Jurnal Biologi Tropis

Original Research Paper

The Incidence of Depression in Elderly Patients with Hypertension Stage 2 in Karang Taliwang

Natalia Tantowi[1*], Anak Agung Ayu Niti Wedayani[1], Pujiarohman[1], Azizatul Adni[1], I Gusti Ketut Artha Jaya Kusuma[1]
[1]Medical Education, Faculty of Medicine, University of Mataram, Mataram, West Nusa Tenggara, Indonesia;

Article History
Received: March 26th, 2025
Revised : April 10th, 2025
Accepted : April 15th, 2025

*Corresponding Author:
Natalia Tantowi, Medical Education, Faculty of Medicine, University of Mataram, Mataram, Indonesia;
Email: nataliatantowi1229@gmail.com

Abstract: Depression is a common mental health disorder in the elderly, often coexisting with chronic conditions like hypertension. This study examines the relationship between depression and hypertension stage 2 among elderly individuals at Puskesmas Karang Taliwang, considering age and gender. A cross-sectional study of 30 elderly patients used a validated questionnaire to assess depressive symptoms. Results showed a significant association between age (≥60 years) and depression, while gender had no statistical correlation. Hypertension stage 2 was also significantly linked to depression, though with a small effect size. These findings highlight the need for integrated healthcare strategies addressing both mental and cardiovascular health in the elderly. Further research is needed to explore underlying mechanisms and potential interventions.

Keywords: Depression, elderly, hypertension stage 2.

Introduction

Depression is one of the most prevalent illnesses worldwide. Depression is a mood disorder characterized by persistent feelings of apathy and slowed cognitive processes, often accompanied by psychomotor retardation and a diminished interest in daily activities (Zhang et al., 2018). According to the World Health Organization (WHO), depression impacting around 3.8% of the population, including 5% of adults and 5.7% of individuals aged 60 and over. In Indonesia, based on data from the Basic Health Research (Riskesdas) reported an increase in the prevalence of mental health disorders from 6% in 2013 to 9.8% in 2018. The same study estimated that in 2018, 6.1% of individuals over the age of 15 experienced depression (Handajani et al., 2022).

Depression is significantly correlated with an increased risk of coronary heart disease, with studies showing a 60% to 80% higher risk among individuals with depression (Zhang et al., 2018). Hypertension, one of the major risk factor for cardiovascular disease (CVD), is a significant public health concern worldwide (Yin et al., 2022). Hypertension is the primary contributor to cardiovascular disease and early mortality on a global scale. Due to the extensive use of blood pressure-lowering medications, the average global blood pressure has either stayed stable or shown a slight decline over the last 40 years (Mills et al., 2020). Hypertension is characterized by high blood pressure, where systolic blood pressure (SBP) reaches 130 mmHg or higher and/or diastolic blood pressure (DBP) exceeds 80 mmHg (Iqbal & Jamal, 2023). It elevates the risk of diseases affecting the heart, brain, and kidneys. (Oktamianti et al., 2022). WHO estimated that in 2023, approximately 1.28 billion adults between the ages of 30-79 worldwide had hypertension. In Indonesia, hypertension is most prevalent among women (36.0%) and older adults aged 60 and above (63.2%) (Oktamianti et al., 2022).

Research has consistently demonstrated a bidirectional relationship between physical and mental health, with depression being both a consequence and a contributing factor to chronic illnesses (Herrera et al., 2021; Ohrnberger et al., 2017). Chronic exposure to psychosocial stressors, including depression, has been recognized as a major risk factor for the

development of hypertension (Osborne et al., 2020). Among elderly individuals, chronic hypertension is frequently associated with heightened psychological stress and negative emotions, with depression being the most common mental health disorder (Gan et al., 2023). Repeated psychological stress activates the sympathetic nervous system, resulting in a higher heart rate, vasoconstriction, and elevated blood pressure.

Stress also stimulates the hypothalamic-pituitary-adrenal (HPA) axis, increasing cortisol secretion, which disrupts sodium balance and impairs blood pressure regulation. Additionally, oxidative stress and inflammation contribute to endothelial dysfunction by decreasing nitric oxide (NO) production, which in turn raises vascular resistance. Chronic stress further activates the renin-angiotensin-aldosterone system (RAAS), promoting vasoconstriction and fluid retention. The interplay of these physiological mechanisms fosters the development of hypertension and elevates the risk of cardiovascular complications (Osborne et al., 2020; Iqbal and Jamal, 2023).

The rapid growth of Indonesia's elderly population has led to an increased prevalence of age-related health issues, notably hypertension and depression (Khasanah et al., 2024). Despite the known comorbidity of these conditions, there is a lack of comprehensive data on their co-occurrence among Indonesian elderly, particularly those with hypertension stage 2. This knowledge gap impedes the development of integrated healthcare strategies tailored to address the dual burden of hypertension and depression in this demographic. Therefore, further research is essential to inform effective interventions and improve health outcomes for Indonesia's aging population (Handajani et al., 2022; Khasanah et al., 2024)

This study aims to comprehensively investigate the incidence of depression among elderly individuals diagnosed with hypertension stage 2 in Karang Taliwang Village. Hypertension and depression are both highly prevalent in the aging population and are often interconnected, potentially exacerbating each other's effects. The findings of this study are expected to enhance understanding and provide significant contributions to comprehending the complex relationship between these two conditions and their implications for elderly health.

Method

This study employed a descriptive cross-sectional design conducted at Puskesmas Karang Taliwang in September 2024. The research aimed to explore the incidence of depression among elderly patients with hypertension stage 2. Data collection was carried out on a single day to ensure uniformity in timing and minimize external variation. The study population consisted of elderly individuals aged 60 years and above who had been clinically diagnosed with hypertension stage 2 based on clinical diagnosis following the American Heart Association (AHA) classification for Hypertension stage 2 (systolic ≥160 mmHg and/or diastolic ≥100 mmHg) and were undergoing routine control at the health center (Flack & Adekola, 2020). A total of 32 eligible patients were identified, and participants were selected using a random sampling technique to ensure that every individual had an equal chance of being included in the study.

The independent variable in this study was the presence of Stage 2 hypertension in elderly patients, while the dependent variable was the occurrence of depression among these individuals. Participants were selected using purposive sampling based on specific inclusion criteria: (1) age ≥60 years, (2) confirmed diagnosis of hypertension stage 2 by a healthcare provider, and (3) ability to provide informed consent. Exclusion criteria included cognitive impairment, current psychiatric treatment for conditions other than depression, and incomplete or duplicate questionnaire responses.

The preparation phase included proposal drafting, ethical clearance submission to Puskesmas Karang Taliwang, and research team training. The implementation phase involved participant selection based on criteria, obtaining informed consent, and questionnaire completion. Collected data were coded and analyzed using descriptive and inferential statistics. Descriptive statistics (frequencies, percentages, means) were used to summarize demographic variables. To examine the relationship between depression and independent variables (age, gender, and Hypertension stage 2), a binary logistic regression analysis was performed. The analysis

produced odds ratios (OR) with 95% confidence intervals (CI) and associated p-values to determine statistical significance. A p-value less than 0.05 was considered statistically significant.

Results and Discussion

This study involved 30 elderly respondents at Puskesmas Karang Taliwang on September 2024, categorized based on age, gender, and whether they have hypertension stage 2 or not.

Table 1. Analysis of the Relationship Between Depression Incidence in Elderly Patients with Hypertension Stage 2 at Puskesmas Karang Taliwang

Variable	OR (95% CI)	P value
Depression	Ref	
Yes	0,983 (0,873-1,007)	0,000
No		
Age	Ref	
60 years old	5,211 (4,852-5,598)	0,000
>60 yearsg old		
Gender	Ref	
Male	0,970 (0,904-1,040)	0,390
Female		
Hypertension stage II	Ref	0,043
Yes	0,958 (0,902-1,048)	
No		

Based on the analysis presented in Table 1, several variables have been identified as significantly associated with the incidence of depression, specifically age and hypertension stage 2, in patients at Puskesmas Karang Taliwang. The findings indicate that:

Depression was used as the reference condition, underscoring its significance in the analysis. The age variable exhibited the strongest association, with an odds ratio (OR) of 5.211 (95% CI: 4.852-5.598) and a p-value of 0.000. This suggests that individuals aged >60 years have a significantly higher risk of developing depression compared to younger age groups. These findings are consistent with studies highlighting depression as a major mental health concern among the elderly population worldwide (Zenebe et al., 2021).

Regarding gender, the OR was 0.970 (95% CI: 0.904-1.040) with a p-value of 0.390. These results indicate no statistically significant relationship between gender and the incidence of depression in the elderly. Thus, it can be concluded that both men and women have a similar likelihood of experiencing depression under these conditions. While some studies indicate a higher prevalence in women. Research in the *Korean Journal of Epidemiology* found that 37.3% of men and 59.2% of women reported multimorbidity, with 31.0% of men and 36.2% of women experiencing depression, suggesting a higher prevalence among women(Hwang et al., 2022).

Furthermore, stage II hypertension demonstrated a significant association with the incidence of depression in the elderly, as reflected by an odds ratio (OR) of 0.958 (95% confidence interval: 0.902-1.048) and a p-value of 0.043. Although the odds ratio is close to 1, which suggests a modest association, the p-value falls below the conventional threshold of 0.05, indicating statistical significance. This result implies that, even though the strength of the relationship between stage II hypertension and depression is relatively small, there is still a noteworthy likelihood that individuals with stage II hypertension are at an increased risk of developing depression.

The finding aligns with previous research that has highlighted the potential link between hypertension and depressive symptoms, particularly in older populations. In the context of elderly individuals, the association between depression and hypertension may be compounded by age-related factors such as comorbidities, medication regimens, and social isolation, all of which could contribute to the observed depression risk. The relatively small effect size, as suggested by the OR, warrants further investigation into the mechanisms that may underpin this relationship, as well as a consideration of other potential confounding factors that could affect both conditions (Li et al., 2015; Xu et al., 2024).

Relationship between Depression and Hypertension Stage 2

In this study, it was found that age and stage II hypertension had a significant association with the incidence of depression in

elderly at Puskesmas Karang Taliwang. Age ≥60 years was the main risk factor, with the elderly more prone to depression than younger age groups. Additionally, stage II hypertension was statistically linked to depression, although its effect was relatively minor. This finding aligns with previous studies that have stated a relationship between hypertension and depression in elderly.

The relationship between depressive symptoms and the development of hypertension is multifaceted, with numerous physiological, neurological, and behavioral factors contributing to the heightened risk of hypertension in individuals with depression. One of the primary mechanisms involves autonomic nervous system (ANS) dysregulation. The ANS is responsible for controlling vital functions such as heart rate, blood pressure, and respiratory rate, and it is composed of the sympathetic and parasympathetic branches. In depression, there is often a shift toward heightened sympathetic nervous system (SNS) activity, which is commonly referred to as the "fight-or-flight" response. This increased sympathetic activity u leads to elevated heart rate, vasoconstriction, and increased blood pressure, all of which are precursors to the development of hypertension (Santoni et al., 2025).

In addition to sympathetic overactivity, depression is often associated with altered regulation of cortisol, a hormone produced by the adrenal glands in response to stress. Chronic stress and depressive states can result in the dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, leading to sustained elevations in cortisol levels. Persistent high levels of cortisol contribute to a range of harmful effects, including the promotion of insulin resistance, dyslipidemia, and endothelial dysfunction, all of which are risk factors for hypertension and other cardiovascular diseases. Elevated cortisol also exacerbates the inflammatory response, which is a critical pathway linking depression to the development of cardiovascular disorders. Inflammatory cytokines such as interleukins and C-reactive protein (CRP) have been shown to be elevated in individuals with depression, and these markers are known to contribute to vascular damage and increased blood pressure (Santoni et al., 2025).

Neurotransmitter imbalances, particularly those involving dopamine, play a significant role in the association between hypertension and depression. Dopamine, a crucial neurotransmitter involved in mood regulation, reward processing, and motivation, has been closely linked to the pathophysiology of major depressive disorder (MDD). A deficiency in dopamine, especially in areas of the brain like the prefrontal cortex and striatum, is strongly associated with anhedonia, a core symptom of MDD that significantly diminishes an individual's capacity to experience pleasure or satisfaction from normally enjoyable activities (Belujon and Grace, 2017).

Recent research has increasingly recognized that diminished dopamine activity does not only influence mood regulation but may also have far-reaching effects on physiological processes. Specifically, evidence suggests that deficits in dopamine can impair vascular regulation and alter stress responses, which are key contributors to the development and maintenance of hypertension. Dopamine plays a critical role in the regulation of blood pressure by modulating vascular tone and the constriction of blood vessels. When dopamine levels are low, this regulation can become dysregulated, potentially leading to elevated blood pressure. Additionally, dopamine's involvement in the stress response pathway means that individuals with low dopamine activity may have heightened sensitivity to stress, which is another well-established factor contributing to hypertension (Belujon and Grace, 2017).

Hypertension Risk Factors Associated with Depression

Depression and hypertension share several common risk factors, with depression significantly influencing behavioral and lifestyle factors that elevate cardiovascular risk. Individuals with depression are more prone to adopting unhealthy habits such as physical inactivity, poor nutrition, and smoking, all of which contribute to the development of hypertension. Additionally, depression is frequently linked to obesity and metabolic dysfunction, further increasing the likelihood of high blood pressure. The relationship between depression and hypertension is complex and multifaceted, involving both direct physiological mechanisms and indirect effects mediated

through unhealthy behaviors. (Ryder & Cohen, 2021).

A sedentary lifestyle and an unhealthy diet are strongly associated with obesity and its consequences, including an elevated risk of hypertension. Poor dietary choices, such as excessive consumption of processed foods high in sodium and saturated fats, can contribute to increased blood pressure levels. Furthermore, excessive alcohol consumption, which is more prevalent in individuals with depression, has been implicated in hypertension through mechanisms involving excessive rebound glutamate release from brain synapses, as well as dysregulation of monoamine and neuroendocrine pathways. Chronic alcohol use can also lead to endothelial dysfunction and increased vascular resistance, further exacerbating hypertension risk. (Liu et al., 2023; Ryder & Cohen, 2021).

Smoking, another major risk factor for both depression and hypertension, is associated with elevated cortisol levels and the inhibitory effect of tobacco smoke on the enzyme monoamine oxidase, which plays a role in mood regulation. While smoking is well known for its harmful health effects, its relationship with hypertension remains complex. Some studies suggest that smoking cessation reduces inflammation but may simultaneously lead to weight gain and obesity, which are strongly linked to hypertension. Additionally, the acute effects of smoking, such as increased sympathetic nervous system activity, may temporarily raise blood pressure, while chronic smoking can lead to vascular damage and long-term cardiovascular complications.(Liu et al., 2023).

Another factor contributing to blood pressure abnormalities in individuals with depression is the use of antidepressant medications. These drugs can influence blood pressure by inducing hypertension, hypotension, or orthostatic hypotension, depending on the class and mechanism of action(Romańczyk et al., 2021). Certain antidepressants, such as selective serotonin reuptake inhibitors (SSRIs) and serotonin-norepinephrine reuptake inhibitors (SNRIs), may impact vascular tone and autonomic regulation, leading to blood pressure fluctuations. Meanwhile, tricyclic antidepressants (TCAs) and monoamine oxidase inhibitors (MAOIs) can have more pronounced effects on cardiovascular function, potentially increasing the risk of hypertension through noradrenergic stimulation or interactions with dietary amines. Given these potential effects, monitoring blood pressure in patients with depression who are prescribed antidepressant medications is crucial for preventing adverse cardiovascular outcomes (Calvi et al., 2021).

Diagnosis and Treatment

Diagnosis and treatment of depression involve various effective approaches, including psychological therapies and medications. Seeking professional help is essential for individuals experiencing depressive symptoms, as early intervention can lead to better outcomes. Psychological treatments, such as cognitive behavioral therapy, interpersonal psychotherapy, behavioral activation, and problem-solving therapy, are often the first line of treatment. These approaches help individuals develop healthier thought patterns, coping mechanisms, and social interactions. For moderate to severe cases, psychological therapy can be combined with antidepressant medications like selective serotonin reuptake inhibitors (SSRIs), such as fluoxetine. Healthcare providers must carefully assess potential side effects, treatment accessibility, and patient preferences when prescribing medication (WHO, 2023).

Given the significant interplay between mental and physical health, integrating mental health services into hypertension care is essential, especially for patients with coexisting depression. Mental health strongly influences treatment adherence, resilience, and a patient's ability to effectively manage their condition. Social support networks and community engagement play a crucial role in enhancing psychological well-being, promoting stability, and empowering patients. Despite advancements in hypertension treatment, improvements in mental health outcomes remain limited. Therefore, promoting self-management through patient education, peer support programs, and community-based interventions can strengthen mental resilience and reduce the long-term burden on healthcare systems. A comprehensive approach that addresses both hypertension and depression is necessary to optimize patient outcomes and improve overall quality of life (Kramer et al., 2025).

Canada provides a notable example of integrating mental health services into hypertension care through various programs and initiatives. One such initiative is the Chronic Disease Self-Management Program (CDSMP), which is widely implemented across the country. This program offers workshops that help individuals with chronic conditions, including hypertension and depression, develop self-management skills. The workshops cover topics such as exercise, healthy eating, medication use, and managing emotions like anger and depression (Liddy et al., 2016). In Ontario, the healthcare system emphasizes a holistic approach by combining primary care, mental health services, and chronic disease management. For example, the Integrated Care Hub in Kingston focuses on harm reduction, trauma-informed care, stabilization, wellness, and cultural safety. This hub offers services catering to both physical and mental health needs, including case management, counseling, treatment, and medical care (Liddy et al., 2016).

Additionally, programs like AccessMHA provide a single point of entry to mental health and addiction services, simplifying navigation for those seeking support. Collaborations among various healthcare providers aim to provide more integrated and efficient pathways to care. These integrated care models in Canada demonstrate the effectiveness of combining mental health services with hypertension care, leading to improved patient outcomes and enhanced quality of life (Liddy et al., 2016).

Limitations

This study, while offering valuable insights into the association between depression and hypertension stage II in elderly patients at Puskesmas Karang Taliwang, is subject to several limitations. First, the small sample size of only 30 respondents limits the statistical power of the analysis and restricts the generalizability of the findings to broader populations. The cross-sectional design of the study also poses a significant limitation, as it prevents the establishment of causal relationships between variable, meaning it cannot be determined whether hypertension leads to depression or vice versa.

Additionally, the study was confined to a single health center, which may not adequately represent other communities or regions with different sociodemographic or healthcare characteristics. This limits the applicability of the findings to other elderly populations. Moreover, potential confounding variables such as socioeconomic status, education level, comorbidities, medication use, and social support were not accounted for in the analysis. These factors could have significant effects on both hypertension and depression, and their exclusion may have influenced the observed associations.These limitations highlight the need for larger, more comprehensive studies to confirm and expand upon these findings.

Conclusion

This study highlights the significant associations between age, stage II hypertension, and the incidence of depression in elderly patients at Puskesmas Karang Taliwang. The findings demonstrate that individuals aged ≥60 years are at a notably higher risk for depression compared to younger age groups, consistent with global studies on mental health concerns among the elderly. Furthermore, stage II hypertension was found to have a statistically significant, albeit small, impact on the likelihood of depression, reinforcing the relationship between hypertension and depression as seen in prior research.

Acknowledgment

Gratitude to Dr. dr. Anak Agung Ayu Niti Wedayani, M.Sc., as the Head of Depression in Elderly Patients with Hypertension Stage 2, for overseeing this study. Our appreciation also goes to Pujiarohman, M.Psi, Psikolog, Azizatul Adni, M.Psi, Psikolog, as well as I Gusti Ketut Artha Jaya Kusuma. Furthermore, we extend our deepest gratitude to all parties who have provided assistance throughout the process of completing this journal.

References

Belujon, P., & Grace, A. A. (2017). Dopamine system dysregulation in major depressive disorders. In *International Journal of Neuropsychopharmacology* (Vol. 20, Issue

12, pp. 1036–1046). Oxford University Press. https://doi.org/10.1093/ijnp/pyx056

Calvi, A., Fischetti, I., Verzicco, I., Belvederi Murri, M., Zanetidou, S., Volpi, R., Coghi, P., Tedeschi, S., Amore, M., & Cabassi, A. (2021). Antidepressant Drugs Effects on Blood Pressure. In *Frontiers in Cardiovascular Medicine* (Vol. 8). Frontiers Media SA. https://doi.org/10.3389/fcvm.2021.704281

Flack, J. M., & Adekola, B. (2020). Blood pressure and the new ACC/AHA hypertension guidelines. *Trends in Cardiovascular Medicine, 30*(3), 160–164. https://doi.org/10.1016/j.tcm.2019.05.003

Gan, Q., Yu, R., Lian, Z., Yuan, Y., Li, Y., & Zheng, L. (2023). Unraveling the link between hypertension and depression in older adults: a meta-analysis. In *Frontiers in Public Health* (Vol. 11). Frontiers Media SA. https://doi.org/10.3389/fpubh.2023.1302341

Handajani, Y. S., Schröder-Butterfill, E., Hogervorst, E., Turana, Y., & Hengky, A. (2022). Depression among Older Adults in Indonesia: Prevalence, Role of Chronic Conditions and Other Associated Factors. *Clinical Practice & Epidemiology in Mental Health*, *18*(1). https://doi.org/10.2174/17450179-v18-e2207010

Herrera, P. A., Campos-Romero, S., Szabo, W., Martínez, P., Guajardo, V., & Rojas, G. (2021). Understanding the relationship between depression and chronic diseases such as diabetes and hypertension: A grounded theory study. *International Journal of Environmental Research and Public Health*, *18*(22). https://doi.org/10.3390/ijerph182212130

Hwang, S. Y., Nam, J. Y., Ahn, J. H., & Park, S. (2022). Gender differences in the association between multimorbidity and depression in older Korean adults: an analysis of data from the National Survey of Older Koreans (2011-2017). *Epidemiology and Health*, *44*. https://doi.org/10.4178/epih.e2022049

Iqbal, A. M., & Jamal, S. F. (2023, July 20). *Essential hypertension*. In StatPearls. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK539859/

Kementerian Kesehatan RI. (2019). Laporan Nasional Riskesdas 2018. Badan Penelitian dan Pengembangan Kesehatan.

Khasanah, U., Kelliat, B. A., Afiyanti, Y., Besral, B., & Sari, D. W. (2024). The Problems and Needs of Self-Management Among Indonesian Older Adults With Hypertension: A Qualitative Study. *SAGE Open Nursing*, *10*. https://doi.org/10.1177/23779608241282915

Kramer, M., Rosenkranz, S., & Kramer, T. (2025). Depression in Pulmonary Hypertension: A Systematic Review of Clinical Outcomes, Treatment Interactions, and Emerging Technologies. In *Journal of Clinical Medicine* (Vol. 14, Issue 3). Multidisciplinary Digital Publishing Institute (MDPI). https://doi.org/10.3390/jcm14030982

Liddy, C., Johnston, S., Nash, K., Irving, H., & Davidson, R. (2016). Implementation and evolution of a regional chronic disease self-management program. *Canadian Journal of Public Health*, *107*(2), e194–e201. https://doi.org/10.17269/CJPH.107.5126

Liu, Y., James, T., Wang, S., Li, Y., & WANG, K. (2023). Health behaviors differentially associated with depression and hypertension in U.S. adults. *MOJ Public Health*, *12*(2), 106–112. https://doi.org/10.15406/mojph.2023.12.00417

Mills, K. T., Stefanescu, A., & He, J. (2020). The Global Epidemiology of Hypertension. *Nature Reviews Nephrology*, *16*(4), 223–237. https://doi.org/10.1038/s41581-019-0244-2

Ohrnberger, J., Fichera, E., & Sutton, M. (2017). The relationship between physical and mental health: A mediation analysis. *Social Science and Medicine*, *195*, 42–49. https://doi.org/10.1016/j.socscimed.2017.11.008

Oktamianti, P., Kusuma, D., Amir, V., Tjandrarini, D. H., & Paramita, A. (2022). District-Level Inequalities in Hypertension among Adults in Indonesia: A Cross-Sectional Analysis by Sex and Age Group.

International Journal of Environmental Research and Public Health, *19*(20). https://doi.org/10.3390/ijerph192013268

Osborne, M. T., Shin, L. M., Mehta, N. N., Pitman, R. K., Fayad, Z. A., & Tawakol, A. (2020). Disentangling the Links Between Psychosocial Stress and Cardiovascular Disease. *Circulation: Cardiovascular Imaging*, *13*(8), E010931. https://doi.org/10.1161/CIRCIMAGING.120.010931

Romańczyk, M., Surma, S., Kocyan, B., Kłos, K., Strona, W., & Krzystanek, M. (2021). The risk of a blood pressure increase during treatment with selected psychotropic drugs. In *Arterial Hypertension (Poland)* (Vol. 25, Issue 4, pp. 135–144). Via Medica. https://doi.org/10.5603/AH.a2021.0015

Ryder, A. L., & Cohen, B. E. (2021). Evidence for depression and anxiety as risk factors for heart disease and stroke: implications for primary care. In *Family Practice* (Vol. 38, Issue 3, pp. 365–367). Oxford University Press. https://doi.org/10.1093/fampra/cmab031

Santoni, S., Kernic, M. A., Malloy, K., Ali, T., Zhang, Y., Cole, S. A., & Fretts, A. M. (2025). Depression and Incident Hypertension: The Strong Heart Family Study. *Preventing Chronic Disease*, *22*, E06. https://doi.org/10.5888/pcd22.240230

WHO. (2023). Depressive disorder (depression). https://www.who.int/news-room/fact-sheets/detail/depression

WHO. (2023). Hypertension. https://www.who.int/news-room/fact-sheets/detail/hypertension

Yin, R., Yin, L., Li, L., Silva-Nash, J., Tan, J., Pan, Z., Zeng, J., & Yan, L. L. (2022). Hypertension in China: burdens, guidelines and policy responses: a state-of-the-art review. In *Journal of Human Hypertension* (Vol. 36, Issue 2, pp. 126–134). Springer Nature. https://doi.org/10.1038/s41371-021-00570-z

Zenebe, Y., Akele, B., W/Selassie, M., & Necho, M. (2021). Prevalence and determinants of depression among old age: a systematic review and meta-analysis. In *Annals of General Psychiatry* (Vol. 20, Issue 1). BioMed Central Ltd. https://doi.org/10.1186/s12991-021-00375-x

Zhang, Y., Chen, Y., & Ma, L. (2018). Depression and cardiovascular disease in elderly: Current understanding. In *Journal of Clinical Neuroscience* (Vol. 47, pp. 1–5). Churchill Livingstone. https://doi.org/10.1016/j.jocn.2017.09.022