

# Individual characteristics and daily activities in their environment that connected with musculoskeletal disorder in fishermen communities in Oesapa coastal area, Kupang City, Indonesia

Características individuais e atividades diárias em seu ambiente que se relacionam com transtorno musculoesquelético em comunidades de pescadores na costa de Oesapa, cidade de Kupang, Indonésia

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## Abstract

**Introduction:** A healthy environment is influenced by a population that is physically and mentally healthy. In particular, fishermen on the Oesapa coast have an active role in protecting the environment. The focus of this paper is on the physical health of fishermen in the area. Oesapa Coast is one of the biggest fishing villages in Kupang City. Most of the fishing communities in this area, still use traditional methods in the process of fishing. Every process in catching fish is still fully using fishermen. This can increase the risk of musculoskeletal disorders (MSDs). This study aims to analyze the relationship between individual characteristics and daily activities with MSDs in fishermen. **Methods:** This research is an analytic descriptive study using a cross-sectional study. The number of respondents in this study was 30 men, all of whom were capture fishermen who were still actively working. Data on individual characteristics and fishing activities were obtained through questionnaires and direct observation, while MSDs were measured using the Nordic Body Map method. **Result and discussion:** The results showed that there was a relationship between BMI (p-value = 0.007; R = 0.480), years of service (p-value = 0.025; R = 0.408) and exercise habits (p-value = 0.017; OR = 0.431), with complaints MSDs in fishermen. **Conclusion:** BMI, work period, and exercise habits are factors related to MSDs in fishermen in the Oesapa Coastal region, therefore these factors need special attention so that MSDs in fishermen can be avoided.

**Keywords:** Fishermen; Body Mass Index (BMI), Exercise habits, MSDs.

## Resumo

**Introdução:** Um ambiente saudável é influenciado por uma população física e mentalmente saudável. Em particular, os pescadores da costa de Oesapa têm um papel ativo na proteção do meio ambiente. O foco deste artigo é a saúde física dos pescadores da região. A Costa de Oesapa é uma das maiores vilas de pescadores da cidade de Kupang. A maior parte das comunidades piscatórias desta área ainda utiliza métodos tradicionais no processo de pesca. Todos os processos de captura de peixes ainda são totalmente utilizados pelos pescadores. Isso pode aumentar o risco de doenças musculoesqueléticas (MSDs). Este estudo tem como objetivo analisar a relação entre características individuais e atividades diárias com DME em pescadores. **Métodos:** Esta pesquisa é um estudo descritivo analítico de corte transversal. O número de entrevistados neste estudo foi de 30 homens, todos pescadores de captura que ainda estavam trabalhando ativamente. Os dados sobre as características individuais e as atividades de pesca foram obtidos por meio de questionários e observação direta, enquanto os MSDs foram medidos pelo método Nordic Body Map. **Resultado e discussão:** Os resultados mostraram que houve relação entre IMC (p-valor = 0,007; R = 0,480), anos de serviço (p-valor = 0,025; R = 0,408) e hábitos de exercício (p-valor = 0,017; OR = 0,431), com queixas de MSDs em pescadores. **Conclusão:** IMC, tempo de trabalho e hábitos de exercício são fatores relacionados aos DME em pescadores da região costeira de Oesapa, portanto, esses fatores precisam de atenção especial para que os DME em pescadores possam ser evitados.

**Palavras-chave:** Pescadores, Índice de Massa Corporal (IMC); Hábitos de exercício; DMEs.

## 1. Introduction

All people who work have the potential to experience fatigue both physically and mentally depending on the characteristics of the work being done. Jobs that are dominated by high physical activity will tend to result in physical fatigue (Yassierli and Inayati, 2016). Across all the European Union (EU) member states, work disability, absence from work, and loss of productivity are generally caused by MSDs. The total cost of productivity that is estimated to be lost due to workers suffering from complaints of MSDs among all working ages in the EU reaches 2% of the total gross domestic product. MSDs are injuries or pain in the human musculoskeletal system, including the joints, ligaments, muscles, nerves, tendons, and structures that support limbs, neck, and back. The disorder of the system is generally caused by a body position that is less or not ergonomic when working. If such body position continues repeatedly for a long time, the risk of MSDs will increase (David et al. 2015; Grimby-ekman et al. 2017).

MSDs are considered a significant public health problem and one of the main causes of incapacity or absence from work in the world (Yassierli and Inayati, 2016; Bevan, 2015). Also, it is noteworthy for its long duration, incapacitating character, and the resulting granting of sickness benefits (Barreto et al. 2019). Such conditions can cause accidents or illness and have an impact on work productivity (Charles, et al. 2018; Sholihah et al. 2016; Riningrum et al. 2016) In addition to non-ergonomic body position factors, individual characteristics like age, sex, long period of work, other physical activities, as well as body size can also influence the occurrence of MSDs (Yassierli and Inayati, 2016; Charles, et al. 2018); Riningrum et al. 2016; Mondigir et al. 2017). As explained by Barreto et al. (2019), fishermen occupy one of the largest and most traditional labor categories in the world, representing around 38 million people in 2014, of which 90% were involved in traditional fishing without modern technology. Of these, 84% are in Asia including Indonesia, 10% in Africa, 4% in Latin America, and the Caribbean.

Doing a job as a fisherman has a high risk of experiencing MSDs that is complaints of low back pain (Krisdianto, et al.2015; Bareto et al 2019). Being a fisherman in Indonesia is a job included as the second most prevalent injury (9.5%), which is after labor (10.1%) (Indonesia Ministry for Health Basic Health Research Data,2018). Kupang City is administratively a district as well as a capital city of the province of East Nusa Tenggara (NTT) where 3.193 people are included as a full-time fishing community. Twenty-five percent of them are in the Kelapa Lima subdistrict, most of them resided across Oesapa coastal area (Kupang Municipality Annual Data, 2020).

Most of the fishing communities in the Oesapa coastal area are still classified as traditional fishermen, where the use of physical strength predominates as opposed to the use of machinery. According to the Kupang Municipality Data (2020), "Lampara" is a popular type of fishing gear currently used by the fishermen on the Oesapa coast. The use of Lampara, however, is constantly predisposing the fishermen to a high risk of experiencing MSDs. Apart from this risk, working posture may be also a risk factor for the occurrence of MSDs among fishermen in the Kupang district as has been shown in previous studies elsewhere. One of these studies was reported by Daika (2019) that 73.2% of fishermen in Tanjung Village, Sumenep Regency, Indonesia were at high risk of developing MSDs and 46.4% of them were working under unhealthy working postures. This study, therefore, aims to identify and analyze the relationship between individual characteristics and activity of fishermen against musculoskeletal complaints experienced. The individual characteristics include age, BMI, and the length of time working as a fisherman, while at the same time they were active smokers without regular sports habits.

## 2. Methodology

This research is a correlative analytic study with a cross-sectional approach. The population in this study is the fishing community on the coast of Oesapa who work full time as fishermen and use Lampara (traditional fishing gear). The sampling

technique used was simple random sampling, so the number of respondents was 30 people. Analysis of individual data and daily activities was obtained by the research team through interviews and special fields with fishermen.

Musculoskeletal data were obtained using a Nordic Body Map questionnaire. This questionnaire was used to measure the prevalence of muscle-skeletal disorders. This questionnaire uses a picture of the human body which is divided into nine main parts, namely the neck, shoulders, upper back, elbows, lower back, wrists, buttocks/thighs, knees, and ankles. The questionnaire was very easy to understand and can be completed independently by the respondents or can be assisted by direct interviews (Indonesian Ergonomic Society, 2020).

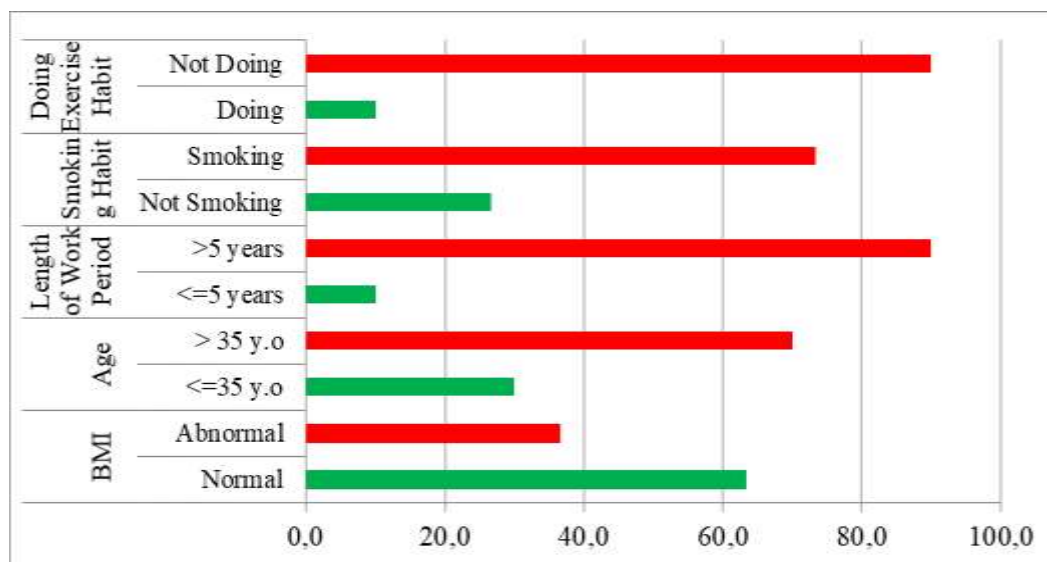
The research data used a nominal scale and an ordinal scale. Data were analyzed by univariate and bivariate, univariate analysis was carried out to see the description of each research variable. Meanwhile, bivariate analysis was conducted to analyze the relationship between the independent variable and the dependent variable in the study. Data analysis using statistical applications with the Spearman rho test. The test results will show the closeness of the relationship between the independent variables and the dependent variable.

### 3. Results

#### Description of individual characteristics and daily activities of respondents

The individual characteristics and the activities of respondents were examined in five variables, namely age, BMI, a period of working, smoking habits, and exercise habits, as shown in Figure 1, below.

**Figure 1.** Graphic representation of individual characteristics and daily activities of the fishermen.



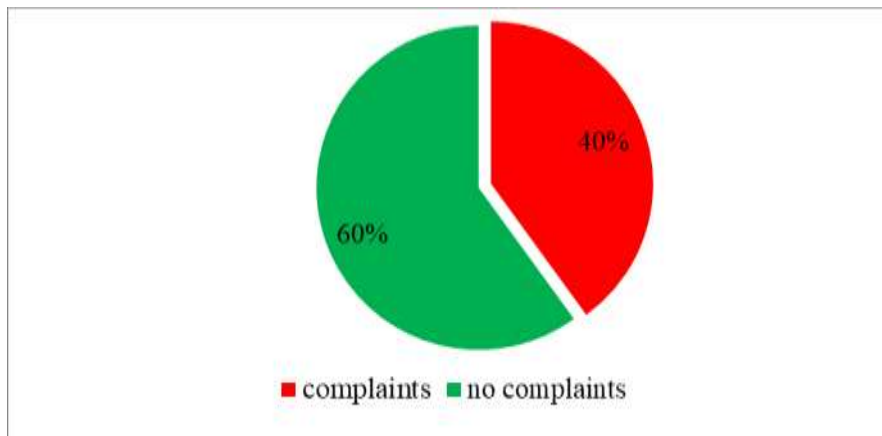
Source: Authors.

Figure 1 shows that four variables of individual characteristics and the daily activities of the respondents studied were in the high-risk category. The vast majority of the respondents (90%) do not develop have a habit of doing exercise. Similarly, the majority of respondents (73.3%) have smoking habits. This study also shows that most (70%) of the fishermen were relatively young (over 35 years old) and 90% of them have worked as a fisherman for over five years. It is interesting, however, to note that only 36.7% of respondents had abnormal BMI and the rest (63.3%) had normal BMI.

### A description of MSDs in respondents

MSDs complaints were assessed using the Nordic Body Map (NBM) method. A description of MSDs in terms of post-work complaints by the fishermen in this study is presented below (Figure 2).

**Figure 2.** Percentage of MSDs post-work fishermen.



Source: Authors.

Figure 2 demonstrated that on the basis of NBM method applied MSDs complaints collected, less than half (40%) of the respondents experienced post-work MSDs complaints while 60% did not have post-work complaints.

### Bivariate Analysis

#### Relationship between age and MSDs

The results of the analysis of the relationship between age and MSDs complaints on fishermen using the Spearman RHO test can be seen in Table 1 below.

**Table 1.** Analysis of the relationship of age with MSDs complaints.

			Age	musculoskeletal complaints
Spearman's rho	Age	Correlation Coefficient	1.000	.356
		Sig. (2-tailed)		.053
		N	30	30
	musculoskeletal complaints	Correlation Coefficient	.356	1.000
		Sig. (2-tailed)	.053	
		N	30	30

Source: Authors.

Table 1 shows that based on the results of statistical tests there is near significant relationship between age and musculoskeletal complaints. However, the significance value obtained is close to the expected significance value ( $p\text{-value } 0.053 > \alpha 0.05$ ). Based on these findings, the researchers believe that there is a relationship between age and musculoskeletal complaints in fishermen when the research was conducted, there were many other contributing factors such as fitness, work environment, workers' mood when answering questions. So that it has an impact on respondents' answers that do not match the actual physical conditions of the fishermen.

### Relationship of BMI with MSDs

The results of the analysis of the relationship between BMI and MSDs in fishermen using the Spearman RHO test can be seen in Table 2 below.

**Table 2.** Analysis of the relationship between BMI and MSDs complaints

		BMI	musculoskeletal complaints
Spearman's rho	BMI	Correlation Coefficient	1.000
		Sig. (2-tailed)	.480
		N	.007
	musculoskeletal complaints	Correlation Coefficient	.480
		Sig. (2-tailed)	.007
		N	30

Source: Authors.

Table 2 shows that there is a significant relationship ( $p$ -value 0.007) between complaints of BMI and MSDs. A close relationship shows a value of 0.480, which means that there is a moderate positive relationship between BMI and MSDs complaints to fishermen. The higher the BMI scale, the greater the chance of experiencing the risk of MSDs complaints.

### Relationship between tenure and MSDs

The results of the analysis of the relationship between a work period and MSDs complaints in fishermen using the Spearman RHO test are shown in Table 3 below.

**Table 3.** Analysis of the relationship of tenure with MSDs complaints.

		work time	musculoskeletal complaints
Spearman's rho	work time	Correlation Coefficient	1.000
		Sig. (2-tailed)	.408
		N	.025
	musculoskeletal complaints	Correlation Coefficient	.408
		Sig. (2-tailed)	.025
		N	30

Source: Authors.

Table 3 shows that there is a significant relationship ( $p$ -value 0.025) between the work period and MSDs complaints. The close relationship shows the value of 0.408 which means that there is a moderate positive relationship between tenure and musculoskeletal complaints. The longer the work period of fishermen, the higher the risk of experiencing MSDs complaints is.

### Relationship between smoking and MSDs

The results of the analysis of the relationship between smoking habits with MSDs complaints in fishermen using the Spearman RHO test are shown in the following Table 4.

**Table 4.** Analysis of the relationship of smoking habits with MSDs complaints.

			smoking habit	musculoskeletal complaints
Spearman's rho	smoking habit	Correlation Coefficient	1.000	.102
		Sig. (2-tailed)		.591
		N	30	30
	musculoskeletal complaints	Correlation Coefficient	.102	1.000
		Sig. (2-tailed)	.591	
		N	30	30

Source: Authors.

Table 4 shows that there is no significant relationship ( $p$ -value 0.591) between smoking habits with MSDs complaints.

#### Relationship between exercise habits with MSDs

The results of the analysis of the relationship between exercise habits with MSDs complaints in fishermen using the Spearman rho test are shown in Table 5 below.

**Table 5.** Analysis of the relationship of exercise habits with MSDs complaints.

			sport habit	musculoskeletal complaints
Spearman's rho	sport habit	Correlation Coefficient	1.000	.431
		Sig. (2-tailed)		.017
		N	30	30
	musculoskeletal complaints	Correlation Coefficient	.431	1.000
		Sig. (2-tailed)	.017	
		N	30	30

Source: Authors.

Table 5 shows that there is a significant relationship ( $p$ -value 0.017) between exercise habits with MSDs complaints. The close relationship shows the value of 0.431 which means that there is a moderate positive relationship between exercise habits and MSDs complaints in fishermen.

## 4. Discussion

The age variables were grouped into >35 years and <35 years old. This grouping is based on previous research which found that workers aged over 35 years had a higher risk of experiencing MSDs compared to workers under the age of 35 years (Kupang Municipality Annual Data, 2020, Barreto et al. 2013). At around 30 years old, the muscle mass begins to decrease, and the older someone is the more his muscle mass decreases. Aging also causes the type of muscle fibers that contract rapidly to decrease dramatically, so the muscles cannot contract quickly in old age 11,12,13. However, this can be overcome by regular exercise. The habit of exercise will increase the ability of the muscles when contrasting at work. Fishermen over the age of 35 are advised to reduce work activities due to the ability of muscle contractions to begin to decline when entering the age of 30 years. However, if this is not the option, it is recommended for fishermen to exercise regularly. This suggestion is related to the results of research that show a relationship between exercise habits with MSDs in fishermen. Exercise can increase the number and size of mitochondria in muscle cells, thereby it increases the amount of oxygen absorbed in the process of respiration. This has an impact on muscular endurance so it is not easy to experience fatigue and injury (Viester et al. 2013). Muscles that are accustomed to being trained through routine sports activities will be more flexible when contracting

while working. Regular exercise also impacts the ideal body mass index. Body mass index is categorized as ideal if it is in the range of 18.5 - 24.9 values (Oley et al. 2018).

The BMI of the respondents in this study falls into an ideal category that is between 18.5-24. This grouping is based on previous research which found that BMI affects MSDs. BMI with a scale higher than the normal scale has a higher risk of developing MSDs with a longer recovery period. The results obtained indicate that fishermen with an ideal BMI are more seldom to experience musculoskeletal disorders compared to fishermen who have higher than ideal BMI. Therefore, it is expected that fishermen with an ideal BMI have to continue to maintain it in various ways such as by regular exercise and a healthy lifestyle to reduce the risk of experiencing musculoskeletal complaints after work (Villa-Forte et al. 2019; Viester et al. 2013; Oley et al. 2018).

Data analysis shows that there is a close relationship between the length of work and the incidence of musculoskeletal complaints. By the results of research conducted on 9,482 people in Indonesia, 16% experienced MSDs disorders. In addition, the research results published by the Indonesian Ministry of Health stated that there were about 40.5% of work-related diseases (Al-Bashaireh et al. 2019). The longer the working period, the more workers are affected by muscle and tissue complaints. This also has to do with age, because increasing age and the length of the working period have an impact on decreasing muscle condition and increasing the risk of pain to injury (Nguyen, 2017; Oley and Asrifuddin, 2018). Previous research also found that fishermen with a service life of >10 years had higher musculoskeletal complaints than fishermen with a service life of <10 years (Oley and Asrifuddin, 2018; Younan et al. 2019).

In this study, fishermen's tenure was narrowed down to a group of respondents with > 5 years and <5 years, so that information on working life variables can be easily obtained. The results obtained showed that the work period of more than 5 years had a significant relationship with musculoskeletal complaints. Chronic work fatigue is closely related to age and years of work. It was reported that MSDs complaints had a significant correlation with age, years of service, workload, and chronic fatigue (Cheng et al. 2013; Younan et al. 2019). The findings of this study are consistent with what was stated by Woodhead et al. (2018) that knowledge about the health and safety of fishermen and their families, especially fisherwomen, is still limited. Communities that make a living from artisanal fisheries are often among the poorest in the population (Younan et a. 2019). Poor knowledge, poverty, erratic working time, traditional fishing gear, and a high dependence on the seasons of fishing are closely related to the high number of occupational accidents and diseases.

According to the researchers, this is also inseparable from the age variable in this study. Fishermen who have worked for more than 5 years are all fishermen who are over 30 years old. Therefore the fishermen are recommended to limit muscle activity while working, or by doing exercises regularly to maintain the ability of muscles to contract when working. The results of this study were confirmed by previous findings that there was a significant relationship between musculoskeletal disorders and physical exercise levels (Tunwattanapong et al. 2016; Hendi et al. 2019; Kambaru et al. 2021). A regular stretching exercise program performed for four weeks can decrease neck and shoulder pain and improve neck function and quality of life for office workers who have chronic moderate-to-severe neck or shoulder pain. Recent findings of Cheng et al. (2013), as well as Kambaru et al. 2(021), show that workplace exercise is beneficial to both employers and workers, so a risk analysis is needed for the early identification of occupational hazards and to prevent the health consequences and costs associated with absenteeism.

Exposure to secondhand smoke can cause disorders of the musculoskeletal system including bones, muscles, tendons, ligaments, and nerves. Tobacco smokers experience decreased bone mineral density which increases the risk of osteoporosis and fractures (Viester et al. 2013). Similarly, Syawal et al. (2015) reported that there is a significant relationship between smoking and musculoskeletal disorders in the smelting section of ferronickel factory workers. Furthermore, exposure to

cigarette smoke causes longer recurrent musculoskeletal disorders (Oley and Asfudin, 2020). Some of the findings above explain that smoking is harmful to the health of workers who have a smoking habit. Although in theory, exposure to cigarette smoke is associated with musculoskeletal complaints, this claim has not been proven by this study where that was no statistically significant relationship between smoking habits and musculoskeletal complaints in the fishermen observed. These results are in line with previous studies which also found that there was no direct relationship between smoking habits and musculoskeletal complaints (Al-Bashaireh, et al. 2019). Previous studies show that smoking was significantly associated with musculoskeletal pain after adjustment for other relevant factors such as BMI indicating an association with smoking status, after adjusting for confounders (Recio-Rodriguez, 2013).

Based on the observations made, it is known that although not all respondents have a smoking habit, exposure to cigarette smoke is still acceptable while in the work environment. This is thought to cause bias so that the results of statistical tests cannot prove significantly the relationship between smoking habits and musculoskeletal complaints. Fishermen are vulnerable to suffer from MSDs due to their work. Age decreased muscle mass, the ability of muscles to contract properly, exercise is not regular, and BMI is not standard. Smoking can worsen ho health conditions even though there is no direct relationship to the incidence of MSDs.

## 5. Final Considerations

This research has once again proven that workers, in this case, fishermen within traditional coastal communities in developing countries are still subject to possibilities of severe musculoskeletal pains and injuries due mainly to the nature of the job worked, inadequate education, and economic hardships forced them to labor more than they can afford to regardless of age and length of time work in a day in addition to general lack of awareness within the fishermen. For these reasons it is reasonable to suggest that it is very important for fishermen to be always given regular supervision and awareness building by the relevant local authorities. Therefore, it is reasonable to conclude that the objective of the study was generally achieved.

Based on the discussion, several concluding points are as in the following. First, there is a near significant relationship between age and musculoskeletal complaints, showing the older the fishermen, the higher the possibilities of experiencing MSDs. Second, a close relationship between the length of work and the incidence of musculoskeletal complaints, Third, There is a moderate positive relationship between exercise habits and MSDs complaints in fishermen

Fourth, although in theory, exposure to cigarette smoke is associated with musculoskeletal complaints, this claim has not been proven correct by this study where there was no statistically significant relationship between smoking habits and musculoskeletal complaints in the fishermen observed. Fifth, the results obtained showed that the work period of more than 5 years had a significant relationship with musculoskeletal complaints. Sixth, there is a significant relationship between the work period and MSDs complaints. Seventh, there is a significant relationship between exercise habits with MSDs complaints. Eighth, the results obtained indicate that fishermen have ideal BMI which is possibly related to misunderstanding of the fishermen on stating their bodyweight data.

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