93 (95% CI: 1.34 - 2.78)], female [Adj. POR = 1.66 (95% CI: 1.10 - 2.50)], and having a chronic disease [Adj. POR = 2.36 (95% CI: 1.92 - 2.90)], smoking daily [Adj. POR = 2.83 (95% CI: 1.90 - 4.24)], not working [Adj. POR = 1.49 (95% CI: 1.17 - 1.90)], primary education [Adj. POR = 2.30 (95% CI: 1.44 - 3.67)], and not having a partner [Adj. POR = 1.55 (95% CI: 1.24 - 1.93)].

Conclusion: Daily smoking is a dominant factor in the occurrence of depression among people with hypertension. Suggested to people with hypertension pay more attention to their mental health. Please immediately check health screening and quit smoking to prevent depression.

Keywords: Depression; Indonesian Health Survey (IHS); Hypertension; Smoking.

INTRODUCTION

Hypertension and depression are bidirectional and complex. International research in China reported that approximately 26.8% of hypertensive patients experience depressive symptoms (Li, Li, Chen, Chen, & Hu, 2025). Studies in Indonesia also show that depression increases the risk of hypertension. The prevalence of depression in people with hypertension varies across different countries (Dutta, Chaudhary, Gupta, Murti, Kumari, Dhir, & Pal, 2024; Li, Yang, Liu, & Li, 2025; Asmare, Ali, & Belachew, 2022). Previous research using 2018 basic health research data reported that 7.0% of hypertension sufferers experienced depression (Agustiya, Isfandari, Suryaputri, Mubasyiroh, Indrawati, & Pradono, 2024). A study using a biopsychosocial approach found that

age, gender, and chronic diseases are associated (Damayanti, 2024 Misawa & Kondo, 2019; Odium, Davis, Owens, Preston, Brewer, & Black, 2018). Other research also examined smoking status, alcohol consumption, education level, employment status, residential classification, and marital status as being associated with depression in hypertension patients (Choong, Lee, & Rashid, 2023; Suryaputri, Mubasyiroh, Idaiani, & Indrawati, 2021). Depression in hypertension sufferers that is not treated or managed well impacts poor blood pressure control (Serhan, Kunjummen, Shahed, Mohamed, Bennett, & Miller, 2020). Medication adherence (Putra, Arisudhana, & Wijaya, 2023), suicidal ideation (Nkola, Kaggwa, Muwanguzi, Kule, Rukundo, & Ashaba,

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2024), and even the risk of death, especially in patients with cardiovascular disease (Wang, Li, Heizhati, Li, Yang, Wang, & Abudereyimu, 2021). Although there are previous studies using 2018 basic health research data, certain populations, certain health facilities (Trihartini & Milkhatun, 2025), and certain age groups (Hasri, 2023). Research based on the latest Indonesian national data is still limited, especially regarding depression in hypertension sufferers. Indonesian Health Survey (IHS) 2023 data allows for the representative analysis of depression incidence throughout Indonesia. With these considerations, it is necessary to identify risk factors for the occurrence of depression in hypertension sufferers, so that the results can be used as a basis for health interventions.

RESEARCH METHOD

Quantitative research use a cross-sectional design utilizing secondary data from the raw data of the 2023 Indonesian Health Survey (IHS). The population in this study consists of all individuals with hypertension in Indonesia. The sample in this study includes individuals who participated in the 2023 Indonesian Health Survey (SKI) and were diagnosed with hypertension by a doctor. Inclusion characteristics for this study are respondents aged ≥ 15 years, while exclusions include respondents who do not have complete data (missing data) for the study's dependent variable. Depression was assessed using the Mini International Neuropsychiatric Interview (MINI), which consists of ten questions with "yes" or "no" response options. The questionnaire examines persistent low mood, loss of interest, fatigue, appetite or sleep disturbances, psychomotor changes, low self-worth, guilt, and cognitive difficulties. The questionnaire also evaluates suicidal ideation, providing a concise overview of depression symptom severity. Respondents were classified as having depression if they answered "yes" to at least two of the three core questions (questions 1–3) and at least two of the seven additional questions (questions 4–10).

Variable independent including age, gender, chronic disease, smoking status, alcohol consumption, educational level, working status, area of residence, and marital status assessed using the Indonesia Health Survey (SKI) 2023 through interview and observation. Demographic characteristics: age was categorized into three groups: (15–45 years, 45–64 years, and ≥ 65 years). Gender (women and men). Chronic disease were categorized as (yes and no), yes if respondents had one or more chronic disease [diabetic, cancer, heart disease, stroke, and chronic kidney failure] and no if they had none. Smoking status categorized based on their frequencies smoking as (current smoker, former smoker, never smoke). Alcohol consumption (yes and no). Education level categorized into four groups: (low education, primary education, secondary education, tertiary education), low education if had no formal education or not completed primary school, primary education if completed primary school, secondary education if completed junior high school or senior high school, tertiary education if completed diploma or bachelor or above. Working status categorized as (working and not working), not working if they answered "not working" or "school" and working if they answered except "not working" or "working". Area of residence (rural and urban). Marital status categorized as (married and unmarried), married if they answered "married" and unmarried if they answered "unmarried" or "widowed" or "divorced".

Data management and analysis were performed using IBM SPSS with Complex Sample module to account for the multistage sampling design and sampling weights. Univariate analysis described the frequency distribution of each variable. Bivariate analysis used Complex Sample Chi-Square with Prevalence Odds Ratio (POR) as the measure of association ($\alpha = 0.05$; 95% CI). Variables with p-value < 0.25 in bivariate analysis were included in the multivariate logistic regression model. The Backward method was applied to identify the dominant factor. Confounding assessment was conducted by evaluating POR changes of $> 10\%$ when variables were removed from the model.

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RESEARCH RESULTS

Table 1. Univariate Analysis (N= 52.967)

Variable	Results	POR (95% CI)	P-value
Age (n/%) (Mean±SD) (Range) (Year)	(51.6 ± 13.3) (15-70)		
15-45	9.822/18.5	1.27(0.91-1.80)	0.161
46-64	28.581/54.0	0.99(0.79-1.23)	0.932
≥65	14.564/27.5	Ref.	
Gender (n/%)			
Female	34.625/65.4	1.18(0.91-1.53)	0.203
Male	18.343/34.6	Ref.	
Chronic Disease (n/%)			
Yes	11.143/21.0	2.15(1.74-2.66)	< 0.001
No	41.825/79.0	Ref.	
Smoking Status (n/%)			
Current	8.701/16.4	1.53(1.14-2.06)	0.004
Former	3.390/6.4	1.50(0.96-2.35)	0.072
Never	40.876/77.2	Ref.	
Alcohol Consumption (n/%)			
Yes	541/1.0	1.05(0.48-2.28)	0.896
No	52.428/99.0	Ref.	
Working Status (n/%)			
Unemployed	22.776/43.0	1.58(1.27-1.97)	< 0.001
Employed	30.192/57.0	Ref.	
Education (n/%)			
Not Enrolled in School	3.376/6.4	2.29(1.43-3.67)	0.001
Incomplete Primary School	5.019/9.5	2.41(1.55-3.73)	< 0.001
Elementary School	18.885/35.7	2.23(1.42-3.50)	< 0.001
Junior High School	7.807/14.7	Ref.	
Senior High School	12.693/24.0		
Diploma	1.981/3.7		
Bachelor Degree	3.206/6.1		
Area of Residence (n/%)			
Rural	35.288/66.6	1.33(1.03-1.72)	0.025
Urban	17.680/33.4	Ref.	
Marital Status (n/%)			
Unmarried	12.754/24.1	1.47(1.19-1.81)	< 0.001
Married	40.214/75.9	Ref.	

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The mean age of the respondents was 51.6 ± 13.3 years (range: 15–70 years). Most respondents were aged 46–64 years (28.581; 54.0%), were female (34.625; 65.4%), had no chronic disease (41.825; 79.0%), had never smoked (40.876; 77.2%), did not consume alcohol (52.428; 99.0%), were employed (30.192; 57.0%), lived in rural areas (35.288; 66.6%), and were married (40.214; 75.9%). The largest educational group had completed elementary school (18.885; 35.7%), followed by senior high school (12.693; 24.0%). Bivariate analysis showed that respondents with chronic disease had significantly higher odds of the outcome than those without chronic disease (POR = 2.15; 95% CI: 1.74–2.66; $p < 0.001$). Unemployed respondents also had significantly higher odds than employed respondents (POR = 1.58; 95% CI: 1.27–1.97; $p < 0.001$). Current smokers had higher odds than those who never smoked (POR = 1.53; 95% CI: 1.14–2.06; $p = 0.004$), whereas former smoking status was not significantly associated with the outcome (POR = 1.50; 95% CI: 0.96–2.35; $p = 0.072$). Respondents living in rural areas had higher odds than those living in urban areas (POR = 1.33; 95% CI: 1.03–1.72; $p = 0.025$), and unmarried respondents had higher odds than married respondents (POR = 1.47; 95% CI: 1.19–1.81; $p < 0.001$). Age group, gender, and alcohol consumption were not significantly associated with the outcome ($p > 0.05$).

Table 2. Final Model Multivariate

Variable	B	Adj. POR (95% CI)	P-Value
Age (n/)(Mean±SD)(Range)(Year)			
15-45	0.66	1.93(1.34-2.78)	<0.001
46-64	0.20	1.22(0.97-1.55)	0.084
≥65		Ref.	
Gender (n/%)			
Male	0.51	1.66(1.10-2.50)	0.014
Female		Ref.	
Chronic Disease (n/%)			
Yes	0.86	2.36(1.92-2.90)	< 0.001
No		Ref.	
Smoking Status (n/%)			
Current	1.04	2.83(1.90-4.24)	< 0.001
Former	0.88	2.43(1.45-4.05)	0.001
Never		Ref.	
Working Status (n/%)			
Unemployed	0.40	1.49(1.17-1.90)	0.001
Employed		Ref.	
Education (n/%)			
Low Education	0.77	2.17(1.31–3.58)	0.002
Primary Education	0.83	2.30(1.44-3.67)	< 0.001
Secondary Education	0.68	1.97(1.25-3.11)	0.003
Tertiary Education		Ref.	
Marital Status (n/%)			
Unmarried	0.44	1.55(1.24-1.93)	< 0.001
Married		Ref.	

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Table 2. Multivariable logistic regression analysis identified several factors independently associated with depression among individuals with hypertension. Respondents aged 15–45 years were 1.93 times more likely to experience depression than those aged ≥ 65 years (Adj. POR = 1.93; 95% CI: 1.34–2.78; $p < 0.001$). Male respondents had a higher likelihood of depression than females (Adj. POR = 1.66; 95% CI: 1.10–2.50; $p = 0.014$). Respondents with chronic disease were 2.36 times more likely to experience depression (Adj. POR = 2.36; 95% CI: 1.92–2.90; $p < 0.001$). Current smokers (Adj. POR = 2.83; 95% CI: 1.90–4.24; $p < 0.001$) and former smokers (Adj. POR = 2.43; 95% CI: 1.45–4.05; $p = 0.001$) had significantly higher odds of depression than never smokers. Unemployed respondents were more likely to experience depression than employed respondents (Adj. POR = 1.49; 95% CI: 1.17–1.90; $p = 0.001$). Compared with respondents with tertiary education, those with low, primary, and secondary education had significantly higher odds of depression, with adjusted prevalence odds ratios ranging from 1.97 to 2.30 ($p \leq 0.003$). In addition, unmarried respondents had a significantly higher likelihood of depression than married respondents (Adj. POR = 1.55; 95% CI: 1.24–1.93; $p < 0.001$). Adj. POR = adjusted prevalence odds ratio; CI = confidence interval; Ref. = reference category.

DISCUSSION

Younger hypertensive patients (15–45 years) had a 1.93-fold higher risk of depression compared to those aged ≥ 65 years after multivariate adjustment, suggesting a confounding effect that masked the relationship in bivariate analysis. Consistent with the concept of a "dual burden" in productive-age individuals who simultaneously cope with a chronic disease diagnosis and high socioeconomic demands (Liu, Ye, Chen, Wang, Wu, Li, et al., 2024). In the Indonesian context, younger hypertensive patients may be more vulnerable to emotional isolation compared to older adults who tend to have more stable social support systems (Woda & Pontoan, 2024).

Female sex was independently associated with a 1.66-fold higher risk of depression [Adj. POR = 1.66 (95% CI: 1.10–2.50)]. This is consistent with a meta-analysis of older adults with hypertension that found

women were 2.24 times more likely to experience depression (Gan, Yu, Lian, Yuan, Li, & Zheng, 2023). Biological mechanisms include estrogen fluctuations during perimenopause and menopause, which simultaneously worsen cardiovascular risk and increase psychological vulnerability (Kundakovic & Rocks, 2022; Albert & Newhouse, 2019). Sociocultural factors such as Indonesia's patriarchal norms, wherein women tend to suppress emotional distress, further compound this risk (Al Firda, Diana, & Yulianti, 2021).

The presence of at least one chronic disease (diabetes, stroke, heart disease, chronic kidney failure, or cancer) increased the risk of depression by 2.36-fold. The primary mechanism involves dysregulation of the Hypothalamic-Pituitary-Adrenal (HPA) axis and chronic systemic inflammation, leading to sustained cytokine release that disrupts neurotransmitter function and manifests as clinical depression (Hasri, 2023; Asmare et al., 2022). This finding underscores the need for routine mental health screening integrated into chronic disease management at primary healthcare facilities (Finlay, Rudd, McDermott, & Samyai, 2022; Carbone, 2021).

Daily smoking emerged as the dominant factor associated with depression among hypertensive patients [Adj. POR = 2.83 (95% CI: 1.90–4.24)], with a dose-response pattern observed (occasional smokers: Adj. POR = 2.43). The neurobiological mechanism involves nicotine binding to nicotinic acetylcholine receptors and modulating dopaminergic and serotonergic systems (Albasara et al., 2021; Suryaputri et al., 2022). Chronic nicotine exposure inhibits monoamine oxidase (MAO) enzymes, disrupting natural mood regulation and increasing vulnerability to depression (Quattrochi, Baird, & Yurgelun-Todd, 2020). Socioeconomically disadvantaged hypertensive patients may also rely on smoking as a primary coping mechanism for financial stress (Pateman, Ford, Fitzgerald, Mutch, Yuke, Bonevski, & Gartner, 2016). Alcohol consumption did not show a statistically significant association with depression (POR = 1.05, $p = 0.896$). The likely explanation is the very low prevalence of alcohol consumption in the Indonesian population (1.0% in this sample), causing statistical underpowering due to imbalanced variable distribution (Bramness, Lid, Bolstad, Lien, & Abebe, 2025). This does not negate

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the known neurochemical relationship between alcohol and depression, but limits detection in the present study (World Health Organization, 2018).

Unemployment was associated with a 1.49-fold higher risk of depression after multivariate adjustment. Biopsychosocial model, unemployment removes key protective social functions of work social identity, structured routine, and group support—while introducing financial instability and chronic stress (Agustiya et al., 2024). These factors collectively heighten psychological vulnerability in patients already burdened by hypertension management (World Health Organization, 2024).

Hypertensive patients without a partner had a 1.55-fold higher risk of depression. This closely mirrors the findings of meta-analysis (OR = 1.50), and (OR = 1.55) (Yan, Huang, Huang, Wu, & Qin, 2021). Marriage provides both social support (instrumental and emotional assistance in disease management) and biological buffering (lower cortisol levels and reduced inflammatory responses). Conversely, the loss of a partner removes these protective elements, increasing vulnerability to depressive episodes in the context of chronic disease (Christiansen, Lund, Qualter, Andersen, Pedersen, & Lasgaard, 2021; Wang, Jiao, Nie, O'Neil, Huang, Zhang, & Woodward, 2020).

Lower education was consistently associated with higher depression risk. Primary-educated patients were at the highest risk [Adj. POR = 2.30 (95% CI: 1.44–3.67)] compared to those with higher education (Albasara, Haneef, Zafar, & Moinuddin, 2021). Lower education is linked to limited health literacy, reduced capacity to understand and self-manage chronic conditions, and restricted access to health services. Individuals with inadequate functional health literacy have been shown to have a 2.7-fold higher probability of experiencing depression (Remes, Mendes, & Templeton, 2021; König, Schröder, Hamer, & Suhr, 2024).

This finding calls for community-based health education programs tailored to patients' education levels within hypertension management programs in Indonesia.

Although urban residence showed a borderline significant association with depression in bivariate analysis (POR = 1.33, $p = 0.025$), it was not statistically significant in the multivariate model and was excluded as a non-confounding variable

(Agustiya et al., 2024). The relationship between residential area and depression in hypertensive patients is likely mediated by other variables such as employment and education level, which are more prominent in urban environments (Yuan, Jiang, Liu, Liu, Du, Sun, & Li, 2024).

CONCLUSION

Hypertension patients are strongly encouraged to cease smoking immediately and undergo regular mental health screening as part of hypertension management. Policies integrating mental health programs with non-communicable disease management should be prioritized. Tobacco control programs specifically targeting hypertensive patients and the strengthening of community-based mental health education for patients with low literacy are recommended.

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