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ORIGINAL ARTICLE

Work Fatigue among Women Fish Processors on the South Coast of Jember District, Indonesia

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ABSTRACT

Introduction: Occupational Health and Safety (OHS) problems need to be addressed because the cause of the high number of work accidents is work fatigue. One of the factors that causes work fatigue is workload. Coastal women, who are identified as a marginal group with a low level of education, have a large role in fishing households and have a high workload. This research aims to analyze work fatigue based on workload. **Methods:** This research is an analytical observational study with a cross-sectional design. The respondents involved were fishermen's wives who lived in the research locus (Puger District). The number of respondents in this study was 75 people using proportional stratified random sampling techniques. The quantitative data collected include sociodemographic factors, namely demographic factors (age and body mass index) and work factors (work period, workload, and work climate), as well as work fatigue factors. Data collection was carried out using questionnaires and measurements. The data in this study were analyzed univariately and bivariately using the Spearman rank correlation coefficient test which was presented in table form accompanied by narrative. **Results:** The results show that 44.0% have a level of heavy work fatigue. The risk factors of age, working time, and workload have a significant relationship with work fatigue at work. Body mass index (BMI) and work climate were not significantly related to work fatigue. **Conclusion:** The high workload of women fish processors causes a lot of work fatigue, so it requires attention from industry owners to manage working time.

Keywords: coastal women, fishermen's wives, women fish processors, work fatigue, workload

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INTRODUCTION

Work fatigue is a crucial Occupational Health and Safety (OHS) problem that must be addressed because it can result in lost work skills, and decreased health conditions and becomes a risk factor for work accidents (Juliana, Camelia and Rahmiwati, 2018; Safira, Pulungan and Arbitera, 2020). Two million workers in the world experience work accidents every year due to work fatigue (ILO, 2016). Data on work accidents in Indonesia that occur every day are 414 work accidents, 27.8% of which are caused by quite high fatigue (Sartono, Martaferry and Winaresmi, 2016). Other data from Directorate General of Labor Inspection Development (Binwasnaker) state that work accident cases in Indonesia amounted to 847 cases, 36% of which were caused by high work fatigue (Safira, Pulungan and Arbitera , 2020).

One of the causes of work fatigue is workload. Each person's workload can be different depending on the activities undertaken or completed. Women's workload in the household can be greater because of the various roles they have to carry out and can be called a triple burden. Triple burden refers to women who have reproductive, productive, and social roles (Rahmawati and Karmeli, 2022). This situation is experienced by many coastal women, especially fishermen's wives, because of their large role and duties in fulfilling the family's economic needs. This cannot be separated from unstable family income because fishermen's work is very dependent on the seasons or uncertain climatic conditions (Indrayani *et al*., 2023). Conditions like this result in the low economic resilience of fishermen's households requiring all family members to participate in

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improving the family's economic level. Likewise, fishermen's wives are required to have income to overcome famine conditions (Wulandari, Indrianti and Hilmi, 2022). This means that the workload carried out by coastal women is very high, causing the risk of work fatigue (Jeebhay, Robins, and Lopata, 2023).

Several previous studies have shown that women are more likely to experience work fatigue because women's physiological conditions are more vulnerable than men's (Bonini-Rocha *et al*., 2021). The triple burden factor in the household which leads to a large physical workload has not been widely discussed, especially for coastal women. Most coastal women have a large role in the small-scale fishing industry by processing fish (Ameyaw *et al*., 2020). Findings from previous research conducted by researchers show that the role of a fisherman's wife is to process fish, help sell her husband's catch, look after the children, do domestic tasks, and be the head of the family when her husband goes to sea. This raises concerns about the possible impact of work fatigue on work accidents and other health problems due to the various roles carried out.

The condition of fishermen's wives as coastal women who have little knowledge a low level of education, and no access to occupational health and safety information indicate that there is no guarantee for the rights of workers, especially female workers. This does not follow the Sustainable Development Goals (SDGs) 8 indicator which aims to protect women to work safely in a work environment that can implement OHS norms (ILO, 2019). Therefore, this study aims to analyze work fatigue based on the workload (triple burden) of women processing fish on the coast of Puger Beach, Jember.

METHODS

The type of research used is analytical observational research with a cross-sectional design which aims to analyze the relationship between the independent variable (risk factors) and the dependent variable (work fatigue) with a measurement method at one time. Risk factor variables include sociodemographic factors, namely demographic factors (age and body mass index) and work factors (work period, workload, and work climate).

This research was conducted in Jember Regency with the research locus in the coastal area, namely Puger District. The selection of the research locus was based on the following criteria: (1) It is a coastal area with the largest number of fishermen (±2000 fishermen) compared to other areas in Jember Regency; (2) The number of coastal women with triple burden criteria (reproductive role, productive role, and social role; (3) Low access to knowledge of working safely and securely. This research was conducted from May 2023 to December 2023.

The target population in this research is coastal women (fishermen's wives) who live in the research locus (Puger District). The accessible population is women who work as fish processors in Puger District, namely 104 respondents spread across seven fish processing industries. The selection of samples from the population considered the following inclusion criteria: (1) female fish processors who are fishermen's wives; (2) have a triple load; (3) have a working period of more than one year. The exclusion criteria in this study were: (1) fishermen's wives who had not processed fish for the last one year and had other jobs besides fish processing. Based on inclusion and exclusion criteria, the total population was 90. The sample size in this study was determined using the Isaac and Michael formula with an error rate of 5%. Based on the results of this formula calculation, a sample of 75 respondents was obtained. The sample selection technique in each industry uses proportional stratified random sampling.

The data collection was carried out using questionnaires and measurements. The questionnaire included questions to collect information about age, years of service, and work fatigue. The work fatigue questionnaire used the Swedish Occupational Fatigue Inventory (SOFI). Measurements were carried out to assess the nutritional status of workers using the BMI method, measuring the hot working climate at several points around the fish processing work area using a heat stress monitor, and measuring workload using the energy consumption or energy expenditure equation. The data in this study were analyzed univariately and analyzed bivariately using the Spearman rank correlation coefficient test which was presented in table form accompanied by narrative. Ethical clearance for this research was carried out at the Faculty of Dentistry, Jember University with number 2028/UN25.8/KEPK/DL/2023.

RESULT

Table 1 presents an overview of respondents' sociodemographic factors namely demographic factors (age and BMI) and work factors (work

period, workload, and work climate), as well as work fatigue factors: 32.0% of workers are aged 41-50 years, with 53.5% having a working period of 1-10 years, 34.7% having an obese body mass index, 80.0% working more than six hours, 57.3% having a moderate workload, 54.7% working in an environment with a temperature of 27.80C and 44.0% have a level of heavy work fatigue.

Table 1 also presents the relationship between risk factors and work fatigue. The results showed that there was a relationship between age, working hours, workload, and the level of work fatigue in female fish processors, but there was no relationship between work period, BMI, work climate and the level of work fatigue in female fish processors.

DISCUSSION

Sociodemographic Factors

The age of fish processing workers in this study was mostly 41-50 years old. The characteristics of coastal workers in other studies state that most workers' ages are in the range of 20 to 29 years and 40 to 49 years (Thamrin *et al*., 2019).

Most workers in fish smokers are women aged over 35 years and only a third of the workers are less than 35 years old (Setyaningsih and Wahyuni, 2020). Research on fish smoking centers shows that most female workers are over 40 years old. Young and old workers have the same type of work and working

Table 1. Sociodemographic Factors, Work Factors and Relationship with Fatigue* (n=75)

Variable	Category	Participants	Work Fatigue				p^
			Very Heavy	Heavy	Medium	Low	
		n (%)	n (%)	n (%)	n (%)	n (%)	
Age	21-30	1 (1.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	0.030
	31-40	20 (26.7)	0 (0.0)	9 (45.0)	10 (50.0)	1 (5.0)	
	41-50	24 (32.0)	1 (4.2)	11 (45.8)	9 (37.5)	3 (12.5)	
	51-60	21 (28.0)	4 (19.2)	11 (52.4)	6 (28.6)	0 (0.0)	
	61-70	9 (12.0)	3 (33.3)	2 (22.2)	2 (22.2)	2 (22.2)	
Body Mass Index (BMI)	Underweight	4 (5.3)	2 (9.1)	11 (50.0)	8 (36.4)	1 (4.5)	0.96
	Normal	22 (29.3)	4 (17.4)	10 (43.5)	6 (26.1)	3 (13.0)	
	Overweight	23 (30.7)	0 (0.0)	2 (50.0)	1 (25.0)	1 (25.0)	
	Obese	26 (34.7)	2 (7.7)	10 (38.5)	12 (46.2)	2 (7.7)	
Work Period	1-10	40 (53.5)	5 (12.5)	15 (37.5)	15 (37.5)	5 (12.5)	0.390
	11-20	18 (24.0)	1 (5.6)	9 (50.0)	8 (44.4)	0 (0.0)	
	21-30	12 (16.0)	1 (8.3)	6 (50.0)	3 (25.0)	2 (16.7)	
	31-40	5 (6.7)	1 (20.0)	3 (60.0)	1 (20.0)	0 (0.0)	
Working Hours	≥ 6 hours	60 (80.0)	4 (6.7)	25 (41.7)	24 (40.0)	7 (11.7)	0.007
	≥ 4 hours	14 (18.7)	4 (28.6)	7 (50.0)	3 (21.4)	0 (0.0)	
	≥ 2 hours	1 (1.3)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	
Workload	Low	27 (36.0)	3 (11.1)	13 (48.1)	6 (22.2)	5 (18.5)	0.024
	Medium	43 (57.3)	3 (7.0)	20 (46.5)	19 (44.2)	1 (2.3)	
	High	5 (6.7)	2 (40.0	0 (0.0)	2 (40.0)	1 (20.0)	
Work Climate	24,80C	13 (17.3)	0 (0.0)	5 (38.5)	5 (38.5)	3 (23.1)	0.275
	26,00C	7 (9.3)	1 (14.3)	3 (42.9)	2 (28.6)	1 (14.3)	
	26,80C	9 (12.0)	1 (11.1)	5 (55.6)	3 (33.3)	0 (0.0)	
	27,80C	41(54.7)	5 (12.2)	19 (46.3)	14 (34.1)	3 (7.3)	
	29,60C	5 (6.7)	1 (20.0)	1 (20.0)	3 (60.0)	0 (0.0)	
Total		75 (100.0)	8 (10.7)	33 (44.0)	27 (36.0)	7 (9.3)	

*Results of Spearman Rank Analysis

^Indicate significance (p<0.05)

hours (Silitonga *et al*., 2022). Fish unloading workers in the Rembang port area have the same characteristics, namely that the majority are over 35 years old (Sutarto, Soemarko and Ichsan, 2022). In other research, it is stated that workers in the fish processing industry are dominated by workers aged less than 40 years (Sutarto, Soemarko, and Ichsan, 2022). This is in line with this research that the variation in the age percentage of fish processing workers does not differ much in each category.

Female fish processing workers have a BMI that is obese and there are still some who have a low BMI. BMI is the result of calculating height and weight and can represent a person's nutritional status. In this table, female fish processors have a BMI that varies and is the same in each category, but the obesity category has the most. In line with research in the field of meat processing, including fish, it shows that the average worker, both male and female, has a BMI that is obese with an average BMI value of 27.84 kg/m2 (Márquez Gómez, 2020). This is also in line with research conducted on informal sector workers who process Lung Fish at Fishing Centers where more than 50% of the workers are women. The characteristics of the respondents in this study were that 85% were in the overweight BMI category (Karmila,Setyaningsih, and Nurjazuli, 2020). Based on research conducted on maritime sector workers, including fish processors, shows that 73% of workers in the maritime sector fall into the obesity category, of which 9% suffer from diabetes compared to non-maritime workers (Evoy and Case, 2022). Research conducted on women in the informal sector in Ethiopia shows that workers have a normal BMI category of 79%, underweight 7.6%, and overweight 13.4% (Mekonnen Yenealem and Geberu, 2020). This is almost the same as this research where the average worker has a normal BMI. However, the BMI categories in other research, namely local female workers belonging to the informal sector, consist of underweight, normal, and overweight with amounts of 52%, 46%, and 2%, respectively (Khan and Machhindranath, 2022). In contrast to this study, the obesity category is the largest.

Work Factors

Most of the fish processors in this study had a working period of less than 10 years. Another study with respondents who worked in the seaweed industry had a distribution of work periods where more than half of the workers (74.3%) worked for a period of one to ten years (Thamrin *et al*., 2019). This is supported by data from the American Bureau of Labor Statistics which show that the median work experience of workers in agriculture, fisheries, and forestry is 4.1 years, meaning that there are half of the workers have worked for more than 4.1 years and the other half have worked. less than 4.1 (Bureau of Labor Statistics, 2022). One of the reasons workers choose to stay in the informal industry is the lack of other job opportunities (Gutierrez *et al*., 2019). Fish processing workers work according to the harvest season, they are not bound by an agreement so they can come or not to the fish processing industry during the harvest season. This is in line with research by Gutierrez *et al*. (2019) which states that most informal workers choose their jobs voluntarily so they tend to remain working in the same job for a long time.

Based on the research results, it appears that most female fish processors work excessive hours. The fish obtained by fishermen is then processed into salted fish, pindang fish, and cold stored (preserved for direct distribution). There were so many fish caught that day that they had to process the fish in large quantities. Following research on the activities of women processing salted fish in coastal areas of Bangladesh which states that many women carry out fish salting activities. This causes women to have to work long hours salting fish for lower and lower wages than men (Rashid *et al*., 2023). Supported by other research, namely in the informal industry among female seafood processing workers in Prakasam district, Andhra Pradesh, India. The long duration of work every day is caused by work that is still done manually without using tools and machines. As many as >80% of workers work more than eight hours per day. For workers who work more than eight hours one of the factors that can influence the risk of injury due to fatigue due to long working hours so that the worker's concentration is disturbed (Navya, Sumit and Tiwari , 2023).

However, this is different from female workers in Negombo, Sri Lanka, most of whom work part-time and will be called upon if needed. Part-time workers will only work 4-5 hours a day because their duties are only small, namely sorting, grading, cutting fish heads, gutting, and drying fish, while washing, salting, and packaging are mostly done by men (Neranjala, Eranga . and Dissanayake,2022). So, the long working hours of women processing fish can be caused by the large number of fish obtained and the many activities carried out during

the fish processing process. Apart from that, every processing process is still carried out manually, which has an impact on the length of time women work to process the fish, even though there are not many workers.

The low number of workers also causes workers to work long hours. This is supported by research data on fish farming, most of whom work 9-12 hours per day (Thorvaldsen *et al*., 2020). In the seafood processing industry in Alaska, it is stated that long working hours can cause the risk of work accidents due to lack of rest (Syron *et al*., 2019). The small number of workers available can extend the working hours of women processing fish because the large number of fish and their activities are not balanced by an adequate number of workers. Long working hours can cause decreased performance, this is due to long working hours so that workers do not get enough rest. This can create a risk of accidents. Therefore, it is necessary to improve and regulate working hours for women fish processors so that they can improve performance and reduce the risk of work accidents. Measuring energy consumption levels can also be used to determine worker workload. The energy consumption level of each worker can produce different pulse rates (Purbasari and Purnomo, 2019). Therefore, the energy consumption expended during work can be calculated based on the pulse rate during work, the higher the pulse rate, the more energy is used during work (Erlianan, Syarifuddin and Trisyiam, 2023).

The research results show that workload results based on energy consumption measurements show that most workers have a calorie requirement of >200-350 KCal/hour so the workload of these workers is included in the medium category. Apart from that, most other workers need 100-200 KCal/hour to do their work so the workload for these workers is low. Low workload can cause workers to feel bored with monotonous work. The feeling of boredom when working arises from the type of work that is done repeatedly (repetitively) (Suntari, Suroto and Ekawati, 2023).

Working positions that are less ergonomic are also one of the work activities that drain workers' energy. Fish processing workers in Puger carry out the process of panning fish in large quantities while sitting in a squatting position and bending slightly. Based on findings in the field, most workers complained of pain in their knees, waist, neck, and elbows. In addition, workers are in these positions for quite a long time. Work carried out with a static body posture will cause workers to exert 50% of the maximum strength their muscles have (Deyulmar, Suroto and Wahyuni,2018).

In the fish processing industry in Puger, especially fish cultivation, most work environments have hot climate conditions. Bearing in mind that there are large stoves that are used to boil fish and there are also several industries that are semi-outdoor so that workers also get exposure to quite hot sunlight during the day. Therefore, the work environment is also another factor that plays a role in influencing workload. This is in line with research results (Hasibuan, Munte and Lubis, 2021), that several factors can influence workload, namely: worker skills, work environment, worker behavior, and worker perceptions.

The Wet and Ball Temperature Index (ISBB) is a parameter for assessing the level of hot working climate which is the result of calculations between dry air temperature, natural wet temperature, and ball temperature (Ministry of Manpower and Transmigration of the Republic of Indonesia, 2018). The results of previous measurements show that most respondents have a moderate workload (57.3%) with a working time of 75% -100% (80%). The ISBB work climate threshold value for workload and time is 28˚C (Ministry of Manpower and Transmigration of the Republic of Indonesia, 2011). Based on the data in Table 1, it is known that there are only five respondents who work in an environment with a work climate above NAB. The hot working climate is caused by the presence of a fish-boiling stove. Some workplaces do not pay attention to the location of the ventilation so that hot steam from the furnace is trapped indoors. A semi-outdoor workplace also allows the sun's heat to enter, especially if work is carried out during the day.

Work Fatigue

Most workers in this study felt severe levels of subjective fatigue. These results are in line with research on UD salted fish processing workers. X stated that most workers experienced severe work fatigue (56.7%) (Yamaula, Suwondo and Widjasena, 2021). Another study of workers at fish-smoking centers showed that the majority of respondents experienced moderate levels of work fatigue (61.9%) (Cahyani and Pramana, 2022).

Most workers experience severe fatigue due to monotonous work processes. Workers must sort the fish by sitting on small chairs which causes the worker's knees to bend and their backs to bend

for a relatively long time. The worker's hands also move repeatedly when putting the fish into the rattan container. Monotonous and repetitive work in a hot workplace causes workers to often feel bored, sleepy, sweaty, and even pain in certain parts of the body. Fish processors' working hours also depend greatly on the arrival time of fish supplies from fishermen. Sometimes workers must work straight away at night to avoid damaging the fish. There are five dimensions of work fatigue in the SOFI questionnaire, namely sleepiness, physical discomfort, lack of motivation, lack of energy, and physical exercise. The distribution of scores on the dimension of work fatigue felt by female fish processing workers in Puger District, Jember Regency has the highest score on the physical discomfort dimension. These results are in line with research (Oktaviara, 2021) which states that the SOFI dimension with the highest total score is physical discomfort.

Symptoms of physical discomfort in fish processors in Puger District include muscles feeling tense, pain in parts of the body, joints feeling stiff and numb, and pain in several parts of the body. In other research, this dimension was also the dominant complaint felt by fish canning workers at PT. Sarandi Karya Nugraha (Sm, Junus, and Hasanuddin., 2021). Symptoms of physical discomfort can be caused by monotonous work that is repeated every day for a long time. Research conducted by Karliman and Sarvia (2019) states that increasing workload will increase complaints of physical discomfort in workers, especially in the arms, back, waist, neck, shoulders, thighs, and calves. The application of ergonomics of posture and work tools as well as work time management is important for managing discomfort in the physical dimension (Karliman and Sarvia, 2019).

Relationship of Sociodemographic Factors and Work Factors Association with Fatigue

This research shows that there is a relationship between age and work fatigue. The proportion of work fatigue is higher at ages over 35 years than at ages less than 35 years. Workers aged more than 35 years have 1.8 times the risk of experiencing work burnout compared to workers aged less than 35 years (Rini, 2023). Research on informal workers conducted by Nuraini (2022) shows that there is a relationship between age and work fatigue. This is in line with other research on informal workers which shows that there is a relationship between age and work fatigue where workers aged less than 45 years are considered young enough to be able to work with a heavier workload compared to older workers (Kurgiyanto. Suroto and Ekawati , 2017).

BMI is not significantly related to work fatigue in the southern coastal area of the Jember district. Similar research was also carried out at UD. X is an informal salted fish processing industry where more than 50% of the workers are women. The results showed that BMI did not have a significant relationship with work fatigue. This is because most workers have good nutritional status so they have enough energy to work, thereby reducing fatigue (Yamaula, Suwondo and Widjasena,2021). This is in line with research conducted in other informal sectors such as rice farmers in Teupin Panah village, West Aceh, where 20 out of 30 workers have an excessive BMI to obesity. The results of the analysis show that nutritional status (BMI) does not have a significant relationship with work fatigue. This could be because even though the farmers' nutritional status is excessive, they have good work performance and optimal nutrient absorption so these variables are not related to work fatigue (Yudha and Fitriani, 2022). Other research conducted on female workers in the same sector, namely agriculture, gave different results. The research results show that BMI can influence the occurrence of one of the indicators of work fatigue, namely musculoskeletal disorders. The relationship between these two variables is stronger in women who are obese. Musculoskeletal disorders are caused by the burden experienced by workers due to fat accumulation (Pal *et al*., 2019). So, it can be concluded that the existence of BMI variables that are not related to work fatigue can be caused by the distribution of BMI categories which are almost the same between normal, excessive, and obese with different individual characteristics and other job characteristics.

One indicator of SOFI in the physical activity dimension is the amount of sweat that comes out of the worker's body. Tired workers will easily experience dehydration; this is due to a lack of fluid intake in workers. However, the results of another study conducted on female shellfish collectors in the informal sector in the Saubara maritime region, Brazil showed that there were more workers with a normal BMI than obese workers. This research states that workers with a normal BMI experience more dehydration than workers with an obese BMI category (Couto *et al*., 2019). The research was conducted on informal workers at fish smoking

centers in Bonang, Demak Regency. Most workers (72%) are women. The research results show that the majority of workers have an excess BMI of 85%, whereas workers with good status (normal) can also have good endurance and work capacity (Setyaningsih and Wahyuni, 2020). Based on existing research, workers' nutritional status will influence their performance which is related to the level of work fatigue. Workers with good nutritional status will have good performance which will reduce the level of dehydration (excessive sweating) and work fatigue.

In this study, no relationship was found between work period and work fatigue. This is in line with research on fish-smoking workers with work periods divided between more than five years and less than five years where there is no significant relationship between work experience and work fatigue (Cahyani and Pramana, 2022). Other research in the fish processing industry which divides work periods into more than 3.5 years and less than 3.5 years shows that there is no significant relationship between work years and work fatigue (Sutarto, Soemarko and Ichsan, 2022).

In contrast to research on seaweed industry workers, the results show that there is a relationship between work experience and work fatigue. The longer the working period, the more boredom it will cause. The longer the work period, the greater the negative impact on the immune system (Thamrin *et al*., 2019). Other research on informal workers states that there is a relationship between work experience and work fatigue. The longer the working period, the greater the work fatigue experienced (Sumardiyono, Rochmah, and Rinawati, 2023). This difference is possible because fish processing work is determined by the season and the uncertainty of marine products. Workers do not necessarily work all the time but depend on the harvest. Apart from that, fish processing work is repetitive work. This reason is supported by research by Malik (2021) which states that there is no relationship between work experience and work fatigue because working time affects workers' skills. Longer working periods make workers more adaptive and increase their work experience.

Working time is related to work fatigue in female fish processing workers in Puger. Apart from that, the correlation coefficient value is 0.309, indicating that the nature of the relationship between the working time variable and work fatigue is sufficient. The direction of the relationship between variables is positive, so the higher the working time, the higher the work fatigue of female fish processing workers in Puger. Long working hours can increase work fatigue. Based on research by Rini and Lanita (2023) on workers in both the formal and informal sectors in Jambi, the majority of workers work more than eight hours. The research results state that working time has a significant relationship with work fatigue. The results of the literature study also show that long working hours are a problem in the fishing industry. Long working hours and fatigue are common problems that cannot be avoided by the fishing industry. Therefore, organizational culture regarding long working hours and work fatigue must be addressed (Lincoln *et al*., 2021).

One of the indicators of work fatigue used in the SOFI instrument is the presence of physical discomfort such as musculoskeletal disorders, for example, muscle tension, joint stiffness, pain in parts of the body, pain in parts of the body, and numbness in parts of the body. Research on fish processors in the city of Udupi, India shows that the average worker works for eight hours (>6 hours). Long working hours affect 81.5% of workers who experience MSP (musculoskeletal pain) (Gundmi *et al*., 2021). This is also supported by other research which shows that lower back pain is significantly related to work fatigue and work attitude (Gawe, Ruliati, and Tira, S 2022). Working hours are related to work fatigue which can result in the risk of injury to female fish processing workers in coastal areas (Thamrin *et al*., 2019). Therefore, working hours need to be increased to avoid fatigue and musculoskeletal disorders which can result in injury.

There is a relationship between workload, methods of measuring energy consumption levels, and work fatigue in female puger fish processing workers. This research is in line with research conducted by Yamaula, Suwondo and Widjasena (2021) that physical workload is related to work fatigue in salted fish processing industry workers because most of the physical activity is carried out in the workplace without using tools. The same thing also happened in the fish processing industry in Puger. Most of the workers carry out the fish processing process, starting from sorting the fish, arranging the fish, and salting the fish, to boiling the fish, everything is done manually without any tools.

Apart from that, workers also work in a squat sitting position with their backs half bent for quite a

long time, namely approximately six hours per day. This predominantly static working position creates a physical workload which can cause workers to feel symptoms of work fatigue with complaints of pain in the back, waist, neck, knees, and calves. Research conducted by (Sm, Junus and Hasanuddin, 2021) also states that there is a relationship between workers' physical complaints on the left calf and right calf with work fatigue in fish canning workers. Fish processing workers in Puger also sometimes must work overtime when fish is abundant. This causes the length of work to increase, and workers are in a static position which causes work fatigue for a longer time. Based on the results of interviews in the field, workers can work 12 hours in a row when the fish supply from fishermen is abundant.

If the workload is not balanced with the worker's work capacity, it can cause work fatigue (Sari, Ramadani and Fahriati, 2022). An increase in physical workload is in line with an increase in energy consumption. If the physical workload exceeds the maximum energy consumption level, the oxygen supply to the muscles will decrease so that an anaerobic process will occur in the breakdown of muscle glycogen into energy and lactic acid (Brooks *et al*., 2022). This will cause symptoms of fatigue. Based on research conducted by (Bláfoss *et al*., 2019), bending or twisting the back for more than a quarter of the working day is associated with increased levels of fatigue in the worker's body. Therefore, workers should stretch regularly as a preventive measure. Working in a static position for a long time will hamper the worker's blood circulation and have the potential to trigger high blood pressure. Stretching between working hours can improve blood flow and reduce muscle pain due to static working positions.

In this study, there were only five respondents who worked in a work climate greater than standard. The results of the Spearman test show that there is no relationship between work climate and the level of work fatigue in female fish processors in Puger District ($p = 0.275 > 0.05$). The results of this research are strengthened by research by Dwiyanti and Mustofani (2019) that there was no relationship between work climate and work fatigue. The heat energy radiated in the work environment is an additional workload for workers which is called heat stress. Heat stress will result in the loss of fluids in the body, causing fatigue due to work (Suma'mur, 2013). The human body's response to hot environments can vary between individuals (Gao *et al*., 2018). A person experiences various symptoms due to a hot work environment, including increased core temperature and heart rate, headaches, or nausea.

The tropical climate in Indonesia means that many people can adapt to temperatures ranging between 28-32°C. This is called acclimatization or a person's adjustment to the surrounding climate so that they get used to it and do not experience the negative impact of certain conditions (Suma'mur, 2013). Repeated exposure to heat over a certain time causes the worker's body to adapt to the environment by increasing sweating efficiency, stabilizing circulation, and relatively lowering core temperature and heart rate (Jacklitsch *et al*., 2016). Workers will be able to adapt to hot climates after 5-7 days and a maximum after 12-14 days. Based on the research results, most respondents have worked processing fish for 1-10 years. Therefore, the workers can be said to have adapted to the hot climate in the fish processing factory. Workers often rest and fulfill their fluid intake by drinking water. Water consumption can replace fluids lost during work (Gao *et al*., 2018).

CONCLUSION

There is a relationship between age, working time, and workload with the level of work fatigue. The proportion of older workers increases complaints of work fatigue. The high workload due to the various roles carried out by women fish processors causes a lot of work fatigue. Long working hours without proper rest periods and static working positions increase complaints of work fatigue. This requires the role and attention of industrial owners to organize working hours and provide ergonomic work equipment to reduce complaints of work fatigue.

Our research provides important insights into the relationship between workload and work fatigue, but this research still has limitations, including the small research sample and limited access to data to determine the population of female workers in the research locus. Future research could include measuring workload at work and home by considering women's triple burden.

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