

Background

According to a 2023 report by International Labour Organization [1], around 35% of the global workforce work excessively in 2019. The share of those employed that work excessively (49 or more hours per week) in Mexico is around 27.63%, Vietnam 27.23%, Colombia 24.15%, Costa Rica 23.24%, and Indonesia 25.76%—which is equivalent to approximately 35 million people in 2022 [2]. As a middle-income country, Indonesia tends to have people working longer hours compared to those in high-income countries [3]. Indonesian Bureau of Statistics (BPS) noted that for the past few years, even during the pandemic of Covid-19, the number of people working excessive hours (more than 40 h per week) has always been over 32 million people or around 26% [4, 5].

This definition of excessive work hours may differ across countries as it also differs from the ILO's. However, the United States, Japan, and South Korea have the same standard for maximum normal working hours per week in general [6–8].

Although it is common for workers to work overtime, working long hours may adversely affect health. The health implications may vary due to several factors such as job characteristics, socioeconomic status, and health condition. Besides affecting mental health, working excessive hours can increase the risk of cardiovascular diseases, including hypertension [3].

Hypertension is a major cause of premature death, and one of the global targets for noncommunicable diseases is to reduce the prevalence of hypertension by 33% between 2010 and 2030 [9]. However, the global prevalence trend of hypertension has increased significantly over the past two decades, with a rate of 165.11 prevalent cases per 100,000 in 1999 and continued increasing until 240.36 prevalent cases per 100,000 in 2019 [10]. The prevalence of hypertension among Indonesian adults has increased from 25.8% in 2013 to 34.1% in 2018 [11] amounting to approximately 63.3 million people, with around 427,000 deaths [12]. However, the latest survey conducted by the Indonesian Ministry of Health revealed that the prevalence of hypertension has then decreased to 29.2% in 2023. Although the country observed a decrease, the prevalence remains high [13].

Studies have been conducted to analyze the relationship between working hours and blood pressure. However, findings on association between working hours and hypertension have been varied. Some suggest that

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regulation of normal work hours in Indonesia, those who work more than 40 h per week are considered as individuals with excessive work hours. The logit regression equation is as follows:

Table 4 Logit regression result (dependent variable: measured hypertension)

Variable	Coefficient	Marginal effect
Work hours per week	0.0031*** (0.0007)	0.0006*** (0.0001)
Physical activity	-0.0931*** (0.0365)	-0.0168*** (0.0065)
Lifting heavy loads	-0.0931** (0.0409)	-0.0165** (0.0073)
Stooping, kneeling, crouching	0.0428 (0.0359)	0.0076 (0.0064)
Using computers	-0.1088** (0.0652)	-0.0230** (0.0116)
Stress	-0.1088* (0.0610)	-0.0193* (0.0108)
Formal	0.0924** (0.0364)	0.0164** (0.0001)
BMI	0.0005** (0.0002)	0.0001** (0.0000)
Smoking behavior (ref: never smoker)		
Former smoker	-0.1532 (0.1036)	-0.0277 (0.0183)
Current light or moderate smoker	-0.3588*** (0.0507)	-0.0626*** (0.0087)
Current heavy smoker	-0.1443* (0.0825)	-0.0262* (0.0147)
Male	0.2416*** (0.0469)	0.0429*** (0.0083)
Married	0.0175 (0.0410)	0.0429 (0.0073)
Rural	-0.0889*** (0.0347)	-0.0158*** (0.0062)
lnPCE	-0.1142*** (0.2622)	-0.0212*** (0.0047)
Age	-0.0599*** (0.0072)	-0.0106***

Stress level involved in individuals' job is also found to be negatively related ($p < 0.10$). Being a current smoker is also found to be associated with lower risk of hypertension ($p < 0.01$; $p < 0.10$). Additionally, the result shows that a male worker relatively has a higher probability of having hypertension than a female worker by 4.29% points ($p < 0.01$).

Table 5 shows the logit regression result for the alternative model which used continuous blood pressure as the dependent variable. It further confirms the finding of the positive and significant relationship between work hours and higher blood pressure ($p < 0.10$).

Table 6 presents the logit regression result of the second alternative model, using dummy excessive work hours as the independent variable. The result shows that excessive work hours are positively and significantly related to higher risk of hypertension ($p < 0.01$), verifying the main finding of this study. It also serves as a robustness check, ensuring that the estimation of the main

working overtime is allowed, as long as the total working time is no higher than 10 h per day and no higher than 56 h per week. In Indonesia, overtime work hours can be done for a maximum of four hours per day and 18 h per week with a normal working time provision of 40 h a week—totaling a maximum of 58 h per week. This number is two hours higher than the international standard.

It is not uncommon for countries to have maximum working hours shorter than the international standard. In the United Kingdom, an initiative of a shorter workweek—4 days amounting to 32 h per week, had most businesses report a reduction in employees' stress and an increase in their well-being [46]. However, a lot of Indonesian workers, especially in the manufacturing industry, are low-skilled labors and reducing work hours may impose challenges such as lower productivity and underutilization of labor [47]. Having similar characteristics, Indonesia may adopt the initiative of the flexible work arrangement of Philippines which allows employers and

Conclusions

This study found a significant and positive relationship between work hours and hypertension, meaning that longer work hours are associated with a higher risk of hypertension. Possible mechanisms are incidence of sleep deprivation, increased stress-level and less time to recover. Although this study cannot suggest causality, the strongly significant correlation may provide an idea and an overview regarding the risk of hypertension among working individuals in Indonesia. The Indonesian government, after conducting further studies, may adopt initiatives such as flexible working arrangements into its regulation and incentive provisions to promote workers' health outcomes in the presence of the challenges the country may face in regulating work hours.

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Author contributions

F.A. performed the data analysis, result interpretation, and took lead in writing the manuscript. A.S. supervised the study, provided critical feedback, and helped shape the research and manuscript. All authors read and approved the final manuscript.

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Data availability

The data used in this study are freely available in the RAND repository, <https://www.rand.org/well-being/social-and-behavioral-policy/data/FLS/IFLS.html>.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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