



RESEARCH ARTICLE

Work stress & sleep quality as factors of hypertension in Labuhan Deli

Selviyani Harefa¹, Damaria Waruwu¹, Andry Simanullang^{2*}, Putri Yunita Pane²

ABSTRACT

Background: Hypertension is a non-communicable disease with high prevalence that constitutes a leading cause of morbidity and premature mortality worldwide. Work stress and poor sleep quality are presumed to contribute to blood pressure elevation among working populations. This study aimed to analyze the relationship between work stress and sleep quality with hypertension incidence among workers in the Labuhan Deli Public Health Center working area.

Methods: An analytical cross-sectional design with a quantitative approach was employed. The sample comprised 98 respondents selected through purposive sampling based on inclusion and exclusion criteria. Data collection utilized the Job Stress Questionnaire (JSQ) to measure work stress, the Pittsburgh Sleep Quality Index (PSQI) to assess sleep quality, and sphygmomanometer measurements for blood pressure determination. Data analysis employed the Chi-Square test with a significance level of $\alpha=0.05$.

Results: Results demonstrated that the majority of respondents experienced high work stress (42.9%), poor sleep quality (63.3%), and hypertension (53.1%). Significant associations were identified between work stress and hypertension incidence ($p=0.019$) and between sleep quality and hypertension incidence ($p=0.019$). Workers with high work stress exhibited a greater proportion of hypertension (66.7%) compared to those with mild work stress (27.8%). Similarly, workers with poor sleep quality demonstrated a higher hypertension proportion (62.9%) compared to those with good sleep quality (36.1%).

Conclusion: It is concluded that work stress and sleep quality are significantly associated with hypertension incidence among workers. Stress management and sleep quality improvement efforts need to be integrated into occupational health programs for hypertension prevention.

Keywords: hypertension, work stress, sleep quality, workers, occupational health

Introduction

Hypertension is a leading global public health challenge, affecting 1.28 billion adults and causing over half of cardiovascular deaths worldwide.^{1,2} Often called the “silent killer,” it is especially prevalent in low- and middle-income countries, with regional rates ranging from 18% (Americas) to 27% (Africa).³ Indonesia mirrors this trend: national prevalence rose from 27.9% (2013) to 30.8% (2023), with wide provincial variation (22.2% in Papua to 44.1% in South Kalimantan). Notably, hypertension is increasingly detected in younger adults—10.7% of those aged 18–24 and 17.4% aged 25–34—highlighting the need to address modifiable risk factors in working-age populations. National survey reports (Riskesdas 2018 and SKI 2023) consistently show higher hypertension prevalence among women than men in North Sumatra; several local

Affiliation

¹Undergraduate Program in Public Health, Universitas Prima Indonesia

²Department of Public Health, Universitas Prima Indonesia

Correspondence:

andrymanullang01@gmail.com

theses and provincial reports quote female prevalence in the mid-30s and male prevalence in the high-20s to low-30s.^{4,5}

Work stress is a major occupational hazard, linked to >840,000 deaths annually via psychosocial risks like long hours and harassment.⁶ It activates the sympathetic nervous system and HPA axis, raising adrenaline and cortisol, which increase heart rate, vasoconstriction, and cardiac output—culminating in sustained high blood pressure. High job strain is consistently tied to both elevated blood pressure and incident hypertension.^{7–10} Poor sleep affects 15–39% globally (up to 57% in some studies); in Indonesia, 51% report sleep deficiency, and 10% have insomnia (~28 million people). During normal sleep, sympathetic activity and blood pressure drop; poor sleep disrupts this, causing sustained sympathetic tone, higher cortisol, and increased vascular resistance—raising hypertension risk.^{11–13}

While work stress and sleep quality are each linked to hypertension, few studies examine their combined effects among general workers in Indonesian primary healthcare catchment areas. Most prior work focuses on specific occupations (e.g., healthcare or industrial workers) or assesses factors in isolation.^{14,15} This gap matters because effective occupational health interventions must target multiple concurrent risks. The Labuhan Deli Public Health Center area (Deli Serdang, North Sumatra)—with diverse sectors (manufacturing, commerce, agriculture, services) and 5,635 recorded hypertension cases in 2025—offers a relevant setting. This study analyzes how work stress and sleep quality jointly relate to hypertension among local workers.

Method

This study used an analytical cross-sectional design with quantitative methods. Ethical approval was obtained from the Health Research Ethics Committee of Universitas Prima Indonesia (002/KEPK/UNPRI/VII/2025), and all procedures followed the Declaration of Helsinki. The study was conducted in the Labuhan Deli Public Health Center area in North Sumatra, Indonesia, selected for its high hypertension prevalence (5,635 cases in 2025) and diverse worker population. Data collection occurred from July 2026 through completion. The target population comprised all working-age residents (18–40 years) in the area ($N = 5,635$). Using the Slovin formula with a 10% margin of error, the required sample was 98 respondents. Purposive sampling selected participants who lived and worked in the area, were aged 18–40, consented to participate, and could communicate effectively. Exclusions were incomplete questionnaires, acute illness during data collection, absence during data collection, and being a non-wage-earning housewife.

Work stress was assessed with the 15-item Job Stress Questionnaire (JSQ) across five domains (workload, control, support, role conflict, environment). Items used a 5-point Likert scale (1–5); total scores ranged 15–75 and were categorized as mild (15–35), moderate (36–55), or severe (56–75). The JSQ is validated in Indonesian occupational health settings. Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI; 17 items, 7 components). Component scores (0–3) yield a global score (0–21); ≤ 5 indicates good sleep quality, > 5 poor sleep quality. The PSQI is well validated in hypertensive populations. Blood pressure was measured with a calibrated sphygmomanometer after ≥ 5 minutes of rest; two readings were averaged. Hypertension was defined as SBP ≥ 140 mmHg and/or DBP ≥ 90 mmHg; status was coded normotensive (0) or hypertensive (1). Univariate analysis summarized respondent characteristics and key variables. Bivariate associations between work stress, sleep quality, and hypertension were tested using Chi-Square, with significance at $p < 0.05$ (95% CI).

Results

A total of 98 respondents participated in this study, all of whom completed the questionnaires and underwent blood pressure measurements. The demographic characteristics of the respondents are presented in Table 1. The majority of respondents were aged 25–30 years (36.7%), followed by those aged 18–25 years (33.7%) and 30–40 years (29.6%). Gender distribution was balanced, with 49 male respondents (50.0%) and 49 female respondents (50.0%). Educational attainment showed that the largest proportion had completed senior high school or vocational school (45.9%), followed by junior high school (17.3%), university education (15.3%), primary school (13.3%), and diploma (8.2%). Regarding occupation, factory workers or laborers constituted the largest group (34.7%), followed by traders or entrepreneurs (29.6%), teachers or lecturers (11.2%), healthcare workers (10.2%), students (7.1%), drivers (5.1%), and farmers (2.0%). Most respondents worked 9–10 hours per day (53.1%), with 27.6% working less than 8 hours, 15.3% working 11–

12 hours, and 3.1% working more than 12 hours. Work tenure was predominantly 1-5 years (48.0%), followed by less than 1 year (26.5%), 6-10 years (19.4%), and more than 10 years (6.1%).

Table 1. Demographic characteristics of respondents (n=98)

Characteristic	n	%
Age		
18-25 years	33	33.7
25-30 years	36	36.7
30-40 years	29	29.6
Gender		
Male	49	50.0
Female	49	50.0
Education		
Primary school	13	13.3
Junior high school	17	17.3
Senior high school/vocational	45	45.9
Diploma (D1-D3)	8	8.2
University (S1-S3)	15	15.3
Occupation		
Teacher/lecturer	11	11.2
Healthcare worker	10	10.2
Factory worker/laborer	34	34.7
Trader/entrepreneur	29	29.6
Farmer	2	2.0
Student	7	7.1
Driver	5	5.1
Work duration (hours/day)		
<8 hours	27	27.6
9-10 hours	53	53.1
11-12 hours	15	15.3
>12 hours	3	3.1
Work tenure		
<1 year	26	26.5
1-5 years	47	48.0
6-10 years	19	19.4
>10 years	6	6.1

The distribution of the primary study variables is presented in Table 2. Work stress assessment revealed that the largest proportion of respondents experienced severe work stress (42.9%), followed by moderate stress (38.8%) and mild stress (18.4%). Sleep quality evaluation showed that the majority of respondents had poor sleep quality (63.3%), while 36.7% had good sleep quality. Blood pressure measurement indicated that 53.1% of respondents were hypertensive, while 46.9% were normotensive.

Table 2. Distribution of study variables (n=98)

Variable	n	%
Work Stress Level		
Mild	18	18.4
Moderate	38	38.8
Severe	42	42.9
Sleep Quality		
Good	36	36.7
Poor	62	63.3
Blood Pressure Status		
Normotensive	46	46.9
Hypertensive	52	53.1

Bivariate analysis using the Chi-Square test examined the association between work stress and hypertension incidence (Table 3). Among respondents with mild work stress, the majority were normotensive (72.2%), while 27.8% were hypertensive. Among those with moderate work stress, equal proportions were normotensive and hypertensive (50.0% each). Among respondents with severe work stress, the majority were hypertensive (66.7%), while 33.3% were normotensive. The Chi-Square test yielded a p-value of 0.019, indicating a statistically significant association between work stress level and hypertension incidence. The

proportion of hypertension increased progressively with higher work stress levels, demonstrating a dose-response pattern.

Table 3. Association between work stress, sleep quality and hypertension incidence

Variable	Normotensive n (%)	Hypertensive n (%)	Total n (%)	p-value
Work Stress Level				
Mild	13 (72.2)	5 (27.8)	18 (100.0)	0.019
Moderate	19 (50.0)	19 (50.0)	38 (100.0)	
Severe	14 (33.3)	28 (66.7)	42 (100.0)	
Sleep Quality				
Good	23 (63.9)	13 (36.1)	36 (100.0)	0.019
Poor	23 (37.1)	39 (62.9)	62 (100.0)	

Analysis of the association between sleep quality and hypertension incidence revealed that among respondents with good sleep quality, the majority were normotensive (63.9%), while 36.1% were hypertensive (Table 4). Conversely, among respondents with poor sleep quality, the majority were hypertensive (62.9%), while 37.1% were normotensive. The Chi-Square test produced a p-value of 0.019, demonstrating a statistically significant association between sleep quality and hypertension incidence. Respondents with poor sleep quality exhibited substantially higher hypertension prevalence compared to those with good sleep quality.

Discussion

This study shows that work stress and sleep quality are significantly associated with hypertension among workers in the Labuhan Deli Public Health Center area, with each factor independently contributing to risk. Severe work stress (42.9%), poor sleep quality (63.3%), and hypertension (53.1%) indicate a substantial occupational health burden and the need for integrated preventive measures.^{16,17} Most respondents were young adults aged 25–30 years, reflecting the growing burden of hypertension in younger, working-age Indonesians. Over half had hypertension despite being in their twenties and thirties, consistent with national data showing a shift from older to working-age groups. The equal gender distribution (50% male, 50% female) suggests that, in this setting, occupational risks may affect men and women similarly.¹⁷

Factory workers and laborers (34.7%) and traders/entrepreneurs (29.6%) dominated the sample, mirroring the industrial–commercial economy of Labuhan Deli. Long working hours were common, with most respondents working 9–10 hours and some exceeding 11–12 hours, indicating prolonged exposure to job demands that are known to increase psychosocial stress and cardiovascular risk.^{17,18} Work stress was significantly associated with hypertension ($p=0.019$), with prevalence rising from 27.8% in the mild stress group to 66.7% in the severe stress group, supporting a dose–response relationship. This aligns with evidence that high job strain elevates blood pressure via sustained activation of the sympathetic nervous system and hypothalamic–pituitary–adrenal axis, increasing catecholamines and cortisol and promoting vasoconstriction, higher cardiac output, and sodium retention.^{19,20} These results are consistent with Indonesian studies in tugboat crews and healthcare workers showing significant effects of work stress on hypertension, with high prevalence in both males and females.²¹ Prior research in primary healthcare settings has similarly linked higher stress levels to increased hypertension, and this study extends those findings to a broader mix of occupations within a public health center catchment area.^{22,23}

Poor sleep quality was also significantly associated with hypertension ($p=0.019$); 62.9% of respondents with poor sleep were hypertensive versus 36.1% with good sleep. This is biologically plausible because normal sleep promotes nocturnal blood pressure dipping, whereas disturbed sleep blunts this dipping, maintains sympathetic activation, raises nocturnal blood pressure, and increases cardiovascular load.^{24,25} Sleep disturbance further activates inflammatory pathways and impairs endothelial function, contributing to vascular dysfunction and hypertension.^{26,27} The high prevalence of poor sleep quality (63.3%) is comparable to other Indonesian occupational studies, including university employees and productive-age hypertensive patients, where most report sleep disturbance.¹⁵ In working populations, poor sleep likely reflects combined effects of occupational stress, extended hours, and lifestyle factors, and stress and sleep problems often reinforce each other, creating a vicious cycle that amplifies cardiovascular risk.²⁸

These findings have important implications for occupational health policy and practice. Comprehensive workplace programs should include stress management (relaxation training, time management, social support), ergonomic and workload improvements, adequate rest breaks, and sleep

hygiene education (regular schedules, good sleep environments, limiting stimulants)^{29,30}. Given the long working hours observed, policies limiting work duration and ensuring recovery time are warranted. Primary healthcare services serving workers should integrate occupational health screening into routine care, including blood pressure measurement and assessment of work stress and sleep quality. Early identification of at-risk workers allows timely intervention, and health education should emphasize stress control and good sleep as key to cardiovascular health.^{31,32}

Conclusion

This study links severe work stress and poor sleep quality to higher hypertension rates among Labuhan Deli Public Health Center workers, signaling an urgent need for targeted occupational health interventions. Workers should practice stress management and sleep hygiene, while local health centers must provide routine blood pressure screenings, lifestyle counseling, and educational sessions. Future research should use longitudinal designs with diverse samples and control for confounding variables like diet, exercise, and smoking to establish clear causality.

References

1. Nguyen TN, Chow CK. Global and national high blood pressure burden and control. *Lancet*. 2021 Sep;398(10304):932–3.
2. O'Connell SS, Whelton PK, Mills KT. Global trends in hypertension prevalence, awareness, treatment, and control. *Curr Opin Nephrol Hypertens*. 2026 Jan 7;35(2).
3. Regea F, Birhanu A, Shibiru A. Distribution of risks and prevalence of unscreened hypertension among adults living in rural of Dano District, West Shewa, Oromia, Ethiopia, 2020: Community based cross-sectional study. *Clin Epidemiol Glob Heal*. 2022 Jan;13:100908.
4. Kementerian Kesehatan Republik Indonesia. Riset Kesehatan Dasar 2018 (2018 Basic Health Research). Jakarta; 2018.
5. Kementerian Kesehatan Republik Indonesia. Survei Kesehatan Indonesia 2023. Jakarta: Kementerian Kesehatan Republik Indonesia; 2024.
6. ILO. World Day for Safety and Health at Work 2026 [Internet]. 2026. Available from: <https://www.ilo.org/resource/news/840000-deaths-year-linked-psychosocial-risks-work>
7. Russell G, Lightman S. The human stress response. *Nat Rev Endocrinol*. 2019 Sep 27;15(9):525–34.
8. Herman JP, McKlveen JM, Ghosal S, Kopp B, Wulsin A, Makinson R, et al. Regulation of the Hypothalamic-Pituitary-Adrenocortical Stress Response. In: *Comprehensive Physiology*. Wiley; 2016. p. 603–21.
9. Leistner C, Menke A. Hypothalamic–pituitary–adrenal axis and stress. In 2020. p. 55–64. Available from: <https://linkinghub.elsevier.com/retrieve/pii/B9780444641236000047>
10. O'Connor DB, Thayer JF, Vedhara K. Stress and Health: A Review of Psychobiological Processes. *Annu Rev Psychol*. 2021 Jan 4;72(1):663–88.
11. Purwanto S, Ahmad M, Said Z, Anganthi NRN, Kusumawati Y, Zulaekah S. Prevalence of Insomnia at Before and During the COVID-19 Pandemic. *Sleep Med Res*. 2023 Jun 30;14(2):80–7.
12. Canever JB, Zurman G, Vogel F, Sutil DV, Diz JBM, Danielewicz AL, et al. Worldwide prevalence of sleep problems in community-dwelling older adults: A systematic review and meta-analysis. *Sleep Med*. 2024 Jul;119:118–34.
13. Benjafield A V., Sert Kuniyoshi FH, Malhotra A, Martin JL, Morin CM, Maurer LF, et al. Estimation of the global prevalence and burden of insomnia: a systematic literature review-based analysis. *Sleep Med Rev*. 2025 Aug;82:102121.
14. Maria IL, Yusnitasari AS, Lifoia C, Annisa ATA, Mulyani S. Determinants of Hypertension Incidence in the Work Areas of the Bone and Barru District Health Centers in 2022. *Media Kesehat Masy Indones*. 2022 Sep 30;18(3):83–9.
15. Nugroho AS, Astutik E, Efendi F. Relationship Between Sleep Quality and Hypertension Among Working-Age Population in Indonesia. *Indones Nurs J Educ Clin*. 2020 Apr 10;5(1):35.
16. Kivimäki M, Kawachi I. Work Stress as a Risk Factor for Cardiovascular Disease. *Curr Cardiol Rep*. 2015 Sep 4;17(9):74.
17. Popescu DC, Diaconu M, Nechita AC. Occupational stress as a modifiable risk factor for atherosclerotic coronary artery disease: Evidence, mechanisms, and interventions. *Eurasian J Med Oncol*. 2026 Jul 6;026130147.
18. Landsbergis PA, Schnall PL, Belkic KL, Baker D, Schwartz J, Pickering TG. Work stressors and cardiovascular disease. *Work*. 2001;17(3):191–208.
19. Guimont C, Brisson C, Dagenais GR, Milot A, Vézina M, Masse B, et al. Effects of Job Strain on Blood Pressure: A Prospective Study of Male and Female White-Collar Workers. *Am J Public Health*. 2006 Aug;96(8):1436–43.
20. Spruill TM. Chronic Psychosocial Stress and Hypertension. *Curr Hypertens Rep*. 2010 Feb 27;12(1):10–6.
21. Mansyur M, Sagitarsi R, Wangge G, Sulistomo AB, Kekalih A. Long working hours, poor sleep quality, and work-family conflict: determinant factors of fatigue among Indonesian tugboat crewmembers. *BMC Public Health*. 2021 Dec 9;21(1):1832.
22. Wang J, Zhu L, Song L, Zhou Z, Chan W, Li G, et al. A cohort study on the association between changing occupational stress, hair cortisol concentration, and hypertension. *Rippe RCA, editor. PLoS One*. 2023 May 17;18(5):e0285623.
23. Andini FAD, Siregar AYM. Work hours and the risk of hypertension: the case of Indonesia. *BMC Public Health*. 2024 Sep 12;24(1):2480.
24. Chellappa SL, Vujovic N, Williams JS, Scheer FAJL. Impact of Circadian Disruption on Cardiovascular Function and Disease. *Trends Endocrinol Metab*. 2019 Oct;30(10):767–79.
25. Greenlund IM, Carter JR. Sympathetic neural responses to sleep disorders and insufficiencies. *Am J Physiol Circ Physiol*. 2022 Mar 1;322(3):H337–49.

26. Cherubini JM, Cheng JL, Williams JS, MacDonald MJ. Sleep deprivation and endothelial function: reconciling seminal evidence with recent perspectives. *Am J Physiol Circ Physiol*. 2021 Jan 1;320(1):H29–35.
27. Holmer BJ, Lapierre SS, Jake-Schoffman DE, Christou DD. Effects of sleep deprivation on endothelial function in adult humans: a systematic review. *GeroScience*. 2021 Feb 9;43(1):137–58.
28. Mao Y, Raju G, Zabidi MA. Association Between Occupational Stress and Sleep Quality: A Systematic Review. *Nat Sci Sleep*. 2023 Nov;15:931–47.
29. Soprovich AL, Seaton CL, Bottorff JL, Duncan MJ, Caperchione CM, Oliffe JL, et al. A systematic review of workplace behavioral interventions to promote sleep health in men. *Sleep Heal*. 2020 Jun;6(3):418–30.
30. Kröll C, Doebler P, Nüesch S. Meta-analytic evidence of the effectiveness of stress management at work. *Eur J Work Organ Psychol*. 2017 Sep 3;26(5):677–93.
31. Alhajaji R, Alfahmi MZ, Alshaikhi SA, Fairaq AM, Fudlaldeen Jan S, Aljuaid S, et al. The influence of workplace stressors on the risk of cardiovascular diseases among healthcare providers: a systematic review. *Front Psychiatry*. 2025 Aug 21;16(4):649–57.
32. Mattioli AV, Gallina S. Early cardiovascular prevention: the crucial role of nurse-led intervention. *BMC Nurs*. 2023 Oct 2;22(1):347.