Ergonomics Awareness as Efforts to Increase Knowledge and Prevention of Musculoskeletal Disorders on Fishermen

Qomariyatus Sholihah\textsuperscript{a*}, Aprizal Satria Hanafi\textsuperscript{b}, Ahmad Alim Bachri\textsuperscript{c}, Rahmi Fauzia\textsuperscript{d}

\textsuperscript{a}Public Health, Faculty of Medicine Lambung Mangkurat University Jl. A. Yani Km. 36,3 Banjarbaru 70714 Banjarbaru South Kalimantan Indonesia
\textsuperscript{b}Alumni of Public Health, Faculty of Medicine Lambung Mangkurat University Jl. A. Yani Km. 36,3 Banjarbaru 70714 Banjarbaru South Kalimantan Indonesia
\textsuperscript{c}Faculty of Economy, Lambung Mangkurat University Banjarmasin 70123 South Kalimantan Indonesia
\textsuperscript{d}Psychology, Faculty of Medicine Lambung Mangkurat University Jl. A. Yani Km. 36,3 Banjarbaru 70714 Banjarbaru South Kalimantan Indonesia

Abstract

The fisheries sector is one of the high risk jobs. Fishermen often have to face the fatigue risks. The main cause that emerge the impact of their workloads is the way they behave, that pay less attention to ergonomic principles. The purpose of this study is to explain the effect of counseling ergonomic work towards a working knowledge of musculoskeletal disorders and complaints at Saijaan Fishermen Association. The research used a method of Pre- Experimental with one group pre-test-post-test design. This design used a single group, with the main characteristic was to compare the group and individual without any group comparison. The research population was the Fishermen Association Saijaan. Samples were taken from 186 fishermen. Wilcoxon test results showed that there were differences in the Fisherman knowledge before and after the counseling activities with the p value of 0.021 and differences in musculoskeletal disorders at Fisherman's complaints before and after the counseling activities with p value 0.013.

Keywords: Counseling; ergonomics; knowledge; musculoskeletal; fishermen.
1. Introduction

Occupational Health and Safety (K3) is an effort to create a safe and comfortable working atmosphere to achieve highest productivity. Therefore, K3 is a mandatory to be implemented on any kind of field work without exception. K3 effort is expected to prevent and reduce the risk of accidents and occupational diseases. K3 is an important aspect as supporting welfare and increased productivity. K3 is considered to reduce the emerge risk of Occupational Diseases (PAK) (Salim, 1999).

One of the activities that have a job hazard the K3 is diving in fishing activities. Fishermen are considered as Traditional divers in Indonesia that dive to get the catches (COREMAP, 2009). In Indonesia, most residents work as fishermen. Fishing activities that they have to carry out need to be supported by optimum body condition and power, possessed by each individual. There must be a balance between these two things because it will have direct impact on their health and performance. Fishermen have to work continuously and perform continuous movements during the work, thus they can experience muscle fatigue. Ergonomic working attitude will directly leads to fatigue and various disorders of the skeletal muscle system, while require greater energy in performing similar efforts, for example in the process of fishing that resulted fatigue occurs sooner (Manuaba, 1990). Such conditions might result accidents and occupational diseases (Sutjana, 2006).

According to Dharmawirawan et al. (2012), on preparatory fishing activities, they discovered the dangers of ergonomic form of noise, slipped risk caused by slippery floor, mechanical dangers like thorn fish, blow of high air pressure in the tube compressors, chemicals such as oil and fuel, rust, pressure fire hoses corrosive, high air pressure. They also have to face the dangers while checking ocean currents, ex being scratched by coral, extreme pressure, freezing temperatures, bites by marine lives, sting fish, coral toxic, gas poisoning of carbon monoxide (CO), carbon dioxide (CO₂), and nitrogen, shortage of air intake of the compressor, poor vision, strong currents, propeller spinning and hot temperature (Dharmawan and Modjo, 2012).

All the works performed by human in their life have to be done in accordance with their body condition and the energy that they have. This conformity is related to maintain the balance between work stations and the condition of the human body, to follow the ergonomics principles. This balance will have a big impact on the health and human performance at work (Nugroho et al., 2013).

Ergonomics according to the Occupational Safety and Health Administration (OSHA) is a relationship between human and work environment that does not cause a disturbance. In outline conclusion, ergonomics means the occurrence of a healthy, safe, and convenient working environment for humans (Andayasari and Anorital, 2009). Working attitude that was not in accordance with the condition of the body could cause physical complaints such as pain / muscle disorders / musculoskeletal. Musculoskeletal disorder is the condition that the muscles suffered load from the static and repetitive activities that happened consecutively for quite long period of time that lead to complaints of damage to the joints, ligaments and tendons. This is caused as the result of unnatural working postures caused by the characteristics of the task demands, work tools and work stations that are not in accordance with the capabilities and beyond the workers limitations (Masrah, 2009).

European Foundation for the Improvement of Living and Working conducted a survey on 235 × 10⁶ workers in 31 European countries in 2007. This survey obtained the results as follows: 25 % experienced back pain and 23 % muscle aches, that was caused by musculoskeletal disorders. In Indonesia, according to the Ministry of Health survey, it indicated that about 40.5 % of workers illness have an interconnection relation with their work. Based on the study of 482 workers in 12 cities in Indonesia, health problems experienced by workers are generally in the form of musculoskeletal disorders, about 16 % (Masrah, 2009).

Indonesian fishermen in general are still using the traditional way of working, in form of physical energy, rather than using the modern tools as a substitute for human labor. Types of activities that they carried out starting from the preparation of the net and the necessary equipment, net stocking, as well as the removal of nets and other fishing supporting equipment (Dharmawan and Modjo, 2012).

A person that keeps perform the same movements continuously for a quite long period of time will feel physical fatigue. This fatigue was caused by constantly body movements that without being noticed, leads to a decrease in the muscular system. Decrease that appears on the muscular system is caused by muscle tension, as a result of movements performed, resulted the decrease of muscle strength of the lower extremities that leads to motion slackness, short steps, un firmly foot stepping firmly and more easily swayed (Wijayanti, 2013). According to
Harrianto (2009), improper work equipment design could cause musculoskeletal disorders.

Fatigue level of the fishermen could be affected by many causes, one of those is the workload faced by them. The workload is the length of period that the person did their work activities according to the ability and work capacity without showing signs of fatigue. Based on the standpoint view of ergonomics, it stated that every workload received by a person shall be in accordance and balance with the physical and cognitive ability, as well as the limitations concern while receiving the workload (Nugroho et al., 2013).

The majority reasons of the outcome impact of workload mostly caused by the workers behavior that paid less attention to ergonomics (arrangements situation on work environment). Factors need to be considered in preparing ergonomics plan related to humans is the physical or mental limitations possessed by humans that differ from one to another. Ignorance of these factors could resulted negative impact on the workers health that came up in the form of complaints as an illness indication (Intani, 2013).

Based on preliminary field observation, Fishermen often do the bent activity with insufficient rest period that caused an increased in the rhythm of their heart in order to give such adjustment to their work. Besides, the way they lift up the nets and fishing equipments often done without concerning the ergonomic effect. Fishermen often do not bend their knees as they supposed to do while bending their body to do their work. Also sometimes the fishermen working from a distance that does not reach the range of hands that caused excessive muscle work.

Standing position that does not supports ergonomics could resulted the cause of musculoskeletal disorders. Keep doing this position for quite a long time, caused the muscles tend to work static, that will lead to the decrease in tissue elasticity and increased the muscle tension that caused back pain. Pressures on the spinal cord bearing could result the spinal disc hernia. Sitting posture that does not ergonomics could cause an increase in pressure on the disc. The more the ergonomic sitting posture while working, the lesser the disorder possibility of the visceral organs and spine, thus the smaller the risk in getting low back pain as well (Silviyani, 2013).

Based on the above background, research is conducted to explain the effect of ergonomic working counseling towards ergonomic working knowledge at Saijaan Fisherman, Kotabaru District of North Sea Island located in South Kalimantan and to measure the fishermen complaints on musculoskeletal disorders.

2. Research methods

This research used the experimental methods with quasi-experimental study design running through the Pre Experimental design that used with one group pre-test-post-test. This design used a single group, with the main characteristic was to compare the group and individual without any group comparison. The different result on the final test score (T-2) with the initial test (T-1) is considered as the effect on the extension efforts (X) (Musafaah et al., 2013). Research samples referred to the respondents of 186 fishermen in this study were determined by using a non-probability sampling technique with purposive sampling method. The study was conducted to explain the effect of ergonomic working counseling towards ergonomic working knowledge at Saijaan Fisherman, Kotabaru District of North Sea Island located in South Kalimantan and to measure the fishermen complaints on musculoskeletal disorders.

The systematical procedures for counseling derived as follows:

- Briefing, given consecutively for 2 d. Respondents were given the knowledge for various disciplines related to public health, covering the health and safety, ergonomics, occupational diseases, health promotion, environmental health as well.
- Field observations
- Submitted the application letter to the Fishermen Association Saijaan on their willingness to give permission for running the research activities.
- Implementation.

Research instruments in this study were questionnaire containing the material of subjects’ knowledge on the ergonomics in doing their work (fishing). Questionnaires were administered before and after counseling conducted to see the effect of these activities. Besides, musculoskeletal disorders were measured using the Nordic Body Map (NBM) spreadsheet and Visual Analog Scale (VAS) tool to determine the scale of subjective pain, derived into a bit pain, pain and painful to fishermen. Measurements were taken before and after counseling on ergonomics to
Fishermen.

Researcher recorded the results of complaints level from respondents, then categorized the complaints from VAS scale (1-10) into 4 complaint levels in NBM spreadsheet within categories as follow (Adhyati, 2011):

a. 0 = no pain
b. 1 to 3 = little pain
c. 4 to 6 = moderate pain
d. 7 to 10 = painful

Data that have been obtained will then be edited for completeness and accuracy analysis. Furthermore, the data were tabulated and analyzed using the Wilcoxon test with a 95% degree of confidence explain the effect of ergonomic working counseling towards ergonomic working knowledge at Saijaan Fisherman, Kotabaru District of North Sea Island located in South Kalimantan and to measure the fishermen complaints on musculoskeletal disorders.

3. Result and discussions

3.1. Univariate analysis

The main focus of this research is to analyze the knowledge of ergonomics and defined complaints on musculoskeletal disorders before and after counseling. Overview results on knowledge of ergonomics and complaints on musculoskeletal disorders before and after counseling as follows:

3.1.1. Knowledge

Based on the questionnaire results on 186 respondents, the average respondents’ knowledge that obtained through this research can be seen in Table 1.

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Knowledge before</th>
<th>Knowledge after</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Valid</td>
<td>186</td>
<td>186</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mean</td>
<td>52.50</td>
<td>76.00</td>
</tr>
</tbody>
</table>

Based on the above table, it showed the difference in Fisherman's knowledge before and after the counseling activities. After counseling, fishermen knowledge was increased. Prior and after the activities, the average knowledge of participants was 52.50 and 76.00, respectively.

3.1.2. Musculoskeletal disorders

Based on the questionnaire results on 186 respondents, there were differences of complaints on musculoskeletal disorders before and after counseling. The differences on complaints that obtained through this research can be seen in Table 2.

<table>
<thead>
<tr>
<th>Musculoskeletal disorders complaints</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>No complaints</td>
<td>77</td>
<td>123</td>
</tr>
<tr>
<td>Little complaints</td>
<td>61</td>
<td>34</td>
</tr>
<tr>
<td>Moderate complaints</td>
<td>42</td>
<td>25</td>
</tr>
<tr>
<td>Hard complaints</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

Based on the above Table, it showed the difference in in musculoskeletal disorders in Fisherman complaints before and after the counseling activities. After counseling, musculoskeletal disorders complaints were decreased.
3.2. Bivariate analysis

3.2.1. Analysis on the difference knowledge before and after ergonomics counseling on Fishermen’s working condition

Bivariate analysis was performed to determine the differences of knowledge before and after ergonomics counseling on Fishermen’s working condition, by using the Wilcoxon test. The Wilcoxon test results that obtained through this research can be seen in Table 3.

<table>
<thead>
<tr>
<th>Test Statistics</th>
<th>Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>-.5765*</td>
</tr>
<tr>
<td>Asymp. Sig. (2-tailed)</td>
<td>.021</td>
</tr>
<tr>
<td>Monte Carlo Sig. (2-tailed)</td>
<td>Lower Bound: .000, Upper Bound: .049</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>95% Confidence Interval: 95%</td>
</tr>
<tr>
<td>Monte Carlo Sig. (1-tailed)</td>
<td>Lower Bound: .000, Upper Bound: .049</td>
</tr>
<tr>
<td>Sig. (1-tailed)</td>
<td>95% Confidence Interval: 95%</td>
</tr>
</tbody>
</table>

a. Based on negative ranks.
b. Wilcoxon Signed Ranks Test
c. Based on 186 sampled tables with starting seed 264883735.

Data were analyzed using Wilcoxon test. The used of this test particularly based on the parametric statistical data that were not normally distributed. Kolmogorov-Smirnov was used to test the normality of the data distribution. The prior result of this test for knowledge variable prior to counseling by using the Kolmogorov-Smirnov with the p (0.000) > 0.05, concluded that the data were not normally distributed, neither after the counseling, while using the Kolmogorov-Smirnov with the p (0.000) > 0.05.

Wilcoxon test with confidence level of 95% used to examine the differences of knowledge before and after ergonomics counseling on Fishermen’s working condition. The statistical result of the test showed the value of p = 0.021. Based on this, it can be concluded that Ho was rejected (p < 0.05), means that there was significant difference of knowledge before and after ergonomics counseling on Fishermen’s working condition.

The results showed that respondents are paid serious attention and deep concerned on the ergonomics material presented. During the counseling time, Respondents enthusiasm can be seen during through their feedback on answered the given questions, thus the information can be well received. A good response from the respondents is expected to increase their knowledge, that allowed them to apply the ergonomics principles at work.

Based on research conducted by Ratna (2011), it concluded the important in following the counseling activities well, to give the significant effect on the knowledge and interest received in counseling given. High attention of an information given will make the information can be received well so it can improve the knowledge of the respondents (Ratna, 2011; Fitriani, 2011). In addition, the environmental conditions also support the activities such as the availability of facilitating the counseling, and also choosing the right time to conduct the counseling will give better result and can be proven to increase respondent's knowledge significantly (Fitriani, 2011).

This study was in line with the results of the study that conducted by Cicilia et al. (2012), within the statistical test of obtained the p = 0.000 (< α 5 %), which means there was significant influence between the knowledge prior and after the administration of health counseling to the elementary school students.

This research was also supported the research conducted by Widyawati (2010) in which the statistical test result of obtained the p = 0.000, which means there was counseling influence to the knowledge of elementary school students.

Counseling is one of the effective ways to convey information quickly to many people. Also counseling is the
most practical and simplest way to convey information to others in an informal educational system (Akhmad, 2013). In addition, counseling process involved the listening, speaking and seeing activities that make the method effective. Knowledge received can be used as the basis for the development of their habits. Changes in knowledge may lead to changes in habits (Astuti, 2009).

3.2.2. Analysis on the difference of complaints on musculoskeletal disorders before and after ergonomics counseling on fishermen

Bivariate analysis was performed to determine the differences of complaints on musculoskeletal disorders before and after ergonomics counseling on Fishermen, by using the Wilcoxon test. The Wilcoxon test results that obtained through this research can be seen in Table 4.

<table>
<thead>
<tr>
<th>Test Statistics&lt;sup&gt;a&lt;/sup&gt;</th>
<th>MSDs</th>
<th>Z</th>
<th>Asymp. Sig. (2-tailed)</th>
<th>.013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>-4.855&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monte Carlo Sig. (2-tailed)</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. Lower Bound Confidence Interval</td>
<td>.000</td>
<td>Upper Bound Confidence Interval</td>
<td>.036</td>
<td></td>
</tr>
<tr>
<td>Monte Carlo Sig. (1-tailed)</td>
<td>.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. Lower Bound Confidence Interval</td>
<td>.000</td>
<td>Upper Bound Confidence Interval</td>
<td>.036</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> Based on negative ranks.

Data were analyzed using Wilcoxon test. The used of this test particularly based on the parametric statistical data that were not normally distributed. Kolmogorov-Smirnov was used to test the normality of the data distribution. The prior result of this test for knowledge variable prior to counseling by using the Kolmogorov-Smirnov with the p (0.000) > 0.05, concluded that the data were not normally distributed, neither after the counseling, while using the Kolmogorov-Smirnov with the p (0.000) > 0.05.

Wilcoxon test with confidence level of 95 % used to examine the differences of knowledge before and after ergonomics counseling on Fishermen’s working condition. The statistical result of the test showed the value of p = 0.013. Based on this, it can be concluded that Ho was rejected (p < 0.05), means that there was significant difference of musculoskeletal disorders complaints before and after ergonomics counseling on Fishermen’s working condition.

Counseling on ergonomics given to the fishermen has provided additional knowledge on how to work more comfortable. This is proven by the decrease of complaints on musculoskeletal disorders. Increased knowledge on ergonomics enable them to practice what they have learned at their work. Fishermen said that their bodies became more comfortable after knowing what and how ergonomics work.

According to the research conducted by Muitahidah (2014), fishermen often complaining having painful feeling all over their body after capturing activities with monotonous continue movement and lifted working position that will rise the complaints of suffering musculoskeletal disorders. According to Josephus (2011), the process of catching fish in the sea is often done by using nets. When fishermen pulled the net with both hands for a long period of time along with the working attitude of bowing without practicing some necessary stretching activities before and without any sufficient rest period, will tend to emergence the fatigue and pain in skeletal muscles.

Working time during the fishing activities lasts for 6 h, from 23:00 pm to 05:00 am. During the fishing process, fishermen are in a sitting position in long time, pulling the net repeatedly and slow due to the manual operating system of the net, resulted not physiologically working attitude. Such working conditions can increase the risk of
accidents and the emergence of cumulative disorders in muscles.

Work complaints as disorder results of the musculoskeletal system during the fishing process are more involving the skeletal muscle sections, starting from a net stocking up to the pulling process of the rope netting purse seine. Complaints that were often felt after the work completion were the pain in the right wrist and left, back pain, pain in hip, pain in the buttocks, knees and pain in the left leg and right (Corlett, 1992).

International Labor Organization (ILO) stated that safety and healthy aspects for fishermen in catching fish is a matter that must be seriously considered to be aware of. This is because the working environment containing many dangers. The ILO also mentioned that every fisherman must pay attention to ergonomics in the work, including the process of fishing (ILO, 2007).

In addition to ergonomic working attitude, Fishermen should also be given the knowledge to make their tools towing nets more ergonomics. These tools will facilitate the Fishermen to simplify and accelerate in carrying out their work and reducing the power required at the time of pulling of the nets. This will help reduced the risk of accidents and fatigue on Fisherman in carrying out their work (Ubaidillah, 2014).

4. Conclusion

Based on the research analysis and evaluation, there was a difference in the knowledge of fishermen before and after counseling activities with the p value of 0.021 as well as the difference in musculoskeletal disorders complaints of fishermen before and after counseling activities with p value 0.013. After given such counseling there was an increased of knowledge and a decreased in complaints of musculoskeletal disorders. Prior to counseling activities the average knowledge of respondents was 52.50 and after counseling activities the average knowledge increased to 76.00 and little, moderate, and hard musculoskeletal disorders complaints were decreased, and increased the number of fishermen who do not have any complaints on musculoskeletal disorders.

Acknowledgements

The authors would like to acknowledge the Public Health Study Program of Mangkurat University for its noticeable help, and Officials and Community of Saijaan Fishermen.

References


