BKM Public Health & Community Medicine
(Berita Kedokteran Masyarakat)

Volume 38 **Number** 4, 2022
Pages 113-118
DOI: 10.22146/bkm.v38i04.3415

The effect of work stress on blood pressure and fatigue among Universitas Gadjah Mada field operational workers (PK4L)

Daniar Ajeng Dwianri[1], Yayi Suryo Prabandari[1]

Submitted:
November 17th, 2021
Accepted:
April 15th, 2022
Published:
April 30th, 2022

[1]Department of Health Behavior, Environmental, and Social Medicine, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Indonesia

***Correspondence :**
Daniar Ajeng Dwianri
daniaradwi@mail.ugm.ac.id

Abstract

Purpose: This study aimed to know the effect of work stress on blood pressure and work fatigue in the field operation workers of PK4L UGM. **Methods:** This study was a quantitative study with a cross-sectional research design and equipped with a semi-structured interview. The sample size in this study was 163 respondents chosen using purposive sampling. Work stress is the independent variable measured using the HSE management standards indicator tool questionnaire. The dependent variables, blood pressure, were obtained from secondary data from health examination by PK4L UGM, and work fatigue (WF) was measured using the KAUPK2 questionnaire. The data were analyzed using bivariate analysis with Kendall's tau correlation test. **Results:** Out of 163 respondents, as many as 49.7% had a high WS, 24.5% had a high BP, and 31.3% had a severe WF. The causes of work stress were conflicts with a driver, increased workload, hot temperatures, work that requires high concentration, colleagues who are less able to work together, and monotonous work. The causes of work fatigue were increased workload, tedious work, sitting or standing for a long time, and mental exhaustion. Bivariate analysis showed that there was no effect of WS towards BP ($p=0.752$; $\tau= -0.025$), and there was an effect of WS towards WF ($p=0.010$; $\tau=0.190$). **Conclusion:** Work stress did not affect blood pressure, but it did impact work fatigue in the field operation workers of PK4L UGM. Further research is required to understand the other factors affecting workers' blood pressure and work fatigue.

Keywords: blood pressure; work fatigue; work stress

INTRODUCTION

Work stress is a problem that needs to be recognized in the world of work. Stress is a health disorder included in one of the occupational diseases based on the target organ system regulated in Presidential Regulation Number 7 of 2019. According to WHO, in 2014, in several countries, as many as 8% of diseases were caused the result of work is depression.

Job stress combines workplace stressors, individual characteristics, and extra-organizational stressors [1]. The Regus Asia survey in 2012 showed increased stress among workers in Indonesia compared to 2011. Research on mental disorders in workers shows that Indonesian workers experience higher stress and anxiety compared to 3 other countries, namely Malaysia, Thailand, and Vietnam [2]. The results of the 2018 Riskesdas stated that the prevalence of emotional and mental disorders increased in the age group ≥ 15 years, which was 9.8%, compared to 2013, which was 6%.

The increase in stress that occurs in workers every year impacts occupational health. Factors that can trigger stress in workers include uncomfortable work environments, non-ergonomic workstations, *shift work*,

long working hours, excessive workloads, and adaptation to new types of work [3]. According to *the American Psychological Association*, work stress stems from low income, excessive workloads, lack of opportunities for development, monotonous work, lack of social support, insufficient ability to manage work, and unclear job demands.

Stress causes the release of adrenaline hormones in the body, increasing the heart rate which causes narrowing of blood vessels and increased blood pressure [4]. According to the American Heart Association's 2007 report, cardiovascular disease (CVD) is a heart disease caused by stress, such as high blood pressure (hypertension), coronary heart disease, myocardial infarction, angina pectoris, and heart failure [5].

Hypertension is an increase in systolic and diastolic blood pressure [6]. The results of the 2013 Riskesdas, the prevalence of hypertension in employees and laborers was 20.6% and 25.0%. Hypertension in workers is influenced by factors such as type of work, workload, obesity, working hours, and psychosocial stress [7].

Work fatigue is also one of the impacts caused by work stress. According to some definitions, work fatigue is a subjective symptom of work fatigue complained of by workers, which is an unpleasant feeling. Other causes of work fatigue include monotonous work, high mental and physical work intensity and endurance, work environment, psychological factors, nutrition, circadian rhythm, and shift work [8].

Field operational officers of the Center for Occupational Health and Environmental Safety and Security (PK4L) in security and order are tasked with maintaining security, order, and safety in the Universitas Gadjah Mada environment. PK4L routinely conducts nutritional status checks on PK4L members twice yearly to form healthier body proportions. However, no routine psychological examination has been conducted even though the high work intensity and responsibility, as well as shift work, make PK4L field operational officers one of the groups that are prone to stress. Based on this, a study was conducted on the effect of work stress on blood pressure and work fatigue in PK4L UGM field operational officers.

METHODS

This research was conducted using a cross-sectional research design and is equipped with semi-structured interviews conducted between March and June 2020 at the UGM Center for Occupational Health and Environmental Safety (PK4L). The sample was selected by *purposive sampling* based on inclusion criteria, namely field operational officers, and exclusion criteria, namely officers not present when data collection was conducted. The sample size obtained was 163 respondents.

The independent variable is work stress, measured using the *Health & Safety Executive* (HSE) *Management Standards Indicator Tool questionnaire,* consisting of 22 questions tested for validity and reliability. The dependent variable is blood pressure, which was determined using secondary data from periodic health measurements conducted on September 26-27, 2019, by PK4L UGM and GMC *Health Center* using *cut-off points* according to JNC VIII (2014). Work fatigue is measured using the work fatigue feeling measurement tool questionnaire (KAUPK2). Confounding variables include age, work *shift*, work *shift time*, smoking status, physical activity, current medical history, and family medical history obtained from the identity questionnaire filled out by respondents. In contrast, nutritional status is calculated from body weight and height obtained from health examination data conducted in March 2020.

Univariate analysis was conducted to describe the characteristics of respondents descriptively. Bivariate analysis used Kendall's tau correlation test to see the influence of independent and dependent variables. *Chi-Square and Fisher's exact tests* were used to see the relationship between confounding and dependent variables. Multivariate analysis, namely logistic regression and ordinal regression tests, was used to determine the relationship between independent and confounding variables on the dependent variable.

RESULTS

In this study, of the 163 respondents, the majority of respondents were aged ≤ 45 years (87.1%), male (93.9%), portal task unit 24.5%), work period less than 10 years (65.6%), three work *shifts* (68.7%), work *shift time* during the day (50.3%), non-smokers (60.1%), do not routinely do physical activity (sports) (68.1%), have no history of current illness (87.7%), have no family history of illness (90.2%), and obese nutritional status (57.7%). The history of current illness reported by respondents included hypertension, diabetes, gout, heart disease, and stomach acid. The family history of illness reported by respondents included hypertension and diabetes. As many as 49.7% experienced high work stress, 24.5% had high blood pressure, and 31.3% felt heavy work fatigue.

The results of semi-structured interviews explain that the causes of work stress and work fatigue experienced by each task unit are different. Work

stress is caused by conflicts with road users, increased workload during after-work hours, hot air temperatures, monotonous work, work that requires high concentration, and when there are colleagues who are less able to cooperate. Work fatigue is caused when the workload increases, the work is monotonous, and officers have to sit at the portal post while working or stand when securing the portal during after-work hours for a long time, and when required to always be on standby if an emergency occurs.

Informants mentioned that work stress and work fatigue had no impact on health, but it decreased productivity and work motivation. Discussing and conveying work problems to supervisors or superiors is one way to overcome stress. The questionnaire assessment results also showed that most respondents stated that they very often received social support from coworkers and managers.

Exercise and taking a break while working are also ways to overcome work stress and fatigue in officers. PK4L UGM routinely conducts recreational activities and outbound or gatherings as an effort to familiarize officers and refresh them so that they can work more optimally. In addition, there are sports facilities in the form of a sports hall that officers can use, but some officers rarely use this facility. This is because officers feel tired from work or do not have time because the distance between the workplace and home is far.

In the analysis of work stress on blood pressure showed no effect (p > 0.05) with a correlation value of -0.025. A negative correlation indicates the opposite direction of the relationship. The higher the work stress, the lower the blood pressure. In the analysis of work stress on work fatigue showed an effect (p <0.05) with a correlation value of 0.190. A positive correlation indicates the direction of the relationship is in the same direction, the higher the work stress, the more severe the work fatigue.

The analysis results in Table 2 show that the variables of work stress, work shifts, work shift times, current medical history, family medical history, and nutritional status in this study did not affect blood pressure. The influence of variables on blood pressure in this study was 5.7%, while the impact of other factors was 94.3%.

Table 1. Results of the correlation analysis of independent variables and dependent variables

Variables	Work stress		t	*p-value*
	Tall n (%)	Low n (%)		
Blood pressure				
Tall	19 (23.5)	21 (25.6)	-0.025	0.752
Normal	62 (76.5)	61 (74.4)		
Work fatigue				
Heavy	31 (38.3)	20 (24.4)		
Currently	32 (39.5)	29 (35.4)	0.190	0.010*
Light	18 (22.2)	33 (40.2)		

τ: correlation coefficient; *significant p < 0.05

Table 2. Results of multivariate analysis of the dependent variable of blood pressure

Variables	OR	CI 95%	z	*p-value*	R^2
Work stress	0.82	0.39-1.74	-0.52	0.603	
Work *shift*	1.80	0.76-4.28	1.34	0.179	
Work *shift* time	0.71	0.33-1.50	-0.90	0.367	
RPS	2.51	0.81-7.76	1.60	0.109	0.057
RPK	0.98	0.27-3.58	-0.04	0.970	
Nutritional status	1.91	0.86-4.27	1.58	0.113	

OR: odds ratio ; CI 95%: 95% confidence interval;
z: probability value; R^2 : coefficient of determination;
RPS: history of current illness; RPK: family history of illness;
*significant p < 0.05

Table 3. Results of multivariate analysis of the dependent variable of work fatigue

Variables	OR	CI 95%	z	*p-value*	R^2
Work stress	2.48	1.37-4.51	2.99	0.003*	
Work *shift*	1.81	0.97-3.39	1.86	0.063	
Physical activity	0.53	0.28-0.99	-1.97	0.049*	0.055
RPS	2.75	1.09-6.88	2.15	0.031*	
Nutritional status	0.63	0.35-1.14	-1.52	0.128	

OR: odds ratio ; CI 95%: 95% confidence interval;
z: probability value; R^2: coefficient of determination;
RPS: history of current illness; *significant p < 0.05

The analysis results in Table 3 show that the variables of work stress, physical activity, and current medical history in this study affect work fatigue. The variables of work shift and nutritional status in this study statistically do not affect work fatigue. The influence of variables on work fatigue is 5.5%, while the influence of other factors is 94.5%. The variable that has the most significant impact on work fatigue is work stress. Work stress and current medical history are risk factors for increasing work fatigue.

In the case of work fatigue, the chances of respondents experiencing high work stress are 2.48 times higher than respondents experiencing low work stress. The chances of respondents with a history of current illness are 2.75 times higher than respondents without a history of current illness. Physical activity (exercise) is a protective factor for work fatigue. In the case of work fatigue, the chances of respondents who routinely do physical activity are 0.53 times higher than respondents who do not routinely do physical activity.

DISCUSSION

This study showed no effect of work stress on workers' blood pressure. This study's results align with previous studies that showed no difference between work stress and blood pressure [9,10]. In this study and prior studies, most respondents were men under 45. The highest peak blood pressure occurred in the age group over 45 years [11]. The testosterone hormone in men triggers the production of low-density lipoprotein (LDL), which can cause blockages in blood vessels. In contrast, high-density lipoprotein (HDL) production in women makes blood vessels more elastic. Women also have the hormone estrogen, which can strengthen the immune system [12]. Employment status based on gender is a fundamental factor that explains the different mental health histories in the working population. Male workers tend to refuse to ask for help at work. This can affect mental health [13].

There are differences in the results of this study with several previous studies that show a relationship between work stress and blood pressure [14,15]. The differences in the results of this study may be due to differences in the method of collecting work stress data. In addition, the blood pressure used in this study is secondary blood pressure data. Secondary data has the weakness that the data is not entirely accurate and does not describe the latest conditions [16].

Work stress experienced by officers is acute stress, a short-term stress response to incoming danger or events that have or will occur [17]. Acute reactions to stress have an impact on anxiety, fatigue, low motivation, and alcohol consumption [18]. Previous research states that work stress significantly impacts psychosocial health more than physical health, and chronic stress affects health [9].

The analysis shows that work stress is influenced by work fatigue. The results of this study are the same as those of previous studies, which stated that there is a relationship between work stress and work fatigue [19-21]. Work stress affects the fatigue felt at work, such as feeling tense and sore in the body's muscles even though there is no history of previous illness. When physical and psychological conditions are not balanced, it can affect the condition of workers so that they feel tired and experience work stress [21].

The results of the multivariate analysis showed that work stress, physical activity, and current medical history in this study affected work fatigue. Work fatigue is related to excessive physical and mental fatigue from a job triggered by factors such as working hours, physical and psychological activity, health conditions, repetitive work, or a combination of these factors [22]. A person's illness or health condition can also be a factor causing fatigue in the workplace [23]. A person with a history of certain diseases will increasingly impact work fatigue for the employee because his physical condition no longer allows him to do heavy work [24].

Work fatigue is often felt by individuals who never exercise [25]. Previous research has shown that lack of exercise is related to increased work fatigue. Long working hours, high work demands, and an unsupportive work environment can cause a lack of exercise. Other impacts that can occur are related to health and mental disorders, which can then be linked to fatigue [26].

Work fatigue is associated with long working hours, harsh working conditions, high workloads, production pressures, and resource constraints, along with aspects related to demographic and socioeconomic factors, living conditions, lifestyle, health, and well-being. More significant fatigue is significantly associated with younger age, less exercise, poor nutrition, less sleep, increased alcohol use, poor health, more sick leave, higher stress, and lower job satisfaction [26]. Fatigue can affect individual safety, performance, and organizational effectiveness [27].

CONCLUSION

There is no effect of work stress on blood pressure. Still, work stress affects work fatigue in field operational officers of the Center for Occupational Health and Environmental Safety and Security (PK4L) Universitas Gadjah Mada Yogyakarta. Further research is needed on other factors that affect blood pressure and work fatigue in groups of workers, such as nutritional intake, sleep patterns, sleep quality, exercise or fitness, and workload.

REFERENCES

1. Greenberg JS. Comprehensive Stress Management. New York: The McGraw-Hill; 2002
2. Ratanasiripong P, Kaewboonchoo O, Bell E, Haigh

C, Susilowati I, Isahak M, et al. Depression, Anxiety and Stress among Small and Medium Enterprise Workers in Indonesia, Malaysia, Thailand, and Vietnam. International Journal of Occupational Health and Public Health Nursing. 2016

3. Tarwaka. Industrial Ergonomics, Basic Knowledge and Application in the Workplace. 2nd Edition. Surakarta: Harapan Press; 2015
4. Taylor SE. Health Physiology. 8th ed. USA: McGraw-Hill Companies; 2012
5. Scott C. Optimal Stress: Living in Your Best Stress Zone. New Jersey: John Wiley&Sons, Inc.; 2010
6. Baradero M, Dayrit MW, Siswadi Y. Cardiovascular Disorders Clients: Nursing Care Series. Jakarta: EGC Medical Book; 2008
7. Faisal E, Djarwoto B, Murtiningsih B. Risk Factors of Hypertension in Women Workers with Dual Roles in Bantul Regency in 2011. Berita Kedokteran Masyarakat. 2012;28(2).
8. Caldwell, John A., J. Lynn C., Lauren A.T., Harris R. Lieberman. Fatigue and Its Management in the Workplace. Neuroscience and Biobehavioral Reviews. 2019;96: 272-289.
9. Schilling R, Colledge F, Ludyga S, Pühse U, Brand S, Gerber M. Does Cardiorespiratory Fitness Moderate the Association between Occupational Stress, Cardiovascular Risk, and Mental Health in Police Officers? Int J Environ Res Public Health. 2019;16(13)
10. Yamaguchi M, Eguchi M, Akter S, Kochi T, Hu H, Kashino I, et al. The Association of Work-Related Stressors and Their Changes Over Time with the Development of Metabolic Syndrome: The Furukawa Nutrition and Health Study. J Occup Health. 2018;60(6):485–93
11. Tumwesigye NM, Mutungi G, Bahendeka S, Wesonga R, Katureebe A, Biribawa C, et al. Alcohol Consumption, Hypertension and Obesity: Relationship Patterns Along Different Age Groups in Uganda. Prev Med Reports [Internet]. 2020;101141. Available from: https://doi.org/10.1016/j.pmedr.2020.10114
12. Santrock JW. Adolescence Adolescent Development. 6th ed. Jakarta: Erlangga; 2003
13. Halonen JI, Koskinen A, Varje P, Kouvonen A, Hakanen JJ, Väänänen A. Mental Health by Gender-Specific Occupational Groups: Profiles, Risks, and Dominance of Predictors. J Affect Disord. 2018;238:311–6
14. Bautista LE, Bajwa PK, Shafer MM, Malecki KMC, McWilliams CA, et al. The relationship between chronic stress, hair cortisol, and hypertension. Int J Cardiol Hypertension. 2019;2. Available from: https://doi.org/10.1016/j.ijchy.2019.100012
15. Yook YS. Firefighters' Occupational Stress and Its Correlations with Cardiorespiratory Fitness, Arterial Stiffness, Heart Rate Variability, and Sleep Quality. PLOS One. 2019;14(12):1–9
16. Rangkuti F. Marketing Research. Jakarta: Gramedia Pustaka Utama; 2007
17. Robbins G, Powers D, Burgess S. A Wellness Way of Life. New York: The McGraw-Hill; 2011
18. Winarsunu T. Psychology of Occupational Safety. Malang: UMM Press; 2008
19. Mulfiyanti D, Muis M, Rivai F. The Relationship between Work Stress and Workload with Work Fatigue in Nurses at Tenriawaru Class B Hospital, Bone Regency in 2018. MKMI. 2019;4(1)
20. Widyastuti AD. Relationship between Work Stress and Work Fatigue in Workers in the Box Truck Construction Workshop Area. Indones J Occup Saf Heal. 2018;6(2):216
21. Katilahe MO, Arthur P, Kawatu T, Pinontoan OR, Kesehatan F, Universitas M, et al. The Relationship between Workload and Stress with Feelings of Work Fatigue in Maritime Transport Workers. J Public Heal Community Med. 2020;1(April):16–20
22. Prakoso D, Setyaningsih Y, Kurniawan B. Relationship between Individual Characteristics, Workload, and Sleep Quality with Work Fatigue in Educational Personnel at Educational Institution X. J Public Health. 2018;6(2):88–93.
23. 23. Rambulangi CJ. The Relationship between Workload and Work Fatigue of Employees of the Samarida Level II National Defense Agency. Psikoborneo. 2016;4(2)
24. 24. Suma'mur. Corporate Hygiene and Work Safety. Jakarta: CV Sagung Seto; 2009
25. 25. Prastuti TN, Martiana T. Analysis of Individual Characteristics with Work Fatigue Complaints on Taxi Drivers in Rungkut Surabaya. Indones J Public Heal. 2017;12(1):64
26. 26. Pelders J, Nelson G. Contributors to Fatigue of Mine Workers in the South African Gold and Platinum Sector. Saf Health Work [Internet]. 2019;10(2):188–95. Available from: https://doi.org/10.1016/j.shaw.2018.12.002
27. Banks S, Landon LB, Dorrian J, Waggoner LB, Centofanti SA, Roma PG, et al. Effects of Fatigue on Teams and Their Roles in 24/7 Operations. Sleep Med Rev. 2019;48:101216