Research Article

Work Stressors Before and During COVID-19 Pandemic and Factors Related to Workers in the Heavy Equipment Manufacturing Industry of PT.X

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Abstract

Psychosocial hazards are a major public health problem, so it is necessary to prevent and manage them so as not to cause mental and physical harm to workers. This study aims to determine changes in work stressors before and during the COVID-19 pandemic and related factors to workers in the PT.X Heavy equipment manufacturing industry. The study used a retrospective cohort design from 2018 and 2021 Medical Check-Up (MCU) data with a Stress Diagnosis Survey (SDS) questionnaire. Research was conducted from October 2021 until July 2022 with samples of 146 obtained. Bivariate analysis using proportion and mean test. The research found that the increase in moderate-severe stressors before and during the pandemic was role ambiguity, role conflict, quantitative workload, and career development. On the other hand, qualitative workloads and responsibility for others decreased during the pandemic. The most worsened was role ambiguity and responsibility for others. Based on the type of production and non-production work, there was a significant relationship to quantitative workload before the pandemic (p=0.043), and not significant during the pandemic. Furthermore, there is a significant relationship with qualitative workload during the pandemic (p = 0.043), and it was not significant before the pandemic. It can be concluded that the Pandemic conditions caused an increase and decrease in work stressors analysed in workers in the heavy equipment manufacturing industry.

Keywords: *COVID-19, manufacturing, Pandemic, work stressors, Stress Diagnosis Survey (SDS).*

Stresor Kerja Sebelum dan Selama Pandemi COVID-19 dan Faktor-faktor yang Berhubungan pada Pekerja di Industri Manufaktur Alat Berat PT.X

Abstrak

Bahaya psikososial merupakan masalah kesehatan masyarakat yang utama sehingga perlu dilakukan pencegahan dan pengelolaan agar tidak menyebabkan kerugian mental dan fisik pada pekerja. Penelitian ini bertujuan untuk mengetahui perubahan stresor kerja sebelum dan selama pandemi COVID-19 dan faktor-faktor yang berhubungan pada pekerja industri manufaktur alat berat PT.X. Penelitian menggunakan desain cohort retrospective dari data Medical Check Up (MCU) pekerja tahun 2018 dan 2021 yang mempunyai kuesioner Survei Diagnosis Stres (SDS). Penelitian berlangsung dari bulan Oktober 2021 s.d Juli 2022 di PT.X dengan sampel sebanyak 146 orang. Analisis bivariat menggunakan uji proporsi, dan rerata. Dari analisis didapatkan peningkatan stresor sedang-berat sebelum dan selama pandemi pada ketaksaan peran, konflik peran, beban kerja kuantitatif, dan perkembangan karir, sebaliknya, untuk beban kerja kualitatif, dan tanggung jawab terhadap orang lain mengalami penurunan selama pandemi. Perburukan paling banyak adalah ketaksaan peran, dan tanggung jawab terhadap orang lain. Berdasarkan jenis pekerjaan produksi dan bukan produksi, terdapat hubungan yang signifikan pada stresor beban kerja kuantitatif sebelum pandemi (p=0,043), dan tidak signifikan selama pandemi. Selanjutnya, terdapat hubungan signifikan dengan beban kerja kualitatif selama pandemi (p= 0,043), dan tidak signifikan sebelum pandemi. Sehingga dapat disimpulkan bahwa kondisi Pandemi menyebabkan terjadinya peningkatan dan penurunan stresor kerja yang dianalisis pada pekerja di industri manufaktur alat berat.

Kata kunci: *COVID-19, manufaktur, pandemi, stresor kerja, Survei Diagnosis Stres (SDS).*

Introduction

In industrialized countries, it has been known that the risk of psychosocial harm is a major public health problem. Prevention and management of psychosocial hazards have become important and are on the agenda in making a policy.[1] Work stressors have different forms depending on the characteristics of the workplace. They are unique to an organization or industry.[2] Stress can lead to reduced performance, late arrival or absence at work, increased worker exchanges, work insecurity, and workplace accidents.[3]

According to *the National Institute for Occupational Safety and Health* (NIOSH), work stress is a dangerous physical and emotional response that occurs when job requirements do not match workers' abilities, resources, or needs.[1] According to Sutarto, stress can come from work and outside of work. Occupational factors include work-related factors, participation opportunities, responsibilities, and organizational factors. Aspects outside of work includes changes in life structure, social support, locus of control, personality type, self-esteem, flexibility/rigidity, and ability.[4]

On March 11th 2020, WHO announced that COVID-19 was a pandemic. This condition affects many areas, including family, education, and work. Research conducted in the US in 2020 found that the average stress level of adults associated with the COVID-19 pandemic was 5.9 (on a scale of 10). For stress in general, the average stress level is higher during the pandemic, which is 5.4 compared to 4.9 in 2019.[5] Research to determine the impact of COVID-19 on the industry in Japan in 2022 found that manufacturing companies are in the third position affected after goods sales companies (wholesale/retail) and accommodation companies.[6]

Some workplace designs have characteristics that can accelerate the spread of SARS-CoV-2. In manufacturing workers, the occupational risks associated with the COVID-19 pandemic are working in large numbers in one workspace, inadequate ventilation, working closely, and social contact with colleagues or superiors. This condition makes companies need to proactively adapt to reduce the spread of the SARS-CoV-2 virus and also need to maintain the health and welfare of workers.[7,11] To reduce the spread of the disease, temporary workplace closures were carried out, restrictions on the number of workers in one room, working hours became shorter, and even terminations occurred. [8]

Based on the Circular Letter Ministry of Industry Republic of Indonesia Number 5 of 2021, companies are required to implement COVID-19 health protocols in their environment. This is including forming a COVID-19 task force, compiling guidelines for arrangements for entering and leaving work, changing shifts, rest, worship activities, eating, and other activities that can cause crowds in the factory / company environment, and making efforts to prevent and handle the spread of COVID-19 in the environment company. [9]

The main sources of stressors of individuals during the pandemic are threatened perceptions of health and risk of contracting, difficulty filtering out correct information, the presence of quarantine and social distancing, stigma and social exclusion, economic problems and job insecurity. [8] PT. X formed the COVID-19 Response Task Force Team, consisting of information, operational, and medical centers. This team played an important role in the fight against the COVID-19 pandemic in the company.

Assessment of psychosocial stressors in the form of self-reported questionnaires, containing questions about the presence of risk factors in the work environment. This form is widely used because it is affordable and easy to analyze. The limitation of the self-reported questionnaire is that the answers given are subjective, representing the perception of individual work stress.[10]

PT. X is a company engaged in the mining, quarrying, and construction machinery manufacturing industry. Workers comprise a heterogeneous workforce including the production (blue-collar workers) and non-production work sector (white-collar workers).[11] Different types of work cause sources of stress between the two groups are also different. From health data, it was obtained that there was a decrease in work accidents in 2021 compared to 2018 due to the COVID-19 pandemic. The company also assessed workers stressors using the SDS questionnaire in 2018,2020,2021 and obtained the most results in the moderate category. Research on work stressors before and during the pandemic has not existed before, so it is interesting to conduct research on stressors before and during the COVID-19 pandemic.

The aim of research is to know description and changes in work stressors before (2018) and during (2021) the COVID-19 pandemic and factors related to work stress during the pandemic (2021) for workers in the heavy equipment manufacturing industry. Factor related consist of work factors (work section, length of work, and overtime duration) and individual factors (marital status, and level of education).

Methods

The design of the study used the retrospective cohort method. The data used comes from the Medical Check Up (MCU) workers who has a Stress Diagnosis Survey (SDS) questionnaire in the period from March to May 2018 and the period from May to June 2021. The study population is workers in PT. X in 2018 to 2021. All workers who meet the inclusion and exclusion criteria are included in the study. The total sample was 146 workers. The inclusion criteria are workers who have done the MCU and have the results of the SDS questionnaire in 2018 and 2021. Exclusion criteria are workers who are different/change departments from 2018 to 2021 and do not have subordinates/members.

The Stress Diagnosis Survey (SDS) is a questionnaire consisting of 30 questions assessed on a 7-point scale Likert. It measured six dimensions of individual-level stressors consist of role ambiguity, role conflict, quantitative workload, qualitative workload, career development, and responsibility towards others. Score 1 describes a condition that does not cause stress, 2 is rare, 3 is seldom, 4 is sometimes, 5 is often, 6 is usually, and 7 is working conditions that are always a source of stress. Role ambiguity was assessed by adding up respondents' scores for item numbers: 1, 7, 13, 19, and 25. Role conflict was assessed by adding up item numbers: 2, 8, 14, 20, and 26. Quantitative overload was assessed by adding up item numbers: 3, 9, 15, 21, and 27. The qualitative workload was assessed by adding up the item numbers: 4, 10, 16, 22, and 28. Career development was assessed by adding up the item numbers: 5, 11, 17, 23, and 29. Responsibility for people was assessed by adding up the item numbers: 6, 12, 18, 24, and 30. From all these sections, the subtotals are summed to obtain a total stress score and can be classified as low stress, moderate stress, or severe stress according to the total score of each stressor. For low stress, the score is less than 10; for moderate stress is between 10 and 24; and for severe stress, the score is greater than 24.[10]

Processing and analysis of data using SPSS software. Univariate analysis is used to assess and determine worker characteristics, descriptions, and changes in work stressors before and during COVID-19 pandemic. Bivariate analysis, the proportion using Chi square or Fisher with a significance (p) used is ≤ 0.05. This research has received approval from the ethics committee (KET 695/UN2.F1/ETIK/PPM.00.02/2022) Faculty of Medicine, University of Indonesia-RSUPN Dr. Cipto Mangunkusoumo.

Table 1. Overview of Work Stressors Before (2018) and During (2021) COVID-19

Work Stressors	2018		2021	
	n%	CI (95%)	n%	CI (95%)
Role Ambiguity				
Low	31 (21)	(14.4-28.1)	22 (15.1)	(8.9-21.2)
Moderate	114 (78.1)	(71.2-84.9)	119 (81.5)	(75.3-88.4)
Severe	1 (7)	(0.0-2.1)	5 (3.4)	(0.7-6.8)
Role Conflicts				
Low	20 (13.7)	(8.2-19.9)	19 (13.0)	(8.2-19.2)
Moderate	122 (83.6)	(77.4-89.0)	120 (82.2)	(75.4-88.3)
Severe	4 (2.7)	(0.7-5.5)	7 (4.8)	(2.1-8.2)
Quantitative Workloads				
Low	24 (16.4)	(10.3-23.3)	21 (14.4)	(8.9-20.5)
Moderate	117 (80.1)	(73.3-86.3)	115 (78.8)	(71.9-85.6)
Severe	5 (3.4)	(0.7-6.8)	10(6.8)	(2.7-11.0)
Qualitative Workloads				
Low	19 (13)	(8.2-19.2)	24 (16.4)	(10.3-23.3)
Moderate	115 (78.8)	(71.2-85.6)	115 (78.8)	(71.2-85.6)
Severe	12 (8.2)	(4.1-13.0)	7 (4.8)	(1.4-8.9)
Career Development				
Low	36 (24.7)	(17.8-32.2)	33 (22.6)	(15.8-29.5)
Moderate	109 (74.7)	(67.1-82.2)	111 (76.0)	(68.5-83.5)
Severe	1 (0.7)	(0.0-2.7)	2 (1.4)	(0.0-3.4)
Responsibility towards others				
Low	27 (18.50)	(12.3-25.3)	34 (23.3)	(15.8-30.1)
Moderate	108 (74)	(66.4-80.8)	106 (72.6)	(65.1-80.1)
Severe	11 (7.50)	(3.4-12.3)	6 (4.1)	(1.4-7.5)

Results

In Table 1, there are different stressors before and during the COVID-19 pandemic in PT. X. Role ambiguity, moderate stressors increased to 81.5%. Role conflicts, severe stressors increased to 4.8%. Quantitative workload, severe stressors increased to 6.8%. Qualitative workload, mild stressors increased to 16.4%. Career development, moderate stressors increased to 76%, and severe stressors increased to 1.4%. Responsibility towards others, mild stressors increased to 23.3%.

In Table 1, there was an increase and decrease in the number of stressor levels before and during the COVID-19 pandemic. Moderate and severe work stressors categories have increased before and during pandemic were role ambiguity (moderate from 78.1% to 81.5%), role conflict (severe from 2.7% to 7%), quantitative workload (severe from 3.4 to 6.8%), and career development (moderate from 74.7% to 76%; severe from 0.7% to 2%).

Table 2. Changes in Work Stressors (Increased, Settled, Worsened) Before and During the COVID-19

Work Stressors	n	%	CI (95%)
Role Ambiguity			
Increased	14	9.6	5.5-14.4
Settled	110	75.3	67.8-82.2
Worsened	22	15.1	9.6-21.2
Role Conflicts			
Increased	15	10.3	5.5-15.8
Settled	112	76.7	69.2-83.6
Worsened	19	13	8.2-18.5
Quantitative Workloads			
Increased	14	9.6	4.8-14.4
Settled	111	76	69.2-82.9
Worsened	21	14.4	8.9-19.9
Qualitative Workloads			
Increased	22	15.1	9.6-21.2
Settled	112	76.7	69.9-83.6
Worsened	12	8.2	4.1-13.0
Career Development			
Increased	26	17.8	11.6-24.7
Settled	99	67.8	60.3-75.3
Worsened	21	14.4	8.9-20.5
Responsibility towards others			
Increased	33	22.6	15.8-29.5
Settled	96	65.8	57.6-73.3
Worsened	17	11.6	6.8-17.1

In Table 2 there are six types of work stressors increased, settled, or worsened before and during the COVID-19 pandemic. A total of 15.1% of stressors worsened on changes in role ambiguity, 13% of stressors worsened on changes in role conflicts, 14.4% of stressors worsened on changes in quantitative workload, 8.2% of stressors worsened on changes in qualitative workload, 14.4% of stressors worsened on changes in career development, and 11.6% of stressors worsened on changes in responsibility towards others.

In Table 3, an analysis of the relationship between the type of work and work stressors before and during the COVID-19 pandemic was carried out. There were significant results in quantitative workload before the pandemic (p=0.043). The production part experienced a moderate-severe increase in stressors before and during the pandemic, from 81.1% to 83.5%, while non-production remained 100%. Significant results were also found in qualitative workloads during the pandemic (p=0.043). The production part experienced a moderate-severe stressor decline before and during the pandemic, from 85% to 81.1%, while non-production remained 100%.

Table 3. Analysis of the Relationship between Work Section and Work Stressors Before (2018) and During (2021) COVID-19

Work Stressors	2018		2021	
	Low n (%)	Moderate-Severe n (%)	Low n (%)	Moderate-Severe n (%)
Role ambiguity				
Production	30 (23.6)	97 (76.4)	22 (17.3)	105 (82.7)
Not production	1 (5.3)	18 (94.7)	0 (0)	19 (100)
RR (CI 95%)	4.48 (0.64-31.01)		N/A	
p-value	0.077[a]		0.078[a]	
Role conflicts				
Production	19 (15)	108 (85)	19 (15)	108 (85)
Not production	1 (5.3)	18 (94.7)	0 (0)	19 (100)
RR (CI 95%)	2.84 (0.40-20.02)		N/A	
p-value	0.472[a]		0.135[a]	
Quantitative workloads				
Production	24 (18.9)	103 (81.1)	21 (16.5)	106 (83.5)
Not production	0 (0)	19 (100)	0 (0)	19 (100)
RR (CI 95%)	N/A		N/A	
p-value	0.043[a]		0.076[a]	
Qualitative workloads				
Production	19 (15)	108 (85)	24 (18.9)	103 (81.1)
Not production	0 (0)	19 (100)	0 (0)	19 (100)
RR (CI 95%)	N/A		N/A	
p value	0.135[a]		0.043[a]	
Career development				
Production	34 (26.8)	93 (73.2)	31 (24.4)	96 (75.6)
Not production	2 (10.5)	17 (89.5)	2 (10.5)	17 (89. 5)
RR (CI 95%)	2.54 (0.66-9.73)		2.31 (0.60-8.91)	
p-value	0.160[a]		0.245[a]	
Responsibility toward others				
Production	24 (18.9)	103 (81.1)	33 (26)	94 (74)
Not production	3 (15.8)	16 (84.2)	1 (5.3)	18 (94.7)
RR (CI 95%)	1.19 (0.39-3.59)		4.93 (0.71-34.01)	
p-value	1.000[a]		0.076[a]	

Fisher Test

Table 4. Analysis of the Relationship between Length of Work with Work Stressors During (2021) COVID-19 Pandemic

Work Stressors	Length of Work	p-value
Role Ambiguity		
Low	24.64 (9.09-32.95)	0.033[b]
Moderate-Severe	14.11 (7.01-30.9)	
Role Conflicts		
Low	21.52 (9.09-32.95)	0.114[b]
Moderate-Severe	14.34 (7.01-30.9)	
Quantitative Workloads		
Low	24.94 (9.09-32.95)	0.028[b]
Moderate-Severe	14.15 (7.01-30.9)	
Qualitative Workloads		
Low	24.64 (9.09-32.95)	0.031[b]
Moderate-Severe	14.11 (7.01-30.9)	
Career Development		
Low	17.27 (7.01-32.95)	0.082[b]
Moderate-Severe	13.89 (7.69-30.9)	
Responsibility towards others		
Low	16.27 (8.28-32.95)	0.219[b]
Moderate-Severe	14.11 (7.01-30.9)	

Table 5 Analysis of the Relationship between Overtime Duration, Married Status, and Education Level with Work Stressors During (2021) COVID-19

Work Stressors	Overtime Duration		p-value RR (CI 95%)	Married Status		p-value RR (CI 95%)	Education Level		p-value RR (CI 95%)
	<40 hours/ month n (%)	>40 hours/ month n (%)		Married n (%)	Unmarried n		High School/ STM n (%)	Diploma-Bachelor's Degree n (%)	
Role ambiguity									
Low	4 (7.7)	18 (19.1)	0.090[a]	22 (15.5)	0	1.000[a]	20 (19.8)	2 (4.4)	0.017[c]
Moderate-Severe	48 (92.3)	76 (80.9)	2.48 (0.89-6.96)	120(84.5)	4	N/A	81 (80.2)	43 (95.6)	4.45 (1.08-18.25)
Role conflicts									
Low	5 (9.6)	14 (14.9)	0.447[a]	18 (12.7)	1	0.432[a]	16 (15.8)	3 (6.7)	0.128[c]
Moderate-Severe	47 (90.4)	80 (85.1)	1.54 (0.59-4.05)	124 (87.3)	3	1.97 (0.342-11.36)	85 (84.2)	42 (93.3)	2.37 (0.72-7.74)
Quantitative workloads									
Low	3 (5.8)	18 (19.1)	0.028[a]	21 (14.8%)	0	1.000[a]	20 (19.8)	1 (2.2)	0.005[c]
Moderate-Severe	49 (94.2)	76 (80.9)	3.31 (1.02-10.74)	121 (14.8%)	4	N/A	81 (80.2)	44 (97.8)	8.91 (1.23-64.37)
Qualitative workloads									
Low	4 (7.7)	20 (21.3)	0.037[a]	24 (16.9)	0	1.000[a]	22 (21.8)	2 (4.4)	0.009[c]
Moderate-Severe	48 (92.3)	74 (78. 7)	2.76 (0.99-7.66)	118 (83.1)	4	N/A	79 (78.2)	43 (95.6)	4.90 (1.20-19.95)
Career development									
Low	9 (17.3)	24 (25.5)	0.305[a]	32 (22.5)	1	1.000[a]	28 (27.7)	5 (11.1)	0.027[c]
Moderate-Severe	43 (82.7)	70 (74.5)	1.47 (0.7-2.93)	110 (77.5)	3	1.10 (0.19-6.22)	73 (72.3)	40 (88.9)	2.49 (1.03-6.04)
Responsibility towards others									
Low	5 (9.6)	29 (30.9)	0.004[a]	33 (23.2)	1	1.000[a]	29 (28.7)	5 (11.2)	0.020[c]
Moderate-Severe	47 (90.4)	65 (69.1)	3.20 (1.32-7.78)	109 (76.8)	3	1.07(0.19-6.02)	72(71.3)	40 (88.8)	2.58 (1.07-6.24)

(a)Fisher Test (b) Test Man Whitney (c) Chi square

In Table 4, a mean test was carried out to assess the relationship between work period and work stressors during the COVID-19 pandemic. Role ambiguity (p=0.033), quantitative workload (p=0.028), and qualitative workload (p=0.031) had a significant relationship with length of work.

In Table 5, there was analysis between overtime duration, married status, and education level with work stressors during (2021) COVID-19. In overtime duration there was significant results for quantitative workload stressor, overtime duration ≥40 hours/ month 3.3 times at risk of experiencing moderate to severe stress (p=0.028); qualitative workload stressor, overtime duration ≥40 hours/month has 2.7 times at risk of experiencing moderate to severe stress (p=0.037); responsibility to others stressor, overtime duration ≥40 hours/month is at risk of 3.2 times at risk of experiencing moderate to severe stress (p=0.004). In married status, there was not significant relationship with six types of work stressors. In education level, the risk of experiencing role ambiguity stressor was 4.4 times (p=0.017), quantitative workload was 8.9 times (p=0.005), qualitative workload was 4.9 times (p=0.009), career development was 2.4 times (p=0.027), and responsibility to others was 2.5 times (p=0.020).

Discussion

During the pandemic, there was a decrease in the amount of production due to the decrease in demand for goods and restrictions in the workplace as a direct impact of the government's policy to stop the spread of COVID-19 in the workplace. Changes during the pandemic include changing work patterns to *Work Form Home* (WFH) for administrative workers, increasing the number of *shift* groups from two to three groups of production workers so that working hours become shorter, and conducting initial screenings for all workers when entering the factory area and changing work schedules.

The changes that occur can be a source of stress that can be responded to negatively or positively by workers. If the worker responds negatively, it can cause reduced performance, physiological, psychological, or behavioral problems, on the contrary, if responded positively, it can provide enthusiasm and motivation for the worker.[3] This is in accordance with the *Transaction Process* model by Lazarus where workers will make adjustments between abilities and environmental demands, assess the situation that is the source of stress and then react to overcome the stress. If the worker does not have the ability to respond appropriately to a threatening situation then it will become a source of stress.[12]

Changes during the pandemic were responded by PT. X with the formation of the COVID-19 Response Task Force Team. The task force consists of information, operational, and medical centers where each team already has a clear main task. This team have an important role in the company's success in dealing with the COVID-19 pandemic so that the impact of the pandemic did not have much effect on workers.

There were changes in work stressors before and during the COVID-19 pandemic. In role ambiguities, there were 15.1% whose stressors worsened. During the pandemic, there are new rules and policies regarding the control of infectious diseases in the workplace, one of which is by changing work patterns by working remotely on non-production/ administrative workers, and changes in the number of work shifts in production workers. Research conducted by Deguchi et al, (2020) found that what can be done to reduce role uncertainty during a pandemic is to clarify the work and prospects of the company in good or bad conditions, maintain human resources so that workload due to work variations is reduced, and build good communication and social relationships between colleagues to reduce stress.[13]

In role conflicts, there were 13% whose stressors worsened. During the pandemic, there was social distancing so that workers did their jobs remotely. This social restriction causes communication difficulties because it is carried out using virtual media especially for workers who work remotely (work from home) Research on the effectiveness of leaders during the COVID-19 pandemic, the leader must be able to clearly convey the things that guide the work, understand and have open discussions about company expectations, clearly convey the goals or targets to be achieved, and explain how to achieve targets.[14]

In quantitative workloads, there were 14.4% whose stressors worsened. Before the pandemic workers would work without having to bring their work home, and while at home they instigated quality time with family. After the pandemic, workers who can do their work remotely (office/ administrative workers) will work from home. This condition causes workers adapt to different workspaces or work schedules, there is no firm limit between doing office work and homework, so it is possible to work from home for a longer time than working in the office for 8 hours /day.[15]

In qualitative workloads, there were 8.2% whose stressors worsened. During the pandemic,

workers adapted by using different technologies and working mechanisms. Research conducted by Ingusci, et al[16] on workload, mastery of technology, and the impact of stress on behavior during COVID-19 found that job demands (workload and mastery of technology) can increase motivation in positive directions such as job satisfaction, increased job performance, and attachment to work. Conversely, when demands exceed resources, it has a negative impact.[16]

In career development, there were 14.4% whose stressors worsened. Research conducted by Hamouche et al[8] found that the COVID-19 pandemic significantly increased feelings of insecurity to workers and became a source of stress. This is because manufacturing workers are at high risk of facing layoffs (Termination of Employment) and have difficulty finding new jobs due to social restrictions because they can only stay at home.[8]

In responsibility to others, there were 11.6% whose stressors worsened. During the pandemic, managers, supervisors, and other leaders should work with other sections and health institutions to create safety and health programs or policies that can prevent the risk of transmission and spread of the coronavirus in the workplace.[8] Leaders must be able to identify the actions and measures necessary for workers to feel safe, informed, engaged, and productive, being able to explain to all workers that management is committed to actively helping workers and protecting physical and mental health.[8]

The relationship between work types and work stressors before and during the COVID-19 pandemic also have a significant result. Based on the study, work types had a significant relationship with quantitative workload before the pandemic, although during the pandemic it was not significant. Before the pandemic, the stressors of production workers were more due to working by operating large machines and doing their work in accordance with operational standards,[15] were exposed to hazardous work environments such as noise, hot temperatures, dust, hazardous chemicals, and long working hours.[17]

In non-production workers, work stressors come from repetitive work, sitting for long periods of time, working in front of a monitor, poor workplace design, bullying or sexual harassment, unclear tasks and responsibilities, changing work expectations, and serving difficult customers.[2] There was a difference in significance between stressors before and during the pandemic due to new rules and policies related to handling the pandemic in the workplace, including routine health checks for workers who have just entered work, where production workers will experience more frequent inspections due to shift changes.

Based on the study, work types had a significant relationship with qualitative workload during the pandemic and was not significant before the pandemic. The COVID-19 pandemic caused large-scale restrictions on activities, resulting in a decrease in demand for goods and production. In the production department, there was a change in work schedule when 25% of operations follow health protocols, namely three working groups divided into two shifts for five working days. The division changed back when 50% of operations followed health protocols, namely two working groups divided into two shifts for five working days. The impact of this change was decreasing the number of work accidents down compared to before the pandemic, two work accidents in 2021, compared to six work accidents in 2018.

The non-production part was enforced the rules of working from home in accordance with government regulations, ranging from 50% to 75% of the number of administrative workers carried out on a *rolling* basis. This condition if not controlled can make workers do work from home for up to 24 hours/day. In addition to the negative effects, working from home can have a positive effect, namely reducing commuting time to work, having control and autonomy over work, having a better work-life balance of increased participation in the community, and flexible working hours.[7]

Research conducted by Ipsen et al[18] regarding the experience of working from home during the pandemic in workers in Denmark and Germany between March and May 2020 found that 71% of respondents felt that they could already face the changing work situation from working from home.[18] On the contrary, a study conducted by Ince et al[19] that compared conditions before and during the COVID-19 pandemic in workers in Turkey found that the pandemic was a source of stress and had an impact on workers, namely a decrease in performance compared to before COVID-19.[19]

According to the International Labor Organization (ILO), hazard identification and risk assessment in the workplace must first be carried out before making modifications or introductions to new work methods. Some things that company and workers can do to reduce stressors due to workload, and working conditions is to assess the workload and work tasks. It is necessary to ensure that workers

receive the appropriate amount of work, considering the capacity and specific situation of workers. This is because productivity during the pandemic has not been in normal conditions so that workers adjust to new work arrangements and methods.[20]

Length of work had significant relationship between work period and role ambiguity, quantitative workload, and qualitative workload, during the COVID-19 pandemic. Based on previous research, working period has a negative and positive relationship with stress. Workers with less experience experience experience more stress compared to workers with longer working periods.[21] This is because workers with less work often have high expectations when working in companies as a result of which difficult adjustments are made. Conversely, workers with long periods of service can experience burnout at work.[17]

Overtime duration had significant relationship with quantitative workload, qualitative workload, and responsibility to others during the COVID-19 pandemic. Research by Hino[22] found that workers with lower overtime work hours had fewer stress-related complaints. This is because workers who have long working hours will experience poor quality and quantity of sleep, fatigue, and disruption of social activities.[22] In line with this, according to the ILO long working hours are an important psychosocial risk during the COVID-19 pandemic and impact workers due to experiencing longer exposure to sources of infection in the workplace.[23]

Level of education had significant relationship with role ambiguity, quantitative workload, qualitative workload, career development, and responsibility to others during the pandemic. Workers who have higher education have better cognitive skills and can help deal with existing problems.[8] Education acts as a mediator, it can increase or reduce stress depending on the individual's perspective. Worker with higher education can reduce stress and overcome problems, but with the increase in the position of workers, stress levels also increase.[21]

Different from three previous variables, there was no relationship between marital status and six types of work stressors. This is different from Hart and Mitte who stated that during the large-scale social restrictions caused by the COVID-19 pandemic, the conflict of roles in married workers is increasingly felt because all social roles become one so that it is more difficult to perform different roles such as taking care of the household and at the same time being the breadwinner. Role conflicts will be evident in women because women are socially expected to take care of the household, rather than doing payable work.[24]

Conclusion

During the pandemic there has been a moderate-heavy increase in role ambiguity, role conflicts, quantitative workload, and career development. The stressors that experience the most aggravation are role ambiguity, and career development. In production and non-production, there was a significant relationship with quantitative workload before the pandemic, although during the pandemic it was not significant, and there was a significant relationship with qualitative workload during the pandemic, and not significantly before the pandemic.

Length of work had significant relationship with role ambiguity, quantitative workload, and qualitative workload during the pandemic. In overtime duration, there was a significant relationship with quantitative workload, qualitative workload, and responsibility towards others during the pandemic. At the educational level, there was a significant relationship with role ambiguity, quantitative workloads, qualitative workloads, career development, and responsibility to others during the pandemic. In addition, marital status, there is no relationship with six types of work stressors during the pandemic.

It is recommended to the company to carry out evaluations and improvements, especially on the roles ambiguity and responsibilities towards others. In workers, screening should be carried out to determine the impact of psychological disorders, especially on workers with moderate-severe stressors. In addition, companies need to be aware that the source of stressors can come from organizational, occupational, and individual factors. Workers are advised to evaluate stressors at work and from individuals themselves, follow stress management policies and programs at work, and consult if they feel complaints related to stress appear so that management can be carried out earlier.

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