

Association of Shift Working with Mental Emotional Disorder in Oil and Gas Workers with Cardiovascular Risk: A Cross-Sectional Study

Chandra Halim^{1*}, Dewi S.Soemarmo², Ade Mutiara², Nuri P. Adi², Marsen Isbayuputra²

¹Occupational Medicine Master Study Program, Faculty of Medicine, Universitas Indonesia

²Department of Community Medicine, Faculty of Medicine, Universitas Indonesia

*Corresponding author: Chandra Halim

E-mail: chandrahalim385@gmail.com

Abstract

Background: Offshore oil and gas workers face long shifts, unhealthy diets, and low activity, leading to a high cardiovascular disease burden. These workers were also reported to have high rates of anxiety and mental distress. Understanding the association between these health challenges will help develop better wellness initiatives and improved emergency mitigation plans.

Objective: This study aimed to investigate the association of cardiovascular risks and occupational factors with the prevalence of mental emotional disorder among workers in an offshore oil and gas company.

Method: This analytical observational cross-sectional study was conducted in an offshore oil and gas population, using two secondary data sources. Cardiovascular risks were measured using 2025 annual health checkup results, while the MED (mental emotional disorder) was screened using the Indonesian-validated SRQ-20.

Result: Among 126 subjects, 16.7% experienced mental emotional disorder symptoms, and 73% had abnormal blood pressure. However, none of the cardiovascular risks were significantly associated with mental emotional disorder. On the contrary, shift work was found to be the determinant factor associated with mental emotional disorder in this study ($p = 0.007$, $aOR = 0.17$)

Conclusion: Non-shift work is a significant independent factor associated with MED. This highlights that psychosocial factors play an essential role in workers' well-being.

Keywords: mental emotional disorder, shift work, cardiovascular risk, offshore worker, oil and gas

Abstrak

Latar Belakang: Pekerja migas lepas pantai rentan terkena penyakit jantung akibat jam kerja panjang, pola makan buruk, serta kurangnya aktivitas fisik. Mereka juga dilaporkan memiliki angka gangguan mental yang tinggi. Memahami hubungan kedua masalah ini penting untuk menyusun program kesejahteraan dan rencana mitigasi darurat yang lebih baik.

Tujuan: Penelitian ini bertujuan untuk mengkaji hubungan antara risiko kardiovaskular dan faktor pekerjaan dengan prevalensi gangguan mental emosional (GME) pada pekerja di perusahaan minyak dan gas lepas pantai.

Metode: Penelitian observasional analitik dengan desain cross-sectional ini dilakukan pada populasi pekerja minyak dan gas lepas pantai menggunakan dua sumber data sekunder. Risiko kardiovaskular diukur berdasarkan hasil pemeriksaan kesehatan tahunan, sedangkan GME diperoleh melalui instrumen SRQ-20 yang telah divalidasi dalam bahasa Indonesia.

Hasil: Dari 126 subjek, 16,7% mengalami gejala gangguan mental emosional dan 73% memiliki tekanan darah tidak normal. Namun, tidak ada satu pun risiko kardiovaskular tersebut yang berhubungan secara signifikan dengan GME. Sebaliknya, pekerjaan shift ditemukan sebagai faktor determinan yang berhubungan dengan gangguan mental emosional dalam penelitian ini ($p = 0,007$; $aOR = 0,17$).

Kesimpulan: Pekerjaan non-shift merupakan faktor independen yang signifikan terkait dengan GME. Hal ini menunjukkan bahwa faktor psikososial memainkan peran penting dalam kesejahteraan pekerja.

Kata Kunci: gangguan mental emosional, kerja shift, risiko kardiovaskular, pekerja lepas pantai, minyak dan gas

Introduction

Offshore work at an oil and gas company is well known not only for long working hours, continuous shift work, exposure to noise, heat, and chemicals, but also a limited workplace space and shared bedrooms that make their rest time suboptimal. Furthermore, the meals on offshore work are high in calories, high in salt, and saturated fat, with low fiber, and unhealthy habits of the worker, such as low levels of physical activity and low quality of sleep. All of these factors are well known to contribute to cardiovascular disease.

According to the IHME (Institute for Health Metrics and Evaluation) report, 28.3% of deaths in Indonesia in 2019 were due to heart disease, and there was an increase of 1% in cardiovascular cases from 2013 to 2018 in Indonesia.¹ The company of the studied subject in this research is an oil and gas company located in the Strait of Makassar. The operation runs 24 hours a day, continuously with a rotating work system, with two shifts of work. In 2025 checkup results, there were several notable findings, 8% with abnormal fasting blood glucose, 20% with abnormal blood pressure, and 12% obese in a total of 146 workers.

In the NIOSH database, 470 fatalities were recorded during 2014-2019, and about 14.7% were accountable for cardiac arrest events.² Fatalities due to cardiac events are challenging to record due to their work-related chronic illness. It needs to be determined if the illness was work-related due to latent exposure, such as hydrocarbon gases or vapors, or due to lifestyle factors. Thus, it is necessary to anticipate the biomarkers of metabolic abnormality that affect cardiovascular health.

In Parkes' study, anxiety was found to be significantly higher in the offshore worker than the non-offshore blue-collar worker.³ Mental emotional disorders are affected by many factors and pathways. One of the pathways is through the increase of cortisol,⁴ which is stimulated by the HPA (hypothalamic-pituitary-adrenal) axis in stressful conditions. Many studies also showed that the low activity of serotonin or the highly activated adrenergic system, such as chronically elevated blood pressure found in hypertensive individuals, is responsible for the development of anxiety symptoms.^{5,6} The increased secretion of IL-6 and IL-8 due to inflammation, found in individuals with abnormal blood glucose regulation or in obese people due to high leptin production,^{7,8} also affects the synthesis of

serotonin, dopamine, and norepinephrine. While the oxidative process limited the availability of monoamine in this chronic metabolic disorder.⁹ Cigarette smoking habits give nicotine withdrawal syndrome, where the nAChR (nicotine-acetylcholine) receptor is desensitized, causing dysregulation of neurotransmitters like norepinephrine and Acetylcholine.¹⁰ Free radicals, as the side products of smoking, also contribute to the oxidative stress process.¹¹

Biological age, as one of the crucial factors in cardiovascular disease, was also reported to influence mental health. Many longitudinal studies showed that in the middle-aged group (> 45 years old), there is a prevalence of deterioration in their mental health and well-being.¹²

Other psychosocial factors known to influence mental emotional disorders include individuals with lower job tenure.^{13,14} While occupational factors such as working schedule (shift or non-shift) also play an important role in defining mental emotional disorder.¹⁵ Circadian rhythm disturbance in night shift work causes a spike in cortisol hormone, and eventually affects the neurotransmitter regulation.

The study was initiated with the objective to examine the prevalence of mental emotional disorder in the company's offshore settings and their association with cardiovascular risks among the workers and their occupational characteristics. Both cardiovascular risks and mental emotional disorders are concerning chronic conditions that affect workers' quality of life, reduce their productivity, and cause incidents at the workplace. Therefore, this study may provide evidence and reference for improving an integrated cardiovascular and mental health program, including screening and emergency mitigation in the workplace.

Methods

This study had been approved by the Health Research Ethics Committee of the Faculty of Medicine at the University of Indonesia and Dr. Cipto Mangunkusumo National Hospital with the number: KET-1621 /UN2. F1/ETIK/PPM.00.02/2025

This study was conducted as a cross-sectional, analytical, observational study that took place in an offshore oil and gas company located in the Makassar Strait. This study used two secondary data sources, which were taken from the company's 2025 annual

health checkup results and the SRQ-20 questionnaire results in 2025.

Independent variable data in this study were modifiable cardiovascular risks based on the AHA (American Heart Association), which consisted of blood glucose, blood pressure, body mass index, smoking, blood cholesterol, and blood HDL. These data were collected from annual health checkup results from January to August 2025. The other independent variable data were occupational factors, such as shift work and job tenure. These data were collected from the company's human resources data file archives.

Independent variables such as fasting blood glucose, blood cholesterol, and blood HDL values were taken from blood sampling results reported by various KAN (Komite Akreditasi Nasional) certified medical laboratories where the workers performed their annual medical checkup. The laboratory equipment used a standardized method of chromatography and a reagent-enzymatic process to analyze these samples.

The standard value cutoffs used as references were various. In the Indonesian Society of Endocrinology classification, fasting blood glucose with a value ≥ 100 mg/dL or HbA1c $\geq 5,7\%$, is considered impaired blood glucose.¹⁶ In this study, the researcher considered prediabetes classification as an abnormal category. Furthermore, the cutoff for blood pressure value considered normal is < 120 mmHg for systolic or < 80 mmHg for diastolic. Blood pressure with a value ≥ 120 mmHg for systolic or ≥ 80 mmHg for diastolic is considered abnormal. This reference was taken from the Indonesian Society of Hypertension.¹⁷

According to the WHO classification, BMI (body mass index) with a value ≥ 25 is considered either overweight or obese, and value < 18.5 is considered underweight.¹⁸ Both of these classifications are considered abnormal in this study. Only those with a BMI value of 18.5 - 24.9 are considered normal. While cholesterol values that showed ≥ 200 mg/dL are classified as hypercholesterolemia, and HDL values that showed < 40 mg/dL are classified as less desirable.¹⁹ Both of these conditions are considered abnormal in this study.

The dependent variable of this study is mental emotional disorder (MED). According to the WHO, MED is a clinically significant impairment in cognitive functioning, emotional regulation, or behavior, where individuals are impacted in their understanding of their abilities, in stress coping, life productivity, and

contribution to society. The interpretation of MED was screened and collected using the validated Indonesian SRQ-20 questionnaire. SRQ-20 is a questionnaire developed by the WHO and other countries, which consists of 20 questions that screen for various symptoms of non-psychotic mental emotional disorders, such as anxiety, depression, psychosomatic, and reduced energy. Respondents were asked 20 questions with Yes or No options, according to their current mental health state. Every Yes answer would be scored as 1 and would be summarized. If the score was less than 6, it would be interpreted as no experience MED. And if the score was 6 or more, it would be interpreted as an experience of MED. In this study, the SRQ-20 questionnaire used was the Indonesian-validated version, distributed as online form to workers. The SRQ-20 data collection was performed in August and September 2025, followed immediately by respondents filling out the informed consent form.

The inclusion criteria in this study covered all data collected, without considering their working department. While the exclusion criteria were incomplete data, short-contract (under 4 months) workers, or non-regular workers. Sample size was calculated using the proportion comparison formula based on the other study about offshore workers with MED.¹⁴ The result achieved was 124 samples. Sampling was carried out with a consecutive sampling method.

Data were collected and recorded while ensuring medical confidentiality, and then organized according to research variables in the IBM SPSS version 25 program. Subsequently, univariate analysis was conducted to describe the characteristics of the subject. Categorical data like work department, smoking habits, shift working, and the presence of mental emotional disorder would be presented as n (number) and % (percentage).

Numerical data were subjected to normality tests using the Kolmogorov-Smirnov test to determine the distribution of data. Data with normal distribution were presented as mean $\pm$ standard deviation, while non-normally distributed data were presented as median (Q1–Q3 value), where Q1 represents the 25th percentile, and Q3 represents the 75th percentile. Some numerical data (body mass index, blood cholesterol, blood HDL, and job tenure) were also converted into categorical data based on reference cut-off values as mentioned. Fasting blood glucose and HbA1c data were also converted and united into one categorical variable, where it would be presented as an abnormal

category if one of the mentioned numerical data values was abnormal.

In bivariate analysis, numerical data of age was converted into categorical data under two classifications based on their cardiovascular risk.²⁰ A bivariate test was conducted to analyze the association between the independent variables and the dependent variable by comparing proportions using the Chi-Square test or using Fisher's exact test if the Chi-Square assumptions were not met. All of the tests' significance was set at $p < 0.05$.

Subsequently, a multivariate test was conducted to further analyze the determining factor in this study, using all variables in the bivariate test with a p -value < 0.2 . The significance threshold of the logistic regression model was set at p -value < 0.05 .

Results

Characteristics Demographic

To describe the demographics of this study, the researcher conducted a univariate analysis (Table 1). The study population consisted of 126 individuals, with the mean age of the subjects reported as 38.97 ± 8.4 years. In terms of occupational distribution, the majority of the participants were assigned to the operation department (62%), and 64.3% had been working for more than 5 years, and 53.2% were not shift workers.

Assessment of the cardiovascular risk factors revealed a high prevalence of clinical abnormalities. Over half of the study population (53.2%) exhibited an abnormal Body Mass Index (BMI), with an overall sample mean BMI of 25.96 ± 3.5 . Notably, abnormal blood pressure was the most pervasive clinical finding, affecting 73% of the respondents. Risky lifestyle indicated by a high prevalence of smoking behavior, with 43.7% ($n = 55$) of the subjects identified as active smokers.

Additionally, based on the SRQ-20 questionnaire, 21 workers (16.7%) reported experiencing mental emotional disorder symptoms in this research. Based on the 20 questions answered by the affected subjects, the researcher described the mental emotional disorder symptoms distribution specifically in Table 2. The report showed that 17 (81%) workers felt nervous, tense, or worried, 16 (76.2%) workers were easily tired, and 15 (71.4%) workers slept badly.

Association between cardiovascular risks, occupational factors, and mental emotional disorder

The bivariate analysis was conducted to examine the respondents' cardiovascular risk factors and occupational characteristics in relation to mental emotional disorder (MED) (Table 3). Although respondents in the older age (≥ 45 years) group showed a higher likelihood of mental emotional disorder with an OR of 1.43, the result was not statistically significant ($p = 0.45$) between age and the occurrence of mental emotional disorder. Likewise, other cardiovascular risk biomarker parameters evaluated did not show statistically significant associations with psychological distress as the outcome.

While within the occupational factors, job tenure showed a similar marginal trend, with workers employed for 5 years or less (24.4%) reporting a higher rate of experienced symptoms of MED ($p = 0.081$). Notably, shift work emerged as a statistically significant factor associated with MED ($p = 0.001$).

Determinant factor of mental emotional disorder

To identify the determining factor of mental emotional disorder, multivariate analysis was conducted (Table 4). Variables demonstrating notable trends in the bivariate analysis with $p < 0.2$ were entered into a multivariate logistic regression model.

After controlling for body mass index, smoking behavior, and job tenure, personnel engaging in active shift work profiles were 85% less likely to exhibit MED symptoms. The result showed shift work remained as the sole independent determinant significantly associated with a lower likelihood of experiencing mental emotional disorder ($p = 0.007$; aOR = 0.17). This confirms that the protective relationship observed in the baseline bivariate model persisted even after multivariate adjustments.

Discussion

The evaluation of somatic biomarkers, including blood glucose, blood pressure, BMI, and blood lipids, demonstrated no statistically significant associations with MED symptoms. This absence of covariance suggests that while metabolic and cardiovascular risks are widespread within this population, they do not

Table 1. Characteristics of the subject

Variable	n (%)	Median (Q1 – Q3); mean $\pm$ SD
Age (years)		40.21 $\pm$ 8.2*
Departement		
Officer	6 (4.7)	
Ship crew	16 (12.7)	
Operation	78 (62)	
Support	26 (20.6)	
Blood glucose		
Abnormal	44 (34.9)	FBG (mg/dL) : 94 (89 – 100) and HbA1c (%): 5.03 $\pm$ 0.78*
Normal	82 (65.1)	
Blood pressure		
Abnormal	92 (73)	
Normal	34 (27)	
Body mass index		
Abnormal	67 (53.2)	25.96 $\pm$ 3.5*
Normal	59 (46.8)	
Smoking		
Yes	55 (43.7)	
No	71 (56.3)	
Blood cholesterol		
Abnormal	50 (39.7)	192.5 (173 – 219)
Normal	76 (60.3)	
HDL		
Abnormal	19 (15.1)	46 (41 – 53)
Normal	107 (84.9)	
Shift working		
Yes	59 (46.8)	
No	67 (53.2)	
Job tenure (years)		
$\leq$ 5 years	45 (35.7)	7 (4 – 13)
>5 years	81 (64.3)	
Mental emotional disorder		
Abnormal	21 (16.7)	
Normal	105 (83.3)	

*Mean $\pm$ standard deviation

directly dictate acute mental emotional distress in a cross-sectional framework. This finding contrasts with broader clinical literature that frequently demonstrates a bidirectional link between somatic biomarkers and depression or anxiety due to shared chronic inflammatory pathways.

The most alarming finding in this study was the high prevalence of 73% of abnormal blood pressure in the population. This high number needs to be noted, as it includes the prevalence of prehypertension and hypertension cases. This matches Southeast Asian industrial data, where high stress, physical demands, and poor lifestyle choices accelerate cardiovascular risks.²¹

These findings emphasize the urgent need for routine workplace screening and occupational health programs to monitor and treat early-stage hypertension.

Cardiovascular risk is further aggravated by abnormal BMI (53.2%) and active smoking (43.7%). Although smoking is often used by operation crews and shift workers to cope with fatigue and stress, it accelerates arterial stiffness and worsens metabolic disorder.²² When combined with abnormal blood pressure and abnormal body weight, these risks severely increase cardiovascular threats in the workplace, such as sudden medical emergencies during operational duties.²³

Table 2. Distribution of mental emotional disorder symptoms

Item Number		Yes	No
		n (%)	n (%)
	Somatic symptoms		
1	Often have headache	11 (52.4)	10 (47.6)
2	Poor appetite	9 (42.9)	12 (57.1)
7	Poor digestion	9 (42.9)	12 (57.1)
19	Uncomfortable feelings in the stomach	12 (57.1)	9 (42.9)
	Anxious symptoms		
3	Difficult sleeping	15 (71.4)	6 (28.6)
4	Easily frightened	5 (23.8)	16 (76.2)
5	Feeling nervous, tense or worried	17 (81)	4 (19)
	Depressive symptoms		
6	Hands shaking	0	21 (100)
9	Feeling unhappy	12 (57.1)	9 (42.9)
10	Crying more than usual	0	21 (100)
14	Unable to play a useful part in life	5 (23.8)	16 (76.2)
15	Lost interest in things	8 (38.1)	13 (61.9)
16	Feeling worthless	4 (19)	17 (81)
17	Having thought of ending life	0	21 (100)
	Cognitive symptoms		
8	Having trouble thinking clearly	6 (28.6)	15 (71.4)
12	Difficult to make decisions	6 (28.6)	15 (71.4)
	Reduced vital energy		
11	Difficult to enjoy daily activities	10 (47.6)	11 (52.4)
13	Suffering from daily work	5 (23.8)	16 (76.2)
18	Feeling tired all the time	14 (66.7)	7 (33.3)
20	Easily tired	16 (76.2)	5 (23.8)

While smoking and short tenure serve as valuable risk markers in the crude bivariate analysis, they do not act as independent drivers of MED in the multivariate regression model. Conversely, shift working schedule maintained a robust, independent protective association with MED outcomes, emerging as the sole primary determinant in the final model ($p=0.007$, $aOR = 0.17$). However, this outcome differed from mainstream occupational health literature, which mainly documented shift work and circadian disruption as major risks for psychological distress, fatigue, and burnout.^{24,25} In the context of this finding, the inverse relationship can likely be explained by the “Healthy Worker Survivor Effect” (HWSE).²⁶ Workers with lower psychological resilience or those experiencing higher levels of emotional distress may actively self-select out of demanding shift schedules, shift to daytime roles, or leave the company entirely at an early stage. As a result, the remaining

shift work group is predominantly composed of highly resilient individuals who have successfully adapted to non-standard schedules. Furthermore, shift roles carry distinct organizational advantages, such as higher shift differential pay premiums and predictable block-roster rest cycles. Operating outside normal corporate business hours also minimizes administrative stressors and reduces intense, direct supervisory oversight, which are frequently cited as primary sources of presenteeism and workplace anxiety in daytime environments.²⁷ The heightened reliance on teamwork and crew-level camaraderie during quiet operational night hours creates an informal, tightly knit psychosocial support system. This strong peer infrastructure protects shift personnel from acute workplace isolation and emotional distress, effectively shielding their psychological well-being despite the physiological demands of their schedules.²⁸

However, the shift work group (46.8%) also

Table 3. Association between individual and occupational factors with mental emotional disorder

Variable	Mental emotional disorder		p	OR (95% CI)
	Abnormal	Normal		
	n (%)	n (%)		
Age (years)				
≥45 years	9(20)	36 (80)	0.45	1.43 (0.55-3.73)
<45 years	12(14.8)	69 (85.2)		
Blood glucose				
Abnormal	8(18.2)	36(81.8)	0.73	1,18 (0.45 – 3.10) Ref
Normal	13(15.9)	69(84.1)		
Blood pressure				
Abnormal	13 (14.1)	79 (85.9)	0.20	0.53 (0.20 – 1.43) Ref
Normal	8 (23.5)	26 (76.5)		
Body mass index				
Abnormal	8 (11.9)	59 (88.1)	0.129	0.48 (0.18 – 1.25) Ref
Normal	13 (22)	46 (78)		
Smoking				
Yes	13 (23.6)	42 (76.4)	0.065	2.44 (0.93 – 6.39) Ref
No	8 (11.3)	63 (88.7)		
Blood cholesterol				
Abnormal	9 (18)	41 (82)	0.74	1.17 (0.45 – 3.02) Ref
Normal	12 (15.8)	64 (84.2)		
HDL				
Abnormal	2 (10.5)	17 (89.5)	0.738*	0.54 (0.12 – 2.56) Ref
Normal	19 (17.8)	88 (82.2)		
Shift working				
Yes	3 (5.1)	56 (94.9)	0.001	0.15 (0.04 – 0.53) Ref
No	18 (26.9)	49 (73.1)		
Job tenure				
≤5 years	11 (24.4)	34 (75.6)	0.081	2.30 (0.89 – 5.93) Ref
>5 years	10 (12.3)	71 (87.7)		

*fe: Fisher's Exact test

Table 4. Determinant factor of mental emotional disorder

	B	S.E.	p value	aOR	aOR CI 95%	
					Lower	Upper
Body mass index	-0.56	0.52	0.284	0.57	0.21	1.59
Smoking	0.61	0.53	0.251	1.83	0.65	5.16
Shift working	-1.79	0.66	0.007*	0.17	0.05	0.61
Job tenure	0.53	0.52	0.310	1.70	0.61	4.72

Regression logistic test *p<0.05

warrants attention, as it may contribute to the poor biomarker results observed in this research. Chronic shift work disrupts normal circadian rhythms, which can impair insulin sensitivity, elevate systemic cortisol levels, and disrupt lipid metabolism.²⁵ In this study, the collective median fasting blood glucose of 94 mg/

dL and the median total cholesterol of 192.5 mg/dL demonstrate a population transitioning toward borderline cardiovascular and metabolic risks.

Overall, this research aligns with specific occupational health studies indicating that psychological outcomes among active workers are often decoupled

from immediate metabolic biomarkers; in this context, it is reflected in the population's demographic statistics. Instead, it is also driven by acute psychological stressors and immediate organizational frameworks, rather than solely by long-term clinical status.^{25,26} Consequently, occupational health interventions cannot rely solely on addressing isolated behavioral traits such as healthy lifestyle and smoking cessation. Instead, programs must be integrated directly into the structural organization of work, focusing on building resilience, optimizing rest cycles, and targeted mental health support systems for daytime and non-shift personnel who lack these intrinsic structural buffers.²⁵⁻²⁹

This study gained an advantage by revealing the cardiovascular risks, demography, and mental emotional disorders prevalence in one study, specifically in the oil and gas offshore worker population.

This study has some limitations. Due to a cross-sectional study, this limited the area of conclusion to determine the causal relationship between cardiovascular risks and mental emotional disorders. The variation in the blood analysis method performed by the laboratory equipment was limited to only several items requested by the company's policy and was unable to explore other specific inflammatory processes. Thus, it is recommended that, in the future, a prospective study use longitudinal data and also include biomarkers such as IL-6 & IL-8. Due to the study's use of secondary data, the information was limited; other specific questions could not be analyzed further. The SRQ-20 questionnaire used in this study also served as a screening tool for early signs of mental emotional disorder symptoms. It could not be used as a diagnostic tool.

Conclusion

This study revealed there is a prevalence of mental emotional disorder among the subject population (16.7%), with the major symptoms of feeling tense, anxiety or worry (81%), easily tired (76.2%), and sleeping badly (71.4%). It was also reported that a considerable rate of abnormal blood pressure (73%) and abnormal BMI (53.2%). Although this is a concerning trend of cardiovascular risks reflected in the subject's clinical biomarkers, they were not shown to be significantly associated with mental emotional disorder in this study ($p > 0.05$).

Shift work was found to be significantly associated

with mental emotional disorder in both bivariate and multivariate analyses ($p = 0.007$, $aOR = 0.17$). Therefore, it is recommended that occupational health programs should not only focus on minimizing cardiovascular risks but also on managing psychological stressors and adding mental health support within a structural organization framework, especially for non-shift workers.

For future research, it is recommended to use a case-control or cohort analytical design to determine the relationship between cardiovascular risks and mental emotional disorders. And considerably, a more specific inflammation biomarker to determine the cardiovascular risks and a more specific mental emotional disorder screening tool as the research instrument.

References

1. The state of health in Indonesia's provinces, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet Glob Health* 2022.
2. Report presents data on fatalities in oil and gas extraction. *AIHA* 2023.
3. Parkes KR. Mental health in the oil industry: a comparative study of onshore and offshore employees. *Psychol Med* 1992;22:997-1009.
4. Butterworth JF IV, Mackey DC, Wasnick JD, editors. *Morgan & Mikhail's clinical anesthesiology*. 6th ed. New York: McGraw-Hill; 2018.
5. Jorenby DE, Leischow SJ, Nides MA, Rennard SI, Johnston JA, Hughes AR, et al. A controlled trial of sustained-release bupropion, a nicotine patch, or both for smoking cessation. *N Engl J Med* 1999;340:685-91.
6. Henein MY, Vancheri S, Longo G, Vancheri F. The role of inflammation in cardiovascular disease. *Int J Mol Sci* 2022;23:12906.
7. Manpreet Bahniwal, Jonathan P Little, Andis Klegeris. High glucose enhances neurotoxicity and inflammatory cytokine secretion by stimulated human astrocytes. *Curr Alzheimer Res* 2017;14:731-41.
8. Chen K, Li F, Li J, Cai H, Strom S, Bisello A, Zhao AZ. Induction of leptin resistance through direct interaction of C-reactive protein with leptin. *Nat Med* 2006;12:425-32.
9. Valko M, Leibfritz D, Moncol J, Cronin MT, Mazur M, Telser J. Free radicals and antioxidants in normal physiological functions and human disease. *Int J Biochem Cell Biol* 2007;39:44-84.
10. Shytle RD, Silver AA, Lukas RJ, Newman MB, Sheehan DV, Sanberg PR. Nicotinic acetylcholine receptors as targets for antidepressants. *Mol Psychiatry* 2002;7:525-35.
11. Hulea SA, Olinescu R, Nita S, Crocnan D, Kummerow FA. Cigarette smoking causes biochemical changes in blood that are suggestive of oxidative stress: a case-control study. *J*

- Environ Pathol Toxicol Oncol 1995;14:173–80.
12. Blanchflower DG. Is happiness U-shaped everywhere? Age and subjective well-being in 145 countries. *J Popul Econ* 2021;34:575–624.
13. Salahuddin Mohammad, Maud Miguët, Gull Rukh, Helgi B Schiöth, Jessica Mwinyi. Job satisfaction and job tenure of people with mental health disorders: a UK Biobank cohort study. *Scand J Public Health* 2023;51:1248–57.
14. Pavičić Žeželj S, Cvijanović Peloza O, Mika F, Stamenković S, Mahmutović Vranić S, Šabanagić Hajrić S. Anxiety and depression symptoms among gas and oil industry workers. *Occup Med* 2019;69:22–7.
15. Chidiebere Emmanuel Okechukwu, Mark D Griffiths, Mauro Giovanni Carta, Edwin Nwobodo. Biological and practical considerations regarding circadian rhythm and mental health relationships among nurses working night shifts: a narrative review and recommendations. *Riv Psichiatri* 2022;57:67–79.
16. Perkumpulan Endokrinologi Indonesia. Pedoman pengelolaan dan pencegahan diabetes melitus tipe 2 di Indonesia. 2021.
17. Perhimpunan Dokter Hipertensi Indonesia. Konsensus penatalaksanaan hipertensi 2019. Jakarta; 2019.
18. WHO. Physical status: the use and interpretation of anthropometry: report of a World Health Organization (WHO) expert committee. Geneva: World Health Organization; 1995.
19. World Health Organization. Guidelines for the management of dyslipidaemia in patients with diabetes mellitus; quick reference guide. 2006.
20. Ramachandran SV, Danielle ME, Vanessa X, Alexa SB, Sudha S. Temporal trends in the remaining lifetime risk of cardiovascular disease among middle-aged adults over six decades: the Framingham study. *Circulation* 2022;145:1324–38.
21. Freade A, Sugiharto A, Isbayuputra M, Kekalih A, Soemarko DS, Firdaus I. Analysis of the relationship between atherosclerosis cardiovascular disease risk profile and occupational profile to the WHO cardiovascular risk chart 2019 for South-Est Asia in oil and gas industry. *Indian J Occup Environ Med* 2024;28:245–53.
22. Bae MJ, Song YM, Shin JY, Choi BY, Keum JH. The association between shift work and health behaviour: findings from the Korean National Health and Nutrition Examination Survey. *Korean J Fam Med* 2017;38:86–92.
23. Yusuf S, Joseph P, Rangarajan S, et al. Modifiable risk factors of cardiovascular disease and mortality in Eastern Asia. *N Engl J Med* 2020;382:2023–33.
24. Henrique Pereira, Gergely Feher, Antal Tibold, Samuel Mnteiro, Vitor Costa. The impact of shift work on occupational health indicators among professionally active adults: a comparative study. *Int J Environ Res Public Health* 2021;18:11290.
25. Kecklund G, Axelsson J. Health consequences of shift work and insufficient sleep. *BMJ* 2016;355:i5210.
26. Buckley JP, Keil AP, McGrath LJ, Edwards JK. Evolving methods for inference in the presence of healthy worker survivor bias. *Epidemiology* 2015;26:204–12.
27. Adi NP, Odagami K, Nagata T. The critical role of supervisors in creating a mental health friendly workplace. *Indones J Comm Occup Med* 2022;2:55–8.
28. Lea Simms, Katherine E Ottman, James L Griffith, Michel G Knight. Psychosocial peer support to adress mental health and burnout of health care workers affected by Covid-19: a qualitative evaluation. *Int J Environ Res Public Health* 2023;20:4536.
29. Hammer LB, Dimoff J, Mohr CD, Allen SJ. A framework for protecting and promoting employee mental health through supervisor supportive behaviors. *Occup Health Sci* 2024;8:243–68.