

Influence Shift Work on Work Fatigue in Oil and Gas Industry Workers: Literature Review

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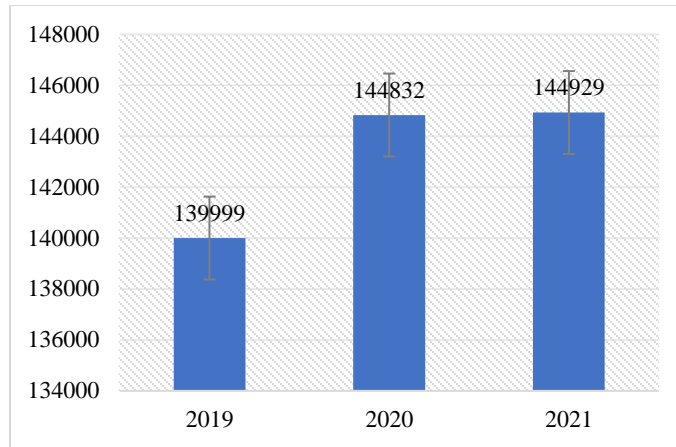
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ARTICLE INFO	ABSTRACT
<p>Manuscript Received: 21 Sept, 2024 Revised: 31 Oct, 2024 Accepted: 03 Nov, 2024 Date of Publication: 9 Dec, 2024 Volume: 7 Issue: 12 DOI: 10.56338/mppki.v7i12.6324</p>	<p>Background: Petroleum and gas industry carries out business in exploration and exploitation activities as well as in the processing of crude oil, an industry that is faced with working conditions and a high level of risk of danger. The work system for workers in the oil and gas sector applies the system shift like shift 4 time rotation, or two week days shift tends to make workers experience higher levels of fatigue and fatigue-related work accidents. For know the influence shift work on work fatigue in oil and gas industry workers.</p> <p>Method: This research uses the method literature review with the PRISMA approach (preferred reporting items for systematic reviews and meta-analyses). In the journal search carried out on database google scholar dan ScienceDirect with the keyword "Shift work", "Work Fatigue", "Oil and Gas Industry". A total of 962 journals were identified, but 5 journals met the inclusion and exclusion criteria.</p> <p>Results: Based on 962 journals identified, 5 journals were selected according to inclusion criteria and exclusion criteria. Work shifts, whether 12-hour rotational work shifts or 2-week rotational shifts for offshore workers, can influence work fatigue in oil and gas workers. Lack of hours of sleep and poor sleep quality and circadian rhythm are often found to be factors causing work fatigue in oil and gas workers. Work fatigue experienced by oil and gas workers has an impact on reducing work performance and work productivity.</p> <p>Conclusion: Shift work has an effect on work fatigue in petroleum and gas industry workers.</p>
KEYWORDS	
<p>Shift Work; Work Fatigue; Petroleum and Gas Industry</p>	

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INTRODUCTION

Work fatigue can be defined as a condition experienced by workers as a physical and psychological response due to prolonged physical and mental activity and lack of sleep (1). Work fatigue conditions can be categorized as physical, emotional and cognitive fatigue (2). The impact that arises as a result of work fatigue felt by workers is a decrease in work productivity levels (3) (4) and an impact on increasing the risk of work accidents (5). Work fatigue felt by workers reduces workers' compliance with occupational safety and health regulations and increases the risk of work accidents (6). Apart from that, from 2019 to 2021 there was an increase in work accident data that occurred in Indonesia, published in BPJS Employment, which can be seen in Figure 1, as follows.



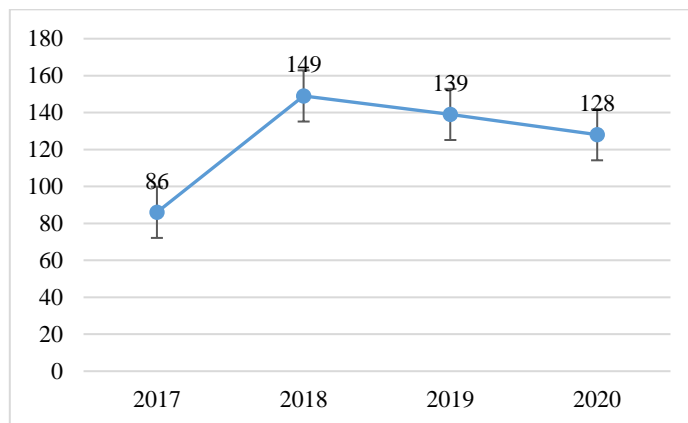
Source: BPJS Employment in the Indonesian Ministry of Manpower 2022

Figure 1. Work Accident Data from 2019 to 2021

Referring to Figure 1 above, the incidence of work accidents in 2019 was 139,999 incidents, the incidence of work accidents increased in 2020 by 144,832 incidents and increased again in 2021 by 144,929 incidents.

The high number of work accidents causes work performance to decline (7). Research that has been conducted shows that work fatigue can cause work accidents with a 78% chance of occurring (8). Besides that, the data collected by The National Safety Council states that 13% of work accidents are caused by work fatigue. It is made worse that work fatigue has an impact on work performance (9) (10). Work fatigue felt by workers is caused by several factors, namely working period, respiratory rate, and blood pressure, noise exposure, heat stress exposure (11) and work shift (12) (13).

The petroleum and gas industry is an industry with a fairly high risk of work accidents in exploration and exploitation activities as well as in the crude oil processing process (14). Compiled from the Ministry of Energy and Mineral Resources regarding upstream mineral and gas work accident statistics for 2018-2020, can be seen in Figure 2, as follows.



Source: Ministry of Energy and Mineral Resources 2022

Figure 2. Upstream Mineral and Gas Work Accident Statistics for 2018-2020

Based on the graph in Figure 2, data on work accidents that occurred in upstream oil and gas has fluctuated since 2017. It can be seen from the number of work accidents that occurred in 2017 which was 86 incidents, then increased in 2018 by 149 incidents, the number of work accidents that occurred in 2020 a total of 128 incidents. From this data, it can be seen that there is still a high incidence of work accidents occurring in the oil and gas industry.

Bearing in mind that workers in the oil and gas sector are faced with high-risk working conditions, which increases the occurrence of work fatigue experienced by workers. This is made worse by the fact that many oil and gas industries implement shift working hours systems such as 12-hour shifts and 2-week rotation shifts (15) because

the oil and gas industry is operated 24 hours a day. The high level of work fatigue experienced by petroleum and gas workers is caused by many factors such as the nature of the work itself, sleep quality, circadian rhythm (16), working period, respiratory rate, blood pressure, noise exposure, heat stress exposure (11) work system with shift rotation (13). In addition, the work system for workers in the oil and gas sector applies the system shift like shift 4 time rotation, or two week days shift tends to make workers experience higher levels of fatigue and fatigue-related work accidents (16).

METHOD

The research method used is a literature review with the "PRISMA" approach. Preferred Reporting Items for Systematic reviews and Meta-Analyses (17). In the journal search carried out on database google scholar and ScienceDirect with the keyword "Shift work", "Work Fatigue", "Oil and Gas Industry" published after 2019. The journal selected after 2019 considering that science is dynamic, in order to get up-to-date information regarding influence shift work on fatigue in oil and gas industry. In selecting journals, inclusion criteria and exclusion criteria were determined. Inclusion criteria, the effect of work shifts on work fatigue in oil and gas industry workers and with quantitative research methods. Exclusion criteria are research conducted before 2019, research objects other than oil and gas industry workers, and types of research other than quantitative. The following are the stages of research using the "PRISMA" method Preferred Reporting Items for Systematic reviews and Meta-Analyses, can be seen in Figure 2, as follows.

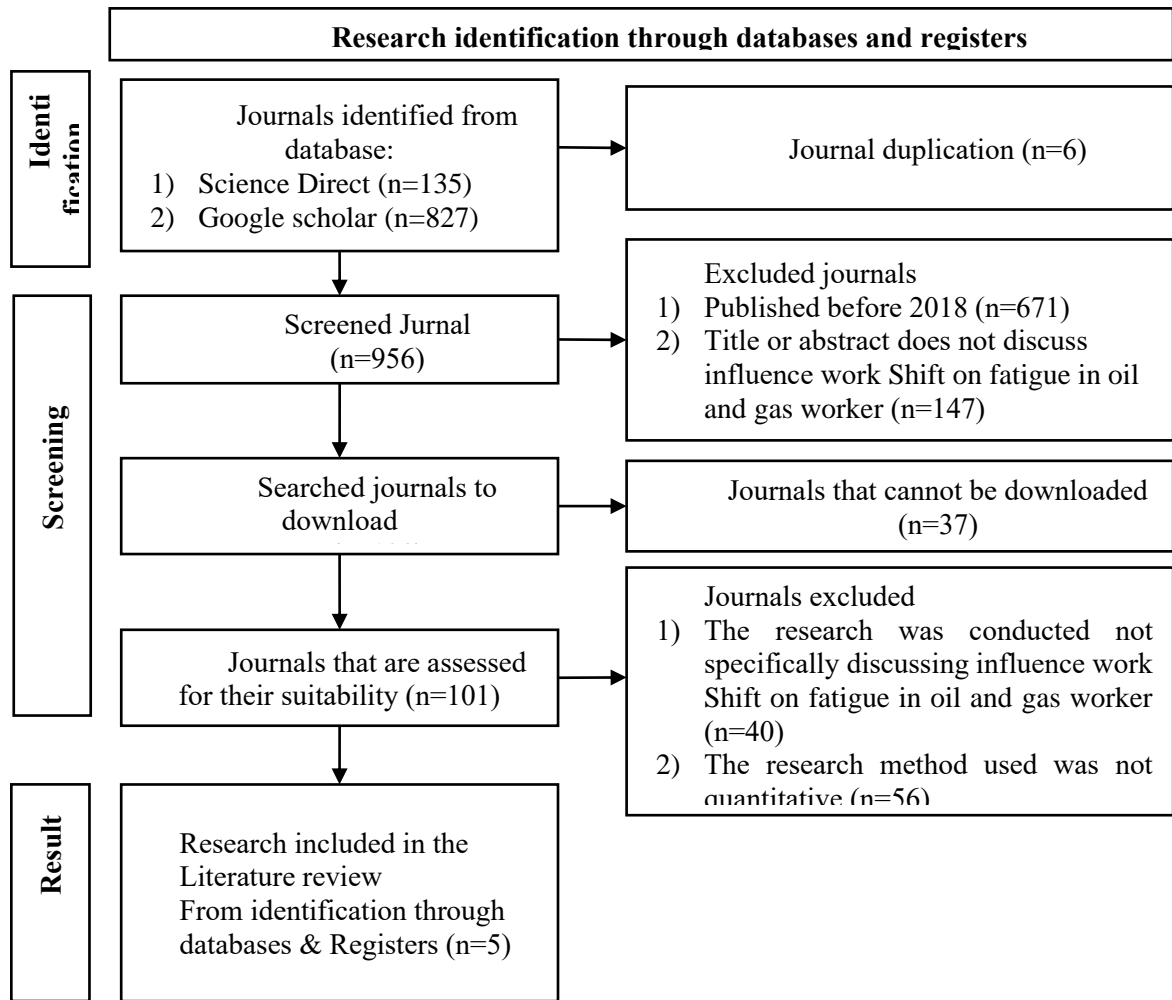


Figure 3. Stages of the "PRISMA" Method

Based on Figure 2 above, 962 journals were identified, of which 135 came from ScienceDirect and 827 comes from google scholar. Six journals were excluded because there were duplications, leaving 956 journals. Screening was carried out with 670 journals excluded because they were published before 2019 and 147 journals excluded because they were published before 2018. Title or abstract does not discuss the influence of work Shift on fatigue in oil and gas workers, so that the remaining journals are 139. A total of 37 journals cannot be downloaded, and 40 journals were excluded because they did not specifically discuss the influence of work shift to fatigue on oil and gas workers and 56 journals were excluded because they did not use quantitative methods. So, there are 6 journals remaining, 4 journals indexed Q1, 1 journal indexed Q2, 1 journal indexed Q3.

RESULTS

The research results selected 5 journals, with 3 journals indexed Q1, 1 journal indexed Q2, 1 journal indexed Q3. The following is a summary of the research results, which can be seen in Table 1, as follows.

Table 1. Summary of Research Results

No	Author, Year	Title	Research Methode, instrument	Result	interpretation
	Petcharatana Bhuanantanondh, Pokkate Bandidcharoenlert, Wattana Jalayondeja, Chutima Jalayondeja, Keerin Mekhora, 2021	Fatigue assessment among onshore oil rig <i>shift</i> workers in Thailand	Cross-sectional study with analysis regresi linier, quetioners	P-value (0,001) < 0,05 Mean sleep hours last on the night shift decreased on 4 hours	End of workdays, compared with at the start of workdays, influence on fatigue In conclusion, swing <i>shifts</i> might affect fatigue levels in <i>shift</i> workers.
	V. Riethmeistera, R.W. Matthews, D. Dawson, M.R. de Boere, S. Brouwera, U. Bültmanna, 2019	Time-of-day and days-on- <i>shift</i> predict increased fatigue over two-week offshore day- <i>shifts</i>	Cross-sectional study with analysis regresi linier, quetioners	P-value (0,001) < 0,05 Mean cumulative sleep loss across the study was 21, 20 hours (SD=08, 10 hours) over the 14 days	a) Across the <i>shift</i> b) post- <i>shift</i> scores c) Time-of-day d) days-on- <i>shift</i> influenced fatigue
	Rachel McNamara, Andrew P Smith, 2020	Combined Effects of Fatigue Indicators on the Health and Wellbeing of Workers in the Offshore Oil Industry	Cross-sectional study, questioners	P-value (0,04) < 0,05 54% Workers in the Offshore Oil Industry have Mentally tired, 48% Workers in the Offshore Oil Industry have Physically tired	Shift schedule influenced on work fatigue of Workers in the Offshore Oil Industry
	Palathoti SR, Al-Aghbari A, Oitolaiye VO, 2023	Effect of Long Extended Working Hours on the Occupational Health and Safety of Oil and Gas	Cross-sectional study with analysis regresi linier, quetioners	P-value (0,001) < 0,05 Respondents reported 27%	Extended working hours potentially expose workers to fatigue

No	Author, Year	Title	Research Methode, instrument	Result	interpretation
		Workers in the Sultanate of Oman		Strongly agree, 63% agree, 12% neutral, 12% disagree	
				breathing problems due to toxic exposure	
	John Kang, Stephanie C. Payne, Farzan Sasanoghar, Ranjana K. Mehta, 2024	Field-based longitudinal evaluation of multimodal worker fatigue assessments in offshore shiftwork	Cross-sectional study with analysis regresi linier, quetioners	P-value (0,001) < 0,05 FRAME overall score Day shift - 0.24 Night shift - 0.29 Swing shift -0.12	a) We report that while day shift workers' perceptions of physical fatigue increased as expected, their perceived sleepiness declined over time. b) Perceived mental fatigue decreased over time for night shift workers but increased for those assigned to the swing shift

DISCUSSION

Based on research results on 5 journals with 3 journals indexed Q1, 1 journal indexed Q2, 1 journal indexed Q3, about influence shift work to the symptoms of work fatigue felt by petroleum and gas workers, can be illustrated in Figure 3, as follows.

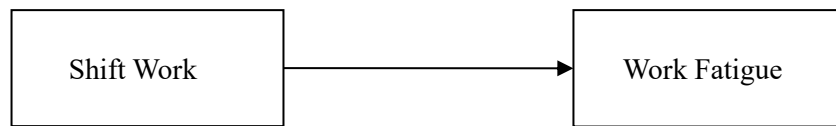


Figure 4. Influence of Shift Work on Work Fatigue

Based on Figure 4, it shows that the system works shifting implemented in oil and gas industry workers has an effect on increasing work fatigue (13) (12) (18) (1) (19). Shift with a 12 hour work system, for workers who are scheduled on shift experience sleep disturbances at night compared to workers shift afternoon (13). This is related to circadian rhythms, the body recognizes that night is rest time and daytime is activity time, triggering disruption of workers' sleep time (20). Working system with shift triggers a decrease in concentration, based on research that has been conducted that 70% of oil and gas workers cannot concentrate while working, while 30% of workers can concentrate while working (18). Respondents' responses show that workers need sufficient rest time to ensure they work with concentration.

This is different from offshore workers which require workers to work with a system shift 2 weeks. Fatigue working with the system shift 2 weeks bigger felt compared to the beginning shift (12) these symptoms were found because fatigue was cumulatively felt at the end shift as a result of lack of hours of sleep and poor sleep quality. It can be explained by 3 factors, namely the influence of circadian rhythm, work tasks carried out almost every day for 2 weeks, and waking hours (12). Circadian rhythms are a result of workers doing work at night and sleeping during the day, resulting in physical, mental and behavioral changes in workers (21). The work tasks carried out by offshore workers are much more difficult considering that the work field and work environment have many sources of danger and are carried out every day, adding to the physical fatigue felt by workers(22). The final factor, namely waking up early, affects sleep quality. Workers feel that their sleep needs have not been met properly, causing workers to feel

more tired when working (23). Research has been carried out that workers offshore Losing hours of sleep has the potential to worsen the health and safety conditions of workers, plus losing >6 hours of sleep has the potential to disrupt neurobehavioral function in healthy adults (24).

Besides that, the work system shift Working causes chronic fatigue in petroleum and gas workers(18). The working environment in the petroleum and gas industry, which produces harmful exhaust gases or pollutants, can trigger problems with the circulatory, respiratory and nervous systems, worsening the fatigue felt by workers (25). Apart from workers, the exhaust gas produced by the oil and gas industry has an impact on the health of residents around the area where the oil and gas industry is located (26) because the exhaust gas and pollutants are distributed along with the direction of the wind. In the short term, exposure to toxic and dangerous gases can threaten occupational safety and health, and in the long term it can result in death for workers (18).

Fatigue felt by workers has an impact on increasing the risk of work accidents (5). Where work fatigue is one of the unsafe actions that increases the risk of work accidents (5). Besides that, work fatigue has an impact on reducing work efficiency (27) and work productivity (28) (5). Research that has been conducted reveals that work fatigue has a negative effect on the performance of oil and gas workers (5). The negative effect indicates that increasing work fatigue has an effect on decreasing performance. The long-term impact of shift work may be felt by workers with breast and prostate cancer and has been classified as class 2A carcinogen by the International Agency for Research on Cancer (29–34).

Recommendations for Future Research

Based on the research results, it was found that work shifts influence work fatigue. Sleep management can be implemented as an effort to minimize symptoms of work fatigue felt by oil and gas workers. Need for further studies on other factors that may affect work fatigue in oil and gas workers.

CONCLUSION

In this research, it can be concluded that work shifts, whether 12-hour rotational work shifts or 2-week rotational shifts for offshore workers, can influence work fatigue in oil and gas workers. Lack of hours of sleep and poor sleep quality and circadian rhythm are often found to be factors causing work fatigue in oil and gas workers.

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