

Seaweed Farmers and Work Fatigue: A Mixed-Method Approach

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Abstract

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BACKGROUND: In Indonesia, particularly in the coastal area, there is a growing number of seaweed farmers who work in the informal sector as a home-based industry. It is generally assumed that this sub-group of workers is also experiencing work fatigue.

AIM: This research aims to explore information-related factors that are associated with fatigue among seaweed workers.

METHODS: The study was conducted in Takalar Regency, South Sulawesi, Indonesia. The research used a mixed-method design combining quantitative and qualitative approach. One hundred sixty-one samples were taken from four districts Mangarabombang, Mappakasunggu, Sanrobone, and North Galesong.

RESULTS: More than half of the respondents feel fatigue 67.1%. Furthermore, based on bivariate analysis, it was found that there were significant associations between work hour $p = 0.041$ and work period $p = 0.031$ with work fatigue. For the qualitative approach, three focus group discussions were conducted to explore more information related to factors that were found associated with work fatigue from the quantitative study. This research found that a large number of employees experienced work fatigue.

CONCLUSION: The factor that associated with work fatigue is work hour and work period. It is suggested that health providers and stakeholders related need to pay attention to this subgroup of the working population regarding their occupational health and safety problems.

Introduction

Fatigue is one of the most common hazards at workplace and it is directly related to health and safety of the worker. Fatigue is the state of feeling very tired, weary, or sleepy resulting from insufficient sleep, prolonged mental or physical work, or extended periods of stress or anxiety. Boring or repetitive tasks can intensify feelings of fatigue. Fatigue can be described as either acute or chronic [1]. Fatigue can be experienced by formal and informal sector workers. Fatigue is a state in which the body's immune system weakens and decreased workforce. ILOSTAT showed that, in 2017, there were 31% workers that work over 49 h/week and this lead to work-related fatigue [2].

Working over successive days or weeks cause a cumulative fatigue. This cumulative fatigue strongly associated with sleep loss. This fatigue experienced by many workers working over a number of days or weeks. It also states that excessive wakefulness beyond a maximum standard (8 h) caused decreased awareness and poor performance at work while increasing the risk of accidents and injuries [3].

In Indonesia, particularly in coastal area, there is a growing number of seaweed workers who work

in the informal sector as a home-based industry. It is generally assumed that this sub-group of workers are also experiencing work fatigue. Furthermore, seaweed workers are required to perform many types of jobs such as cultivation of seeding, planting, maintenance, harvesting, processing, and drying. All type of jobs is physically demanding.

In the second Korean Working Conditions Survey (2010), overall fatigue increased from 17 point 8% in 2006 to 26 point 7% in 2010 [4]. According to the International Labor Organization (ILO) (2013), every year, as many as two million workers die due to work accidents caused by fatigue. In the study, explained from 58,115 samples, 18,828 of them (32.8%) experienced fatigue [5]. The complaint of fatigue is high in the general population in the range of 18.3–27% [6]. The higher prevalence of fatigue has been reported in many operational settings that induce health and safety problems. According to the study results, fatigue is a common reason for employees to consult with a general physician in industrial settings. The prevalence rates of fatigue in industries depending on the instruments used have been reported between 7% and 45% [7].

The first feature of work fatigue is that it involves both extreme tiredness (i.e., lack of energy) and reduced functional capacity. Reduced functional

capacity reflects a decrease in the capacity and/or motivation to respond to certain stimuli or engage in certain types of activities or behaviors [1]. Some factors associated with work related fatigue are duration of work, shift rotation patterns, workloads, timing of tasks and activities, duration of resting, and the workplace environment. Work fatigue was associated with pulse > average, work period > 1 year, and duration of sunlight exposure > average [8]. Thus, this study focuses on factors that associated with work-related fatigue on seaweed worker in Takalar district.

Materials and Methods

The study uses a mixed method design combining quantitative and qualitative approach. All seaweed workers in Takalar Regency become the population of the study. The sample was 161 taken from four districts Mangarabombang, Mappakasunggu, Sanrobone, and North Galesong. Among nine districts in Takalar Regency, those four districts have the highest number of people who work seaweed farmers. A qualitative approach was done by Focus Group Discussion and in-depth interview to stakeholders in four districts.

Questionnaires survey was distributed among 161 workers between August 2018 and March 2019. The workers' fatigue data were obtained using the Work Fatigue Measurement Tool Questionnaire. Furthermore, a Rapid Entire Body Assessment Questionnaire Sheet was used to measure work postures to examine the association between variables, this study performed Chi-square test. This is a qualitative study to understand the surrounding of seaweed worker and was performed with in-depth interview to stakeholder and Focus Group Discussion among seaweed worker.

Results

This part explores information related to the distribution of seaweed farmer's characteristics, distribution of work fatigue, and bivariate analysis of factor related to work fatigue. Table 1 presents demographic data of seaweed workers based on age, gender, work period, and number of working hours per day. As shown in table, almost 70% of workers were at the age group between 20 and 49 years old, while female workers were more than male (60.9% and 39.1%, respectively). Turning to the work period, more than 65% of the workers have been working as seaweed farmers for the above 5 years. Regarding working hours, there were 70 (43.4%) seaweed farmers worked more than 8 h a day.

Table 1: Workers' demographic

Variable	N	%
Age		
10–19	13	8.07
20–29	35	21.7
30–39	38	23.6
40–49	39	24.2
50–59	19	11.8
60–69	13	8.07
≥70	4	2.4
Gender		
Male	63	39.1
Female	98	60.9
Work period (years)		
1–5	46	28.5
6–10	68	42.3
11–15	11	6.8
16–20	26	16.1
21–25	3	1.8
≥26	7	4.3
Working hour		
1–4	38	23.6
5–8	53	32.9
9–12	70	43.4

Table 2 presents the proportion of seaweed worker who experiences work fatigue. More than half of the respondent, 67.1% have experience work fatigue throughout working as seaweed worker.

Table 2: Distribution of respondent based on seaweed worker work fatigue

Work fatigue	Respondent	
	N	%
Fatigue	108	67.1
Not fatigue	53	32.9

Tables 3 and 4 depict from various things related to work fatigue, work hour, and work period are associated with work fatigue. Table 3 depicts seaweed worker that work overtime more than 70% experience work fatigue. More than 60% of seaweed workers that working with proper working hour also experiences work fatigue. With $p = 0.041$, it stated that work hour is associated with work fatigue.

Table 3: Association of work fatigue and seaweed worker working hour (duration of work)

Work hour (Duration of work)	Work fatigue				Total	p-value	
	Fatigue		Not fatigue				
	N	%	n	%	n	%	
Working overtime	53	75.5	17	24.3	70	100	0.041
Proper working hour	55	60.4	36	39.6	91	100	

Table 4 shows that 70% of a long time seaweed worker feel fatigue as a result of the work, whereas recent seaweed worker evenly distributes as half of the seaweed worker feel fatigue and half of them not feel fatigue. Accordingly $p = 0.031$, it stated that the work period is associated with work fatigue.

Table 4: Association of work fatigue and seaweed worker working period

Work period	Work fatigue				Total	p-value	
	Fatigue		Not fatigue				
	N	%	N	%	n	%	
Long time worker	94	70.7	39	32.1	133	100	0.031
Recent worker	14	50.0	14	50.0	28	100	

Discussion

Working condition really affect the work-related fatigue, it also can resulting in acute fatigue syndrome.

More than half of the respondents feel fatigue at 67.1%. At the times of working, the worker bending, sitting, and standing for a long time. Sorting seaweed is done manually and repetitive in bad sitting position/twisting for hours. They do not have set working time, but in growing season, the seaweed worker tend to work overtime.

Related factors to work fatigue are such as age, gender, work shift, rest time, intensity of work, and much more. This study found that there are two factors that related to fatigue among seaweed worker in Takalar South Sulawesi. The factors are work hour and work period means how many years they work.

This study found that working overtime is related to fatigue among seaweed worker. Working overtime means less time to recovery and less time to sleep that can lead to fatigue. A study found for fatigue, the significant predictors became: Female gender, age <50 years, higher socioeconomic group, present illness, hectic work, overtime work, and physically strenuous work [9]. Another study found that working overtime more than 10 h related to work fatigue (acute and chronic) $p = 0.001$ [10]. Another qualitative study revealed that a long period of working is effecting fatigue [11]. Another study found that fatigue, longer work hours in the same workplace, and working as a nursing technician were associated with decreased workability, emphasizing the need for investment in health and quality of work-life [12].

The growing season for seaweed worker means working overtime. Taking care of the seed, then planting, harvesting then drying seaweed is a very long process. Seaweed worker in Takalar is a home industry, every work shared in family member, so the work time is long since the limited workforce in the family. As a respondent says:

"For planting most of the time I work alone sometime two of us, taking seed then we tie the seed an then planting done in squatting position and when in growing season we do it all day long sometimes until night time, so off course we feel fatigue..."

"Sometimes we took short-time rest because if we not watching the seaweed, it will fail..."

A seaweed worker in Takalar is a home industry and handled by the family. They rarely hire a worker; they just shared by a family member. The work started by sorting the seed, preparing the seed to plant by tie it on a rope, plant it on the sea, taking care until the seaweed growing, and harvesting. The process really long and it makes the working hour is almost done all day long. Individuals who obtained <4 h sleep per night showed increasing lapses in performance and reduced speed and accuracy when completing performance tasks, whereas those who obtained 7 h of sleep or more were able to maintain levels of performance over 14 consecutive days [3].

Another result of this study is a long time worker related to work-related fatigue. Fatigue is

strongly associated with time and perhaps become more intertwined as time persists [13]. Long and repetitive work can lead to fatigue as the seaweed worker. Another study stated that the more days people work more fatigued that they feel at the end of the working period because it accumulated [14]. Worker who sleeps less having reduced perform at work [3]. As the respondent says:

"We plant throughout the year, but the suitable month to plant is January until May. So we feel fatigue as long as we work..."

"Off course we feel tired, I do this for 20 years. It is physical work, we just do it..."

A study in Lebanon found that fatigue is related to years of working with $p = 0.002$. In the adjusted analysis, nurses with 5–10 years of working have more fatigue compared with those with <5 years of experience working [15]. Seaweed worker in Takalar mostly carry on the worker from the parents, so they done it for such a young age. It means that they work for years, almost a lifetime occupation. Seeing how they work without a helping tool, it is done manually, so no doubt they experience fatigue. They do not have a day off like office worker, so the fatigue accumulated every day. This accumulated fatigue leads to less productive work as seaweed worker.

Conclusion

The factors associated with work fatigue are work hours and work periods. It is suggested that health providers and stakeholders related need to pay attention to this subgroup of the working population regarding their occupational health and safety problems.

References

1. Frone MR, Tidwell MO. The meaning and measurement of work fatigue: Development and evaluation of the three-dimensional work fatigue inventory (3D-WFI). *J Occup Health Psychol*. 2015;20(3):273-88. <https://doi.org/10.1037/a0038700> PMID:25602275
2. International Labour Organization. ILOSTAT. Department of Statistics. Geneva: International Labour Organization; 2017.
3. Spencer MB, Robertson KA, Folkard S. The Development of a Fatigue/Risk Index for Shift Workers. RR446. London: Report to the UK Government's Health and Safety Executive; 2013.
4. International Labour Organization. World Day for Safety and Health at Work 2016-Workplace Stress: A Collective Challenge. Cambridge, England: Cambridge University Press; 2016.
5. International Labour Organization. Keselamatan dan Kesehatan Kerja di Tempat Kerja. Jakarta: International Labour Office; 2013.

6. Dawson D, Chapman J, Thomas MJ. Fatigue-proofing: A new approach to reducing fatigue-related risk using the principles of error management. *Sleep Med Rev.* 2012;16(2):167-75. <https://doi.org/10.1016/j.smr.2011.05.004>
PMid:21784677
7. Shahraki S, Abu Bakar NB. Effects of nervous fatigue on workforce productivity. *Int J Acad Res.* 2011;3:370-8.
8. Yahya T, Atjo W, Masyita M, Syamsiar SR, Bintara BA, Hasnawati A, et al. Determinants of occupational health and safety problems among seaweed workers in takalar regency. *Indian J Public Health Res Dev.* 2019;10(1):1214-9. <https://doi.org/10.5958/0976-5506.2019.00221.3>
9. Akerstedt T, Fredlund P, Gillberg M, Jansson B. Work load and work hours in relation to disturbed sleep and fatigue in a large representative sample. *J Psychosom Res.* 2002;53(1):585-8. [https://doi.org/10.1016/s0022-3999\(02\)00447-6](https://doi.org/10.1016/s0022-3999(02)00447-6)
PMid:12127175
10. Liu Y, Wu LM, Chou PL, Chen MH, Yang LC, Hsu HT. The influence of work-related fatigue, work conditions, and personal characteristics on intent to leave among new nurses. *J Nurs Scholarsh.* 2016;48(1):66-73. <https://doi.org/10.1111/jnu.12181>
PMid:26641770
11. Morrow G, Burford B, Carter M, Illing J. Have restricted working hours reduced junior doctors' experience of fatigue? A focus group and telephone interview study. *BMJ Open.* 2014;4(3):e004222. <https://doi.org/10.1136/bmjopen-2013-004222>
PMid:24604482
12. Uli R, Modjo R. Factors Related to Fatigue among Nurses in Jambi Mental Hospital: A 2017 Study. Dubai, UAE: KnE Life Sciences; 2018. p. 190-9. <https://doi.org/10.18502/kls.v4i5.2552>
13. Huibers MJ, Leone SS, Van Amelsvoort LG, Kant I, Knottnerus JA. Associations of fatigue and depression among fatigued employees over time: A 4-year follow-up study. *J Psychosom Res.* 2007;63(2):137-42. <https://doi.org/10.1016/j.jpsychores.2007.02.014>
14. Rosa RR, Colligan MJ. Long workdays versus restdays: Assessing fatigue and alertness with a portable performance battery. *Hum Factors.* 1988;30(3):305-17. <https://doi.org/10.1177/001872088803000305>
PMid:3169791
15. Younan L, Clinton M, Fares S, Jardali FE, Samaha H. The relationship between work-related musculoskeletal disorders, chronic occupational fatigue, and work organization: A multi-hospital cross-sectional study. *J Adv Nurs.* 2019;75(8):1667-77. <https://doi.org/10.1111/jan.13952>
PMid:30666686