Musculoskeletal disorder survey for pond workers

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Abstract. Musculoskeletal disorder will affect worker performance and become serious injury when ignored, so that workers cannot work normally. Therefore, an effective strategy plan is needed to reduce the risk of musculoskeletal disorder. A pond worker is profession with high risk of physical complain. Four main activities are ponds preparation, seed distribution, pond maintenance, and harvesting. The methods employed in this current musculoskeletal disorder survey are questionnaire and interview. The result from 73 questionnaire shown that most of pond workers were working for 7 days a week. Prevalence physical complain are on neck, shoulders, upper back, lower back, and knees. The level of perceived complaint is moderate pain. However, most of them do not contact therapists or physicians. Therefore it is necessary to improve the working methods to be able to reduce physical complains due to musculoskeletal disorder.

1. Introduction
Aquaculture can be defined as a human intervention to increase aquatic productivity through cultivation activities. What is meant by cultivation activities is the maintenance activities to reproduce, growth, and improve the quality of aquatic biota so that it can be profitable [1]. Specifically, the aims of aquaculture are for (1) food production, (2) natural stock improvement, (3) fish production for recreation, (4) fish production, (5) ornamental fish production, (6) organic materials recycling and (7) production of industrial materials.

The fishery businessmen who are usually fishermen, pond workers, fishery processors and product marketers are expected to increase productivity, added value, and competitiveness, as well as build a modern and integrated production system from upstream to downstream. Like most of pond workers in Indonesia, the work process is conducted manually. A variety of manual activities carried out are lifting/lowering, pushing/pulling, twisting the body, carrying objects and holding/restraining objects. Work manuals that rely on musculoskeletal are very susceptible to health problems. Repetitive work and work position errors lead to the accumulation of pain that will ultimately have a bad effect for workers.

Based on the information from [2], the musculoskeletal disorders affect workers in various industries. Musculoskeletal disorders may affect a worker’s performance, or even if they are not seriously aware, it can result in a musculoskeletal injury so that workers cannot work normally. Therefore, it is necessary to have an effective strategy plan that can reduce the risk of musculoskeletal injury. However, until now there has been no integrated data of musculoskeletal disorders in Indonesia, including on pond workers. The problem formulation that is solved is how the condition of the fish farmer's complaints against the disorders (pain, agony, and discomfort) in the part of the body caused by the manual work that they do.
The various positions that are observed are lifting/lowering, pushing/pulling, twisting the body, carrying objects and holding/restraining objects. The results of the survey that will be conducted produce the prevalence data of musculoskeletal disorders on pond workers in Surabaya and its surrounding areas. These data can be used as a basis for consideration in designing an effective ergonomic intervention to reduce the risk of musculoskeletal injury.

2. Literature Review

Currently, aquaculture is responsible for the livelihood and nutrition of millions of people [3]. What is meant by cultivation activities is the maintenance activities to reproduce, growth, and improve the quality of aquatic biota so that it can be profitable [1]. Aquaculture is divided into three parts, namely freshwater aquaculture, brackish water aquaculture, and sea water (mariculture). [4] explained that aquaculture development is important because aquaculture provides a high quality of animal protein and other essential nutrients at an affordable price. Aquaculture is also important because it provides job opportunities, cash income and is a valuable export commodity. [5] reinforced that aquaculture in rural areas contribute to poverty alleviation directly through small scale fisheries cultivation for consumption and income. Their indirect contributions are through the provision of employment for the poor in commercial cultivation. Shrimp is one of the commodities in aquaculture. The Vannamei shrimp have been domesticated for several generations, and have become the most important shrimp species in the world [6].

Physical work - often referred to as a heavy work, manual labor, muscle work or manual work - can be defined as (1) activities that require a strong physical (muscle) effort during the work process, and (2) work that requires energy consumption - Kcal/min (measured by heart rate or O2 consumption); which is then used as a measure to determine the weight of the work activities. Mechanization and automation will be considered to be able to accelerate the work process, increase productivity and more importantly reduce the physical workload that must be done by humans. Manual work activities that are mostly done by many pond workers are lifting/lowering, pushing/pulling, twisting the body, carrying objects and holding/restraining objects.

Musculoskeletal disorders are also called as MSDs. [7] suggested that musculoskeletal disorders (MSDs) include various inflammatory and degenerative conditions affecting the muscles, tendons, ligaments, joints, peripheral nerves, and supporting blood vessels. These conditions include clinical syndromes such as tendon inflammation and its related conditions (tenosynovitis, epicondylitis, bursitis), nerve compression disorders (carpal tunnel syndrome, sciatica), and osteoarthritis, and also less standard conditions such as in myalgia, lower back pain and the other regional areas with the condition of the pain syndrome caused by a known pathology.

The most commonly affected areas of the body are the back, neck, shoulders, arms, and hands. Although recently the lower extremities have received more attention, the accurate data on the incidence and prevalence of musculoskeletal disorders are difficult to compare between countries.

However, MSDs are the largest category of occupational illness, representing one-third or more of all occupational diseases listed in the US, Nordic countries, and Japan [8]. Standardization is required in the analysis and recording of musculoskeletal disorder symptoms [9]. Assessment of pain is needed to confirm the level of pain felt by the respondents. This is done to see the severity as a result of working in a non-ergonomic position. Assessment of pain is based on [10] using 0-10 numeric pain rating scale.

3. Research Methodology

3.1. Identification of Observed Objects

The reason of selecting pond workers as an observation object is because they are currently do their job manually, consisting of the activity of lifting/lowering, pushing/pulling, twisting the body, carrying objects and holding/restraining objects. The entire works rely on musculoskeletal strength in its implementation. Mismatching of movements, repetitive and lengthy movements, and performing a job that exceed human capabilities will potentially lead to musculoskeletal disorders that cause pain and decrease productivity. At this first stage of data collection, Tlocor Village is the observed object that is
selected. It is located in Jabon District, Sidoarjo, East Java. The location of the selected pond is Vannamei Shrimp Pond. The pond is one of the incentive ponds that has quite sophisticated equipment compared to the ponds in general.

3.2. Preparation of Survey Instrument

The next step is the preparation of a musculoskeletal disorder survey instrument. The Nordic Body Map questionnaire has been commonly used in the identification of pain in body parts, particularly in the musculoskeletal. However, for its implementation in Indonesia, it is still necessary to make adjustments. PEI (Association of Indonesian Ergonomics) has conducted an initial preparation of a musculoskeletal disorder survey instrument that can be used by researchers to obtain the data of pain complaints in various industries.

The survey instrument consists of two parts, namely:

Part A is demography, containing:
- The respondents' self-data including gender, place/date of birth, height and weight, latest education and ethnicity.
- Company data consisting of the industry type, number of employee (workers) and company location.
- The data of work in the form of specialization/division of work, duration of work, average working hour per day, tendency of using left hand and working shift.

Part B is the form consisting of:
- Perceived complaints (such as pain, agony, or discomfort) in nine parts of the body. Those nine parts of the body are (1) neck, (2) shoulders, (3) upper back, (4) elbow, (5) lower back, (6) hand wrist, (7) buttocks/thighs, (8) knee, and (9) ankle.
- Pain assessment using a scale of 0 to 10. Where the value 0 indicates no pain at all and 10 indicates the highest degree of pain that is felt.

3.3. Selection of Respondents

Respondents who became the object in the survey questionnaires and interviews were workers in intensive ponds in Sidoarjo district. In this study, the observed activities were pond preparation, seed distribution/seedling, cultivation maintenance, and harvesting. For those respondents, we explained about the purpose of the survey, the questions in the questionnaire and the interviews about the activities that they do. After determining the respondents, the data were collected.

3.4. Data Collection

The data were collected on Saturday, June 17, 2017 at 08:30 – 15:00 WIB at Vannamei Shrimp Pond and Semi Incentives Pond in Tlocor Village, Jabon Subdistrict, Sidoarjo District, East Java. The data collection was carried out through direct interviews to the determined respondents. Respondents were not allowed to complete the questionnaire independently. This was to ensure that the choice of answers given by respondents were in accordance with the existing conditions in the questionnaire. Each surveyor asked questions based on the questionnaire. Then each respondent gave the answer. Furthermore, if the respondent had difficulty in giving their answers, then the surveyor would provide more detailed explanation dealing with the questions and answer choices in the questionnaire. Figure 1 shows the respondent's working position and data collection process.
3.5. Data Processing and Analysis

Data processing was conducted after collecting the entire data. Data processing was done in two types of questions that exist in the questionnaire, namely biodata and content identification of pain in the body. Statistical methods were used to process the data and obtain the most vulnerable body parts to musculoskeletal. Then, the results of data processing were analysed. The analysis was addressed to the part of the body that predominantly got the high scores for pain complaints.

4. Result and Discussion

4.1. Respondents Characteristics

At the end of the data collection, 73 questionnaires filled by respondents were obtained. The data processing of respondents based on their age, working period, weight, height, number of working days per week, and working hours per day were conducted by category in [11].

Figure 2. Respondents based on age

Figure 3. Respondents based on weight
Figure 4. Respondents based on height

Figure 5. Respondents based on working periods

Figure 6. Respondents based on working days

Figure 7. Respondents based on working hours

Figure 2 shows the respondents who are dominated by age less than 25 years. Figure 3 shows that the highest percentage of weight is at body weight 41-60 kg. Figure 4 shows the highest percentage of height more than 165 cm. Figure 5 shows the percentage of working duration dominated less than 3 years. Figure 6 shows that the working days is 7 days for almost all respondents. Figure 7 shows the working hours for 5-6 hours per day.

4.2. The Result of Questionnaire

Further, there was an identification of the body parts that had complaints. The data were obtained from the second part of the questionnaire. Figure 8 shows the body parts that experience pain with a time category for last 12 month and last 7 days.

Those body parts was the neck, shoulders, back, waist (lower back), and knee. The highest percentage of pain/complaints on the neck was at the preparation stage. The highest percentage of pain/complaints on the shoulders was on both shoulders at the preparation stage. The highest percentage of pain/complaints on the back was at the harvesting stage. The highest percentage of pain/complaints at the waist (lower back) was at the preparation stage, while the highest percentage of pain/complaints on the knee was on both knees in the preparation stage.
Based on the questionnaire about the pain experience, it did not interfere the workers in doing their work activities. Furthermore, the results of identification of the level of pain felt by the respondents were conducted based on the given answers. The pain was divided into 10 categories. Most respondents assessed the pain that they felt in “moderate pain” degree, shown in figure 9.

Most respondents did not follow up the pain complaints that they experienced. They did not contact therapists or physicians (doctors, medics, etc.) to solve the problem.

5. Conclusion
There has been a survey and we obtained 73 questionnaires filled by respondents of pond workers in the village of Tlocor, District Jabon, Sidoarjo, East Java. The results of a musculoskeletal disorder survey in the pond workers revealed five body parts with the main complaints; they were, the neck, shoulders, back, waist and ankle. The level of pain was a “moderate pain” with no follow-up to therapists or physicians (doctors, nurses, etc.).

Next, it is necessary to observe in detail the working position that is not ergonomic. This is aimed at obtaining the correlation between the pain and work position. Further, the advice and recommendations will be based on the aspects of ergonomics and design of work systems in the implementation of work.
by humans. The improvements of working methods are expected to create a working condition that is called as ENASE (effective, convenient, safe, healthy and efficient) and reduce the pain.

6. Acknowledgments
Thanks to the pond workers who were willing to be a respondent in the distribution of musculoskeletal disorder questionnaires.

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