

## Conference Paper

# Analysis of Manual Material Handling Technique and Its Association with Low Back Pain (LBP) Among Fisherman In Kangkung Village, Bandar Lampung

Diana Mayasari, Fitria Saftarina, Merry Indah Sari, and Ahmad Sirajudin

Faculty of Medicine, University of Lampung

### Abstract

Low Back Pain (LBP) is a sensation of pain in the lower back that may derive from the spine, muscle, nerve, and other structures around the area. Factors that possibly contribute to LBP are including individual factors, occupational factors, and environmental factors. Manual material handling (MMH) is still unavioded to do a job as a fisherman, especially in Kankung Village. Our preliminary study found that 9 of 10 fishermen in Kangkung Village had a complaint of pain at the lower back of the body. This study aimed to determine the association between MMH technique, age, body mass index (BMI), work period, load mass and lifting frequency with the occurrence of LBP. This research was an observational study with a cross-sectional design, involving 101 subjects which were taken by consecutive sampling technique. Data were collected by interview and physical examination using the Lasseque test to determine LBP. Independent variables were age, BMI, MMH technique, work period, load mass and lifting frequency. The dependent variable was LBP. Data were analyzed with Chi-square test ( $\alpha=0.05$ ). Prevalence of LBP among fisherman in Kangkung Village was 81.2%. There was a significant association between age ( $p= 0.001$ ), BMI ( $p= 0.011$ ), MMH technique ( $p= 0.003$ ), work period ( $p= 0.001$ ), load mass ( $p= 0.001$ ), lifting frequency ( $p= 0.012$ ) with the occurrence of LBP. Age, BMI, work period, MMH technique, load mass, and lifting frequency are the risk factor of LBP among fisherman. An ergonomic work procedure is urgently applied to prevent LBP.

**Keywords:** fisherman, low back pain, manual material handling

Corresponding Author:

Diana Mayasari

dianamayasari.dr@gmail.com

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## 1. Introduction

Low Back Pain (LBP) is a perceived pain in the lower back which source may derive from the spinal column (lower back), muscles, nerves or other structures around the area. Low back pain can be either local pain or radicular pain or both. Pain may also spread to other areas such as the upper back and groin.[1] Multicenter research in 14 Indonesian teaching hospitals conducted by the pain study group (Pokdi Nyeri) of PERDOSSI (Persatuan Dokter Spesialis Saraf Indonesia) in May 2002 found that LBP was the second most

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common disease (18.37%) of all pain while fifty percent of the patients were 41-60 years old.[2] The Ministry of Health's study found that 40.5 percent of workers had a work-related health problem, and 16 percent had a musculoskeletal disorder called low back pain.[3]

Several studies had found some factors related to low back pain including age, body mass index, pregnancy, and psychological factors. An elderly would likely experience low back pain due to the decrease of body function especially the musculoskeletal tissue which is no longer elastic as in the young age. Besides, body posture and body movement while working is a supporting factor to the occurrence of low back pain. Unergonomic body Posture while working such as head bent forward, shoulders arched forward, belly bulging forward and excessive lumbar lordosis can cause muscle spasms and this is the most common cause of low back pain.[4]

Unergonomic body movement at work, such as the wrong body position when lifting heavy loads, is also the cause of low back pain. Working with long sitting or standing activity are also factors that support the occurrence of LBP. In addition, work postures that exposed to vibration, lifting or pulling heavy objects, bending and twisting are the risk factors to low back pain.[5]

Until now, the use of manpower in various jobs is still very dominant, especially in manual material handling activities. The advantages of manual material handling compared to material handling with tools or machine are the flexibility of man movement when handling light loads. However, manual material handling activities was identified as a high-risk cause of work-related illness.[6] Wrist pain caused by manual handling was 50% caused by load lifting activity, 9% from pushing and pulling loads, 6% from holding, throwing, twisting And carrying the load.[7]

Based on study by Sonda (2015) on cargo workers, it was found that 91.7% respondents who were assessed using manual material handling questionnaires and had high-risk MMH technique suffered from lower back pain complaints while the respondents with manual material handling who did not at risk of MMH technique only 5.0% suffered from lower back pain complaints. Material handling manual activity is widely used because of its high flexibility, cheap and easy to apply. However, based on the above data it can be concluded that manual handling material handling is also followed by risk when applied to wrong working conditions.[8]

A fisherman is a job relying on muscle activity, so that fisherman is at risk of low back pain.[9] Unergonomic work posture among fisherman will lead to various musculoskeletal system disorders in which one of them is the occurrence of low back pain.[10]

Most people who work as fishermen are people who live in coastal areas. Lampung is a province with Bandar Lampung as the capital city that has a large area and holds the potential of marine resource. One of the coastal areas that have marine potential is Kangkung Village, Bumi Waras Sub-district, Bandar Lampung. In general, in Kangkung Village 63.65% of the citizen works as a fisherman.[11]

From the observation to fisherman in Kangkung Village during manual activity, it's found that there were still many mistakes in manual material handling, and those unergonomic manual activities can trigger the occurrence of low back pain. While the results

of interviews with ten fishermen in Kangkung Village, it's found that 9 out of ten fishermen suffered from LBP. Based on the data above, the researcher is interested to analyze manual material handling and other related factors to the occurrence of LBP among fisherman.

## 2. Methods

This study was an observational analytic study with a Cross-Sectional design, conducted in Kangkung Village on November-December 2016. The subject was 101 fisherman selected by consecutive sampling technique. The subject selection was based on the inclusion criteria of a fisherman who worked as ship crew members; while exclusion criteria were: 1) Once diagnosed with spinal diseases such as spondylitis, osteoporosis, and vertebral fractures; 2) absence from work when data was taken.

The data used was primary data obtained from the questionnaire about the subject's identity, age, work period, working time, load lifting mass, load lifting frequency, manual material handling technique. LBP was assessed by filling out questionnaires and physical examination using the Lasseque Test, BMI was assessed using anthropometric measurement.

The independent variables were: manual material handling technique, load mass, lifting frequency, working period, age, BMI, duration of work. The dependent variable was low back pain.

The data were analyzed using a statistical program on a computer with the Chi-Square test and Fisher's Exact as the alternative test.

## 3. Results

Based on the research data, the prevalence of LBP among fisherman in Kangkung Village was 81.2%, while most subjects aged over 30 years, had normal nutritional status, have worked > 5 years and worked > 8 hours/day. Data also showed that most of the subjects perform a risky manual material handling technique, with load-lifting frequency was >25 times and load mass was >40 kg (tables 1).

Bivariate analysis showed that there was a significant association among age, IMT, MMH technique, working period, load mass, and load lifting frequency with the occurrence of low back pain but there was no significant association between the working time and the occurrence of low back pain among fisherman.

Fisherman activity in Indonesia is still dominated by activity relying on human strength. Fisherman's duties are not only to catch fish in the sea but also the duties of fisherman starts from the preparation before leaving for sailing such as picking up boxes of fixtures, ice cubes, and others. When catching fish, the fisherman has to lift the nets full of fish and heavy, and this activity is often done manually and cause the fisherman to work with the bent body posture. After returning from the sea, the ship's crew have to repeatedly unload the fish that is so heavy. Most of the fishermen do not know how to lift goods manually in a correct and safe technique. From the survey using questionnaire

TABLE 1: Distribution of respondents characteristic and occupational risk factors in fisherman at Kangkung Village.

Characteristic	Frequency (n)	Percentage (%)
Age		
<30 yo	17	16.8
≥30 yo	84	83.2
Nutritional state		
Normal	59	58.4
Malnutrition	42	41.6
Work period		
<5 years	14	13.9
≥5 years	87	86.1
Working time		
≤8 hours	13	12.9
>8 hours	88	87.1
<b>Risk Factor</b>		
MMH technique		
Not at risk	4	4
At risk	97	96
Load lifting frequency		
≤25	29	28.7
>25	72	71.3
Load Mass		
<40 kg	13	12.9
≥40 kg	88	87.1

on manual material handling techniques among fishermen in Kangkung Village known that most fisherman manually performed material handling in a techniques that are at risk for health, for example, lifting loads higher than the eye line, lifting loads far from the body axis, bending when lifting loads From the floor, twisting on the waist and lifting loads more than 40 kg alone. Bivariate analysis showed that there was an association between manual material handling technique with the occurrence of LBP that was 15 times greater in the subject with high-risk MMH technique compared to a fisherman who correctly performed the manual material handling technique.

The result showed that most of the workers were performed high-risk MMH technique and this result was supported with a study by Sonda [7] on cargo workers which found a similar result. LBP that occurred in workers who performed manual material handling technique was often caused by a risky work posture such as unergonomic lifting and pushing body posture.[12] An unergonomic work posture is a posture that causes the body parts to move away from the natural body position, for example, the movement of the hand lifted, the back bent too down, head tilted, etc. The farther the position of the body from the center of gravity, the greater the risk of skeletal musculoskeletal disorders [13].

A man normally works 6-8 hours in a day. The duration of working can affect energy reserve in work so it needs to be balanced with adequate rest which will restore the energy used during work.[14] People can work well for 40-50 hours in one week and will show a negative tendency in health if they are forced to work longer.[15] Most of the fisherman in Kangkung Village work longer than 8 hours in a day but the results showed that there was no significant association between the duration of the working hour and the occurrence low back pain among fisherman. This was probably because fisherman in Kangkung Village was doing dynamic activities during work. Working with more dynamic activities can reduce morbidity, and one of them is lowering the incidence of low back pain.[16]

Work period relates to the length of time a person who had been working in a certain job. It is important to be asked in the anamnesis of LBP since back pain is a disease taking a long time to develop clinical manifestations. A long time exposure on muscles and bone due to unergonomic work posture will cause fatigue on the muscles and bone in the lower back [17]. Most fishermen in Kangkung Village had more than 5 years working period, thus increasing the risk of LBP. The longer working period of a worker, the longer he got exposed to the hazard at the workplace and would lead to permanent narrowing on the intervertebral disc. This could also lead to the degeneration of vertebra along with the increase of ones age [18]. The results are also in accordance with the theory from Tarwaka [13] stating that work period has a correlation with the continuous static workload: if ones work on the unergonomic situation, it will make LBP grow easier.

Results found that most respondents (87.1%) had load mass  $\geq 40$  kg and that most fisherman (75.2%) who suffered from LBP were from the group with load mass  $\geq 40$  kg and the risk was 7 times greater compared to a fisherman whose load mass  $< 40$  kg. The result is in accordance with a study by Indriyani [19] on fruit transport workers that respondents with high-risk load masses are at greater risk of LBP. Maximum load mass in Indonesia are defined through the Regulation of the Minister of Manpower, Transmigration and Koperasi PER.01/Men/1978 with maximum load are 40 kg for adult male (22-45 years) and 10 kg for an adult female (22-45 years) [20]. Activities or movements that require high energy will give a high mechanical burden to the muscles, tendons, ligaments, and joints. A heavy burden will cause irritation, inflammation, muscle fatigue, muscle damage, tendons, and other tissues [21].

In the working process, the fisherman had to lift and transported goods repeatedly. It was known that most respondents (71.3%) lifted and transported goods  $> 25$  times in one day and also known that fisherman who suffered from LBP were mostly from the group with transporting and lifting frequency  $> 25$  times (53.5%). Based on the results of the bivariate analysis, there was a significant association between lifting frequency and the incidence of LBP ( $p$  value=0.012). The results are in accordance with the theory which stated that the factors affected the incidence of back pain (Back Injury) is the load transport distance and the frequency of displacement activity. Manual loading with high frequencies and in a long period of time will cause the degeneration process of the spine. The frequency of manual load lifting in a person with the same task repeatedly with the wrong posture should not exceed 25 times a day [22]. Load lifting frequency is related to repetitive movement. Musculoskeletal disorders due to repetitive movement

occur since the musculoskeletal system receives pressure continuously without getting a chance for relaxation [13].

From the study, it's known that LBP in fisherman was also associated with age > 30 years. The most common cause of LBP is muscle strain or improper posture. LBP is a chronic disease that takes a long time to grow and leads to clinical manifestations.[23] This can occur due to the decrease in muscle strength and endurance along with the aging process and increased the risk of musculoskeletal disorders complaints.[24] At the age of 30, the degeneration process began in the form of tissue damage, tissue replacement into fibrotic tissue and reduction of joint liquid. This causes a decrease in the stability of the bone and muscle system [25]. In general, muscle problems are commonly experienced at the age of 35 and will increase along with the aging process. A study of static muscle strength showed that maximum muscle strength in man occurred at the age 20-29 years, then muscle strength would decrease along with the degenerative process. In workers, LBP is more common in those who perform heavy manual handling work [13].

The incidence of LBP in subjects was also known to be related to BMI, finding that fisherman with malnutrition was at risk of suffering from LBP 5 times greater than fisherman with normal nutritional status. Obesity can lead to a decrease in abdominal muscle tone so that one's center of gravity will be pushed forward and will cause lumbar lordosis that will cause fatigue in paravertebral muscles. While in people with undernutrition, the nutrients needed to perform work is not sufficient so that the energy required cannot be formed and causes fatigue or pain on the muscles [26].

## 4. Conclusions

Low back pain is a musculoskeletal disorder that has a high incidence in fisherman and Manual material handling is a significant risk factor since most fishermen performed an incorrect technique of manually material handling. Further study is required to as an experimental study to apply correct manual material handling to reduce the incidence of LBP among fisherman.

## Ethical Approval

This research had got ethical approval from the Ethical Research Committee in the Faculty of Medicine Lampung University with ethical approval letter number 200/UN26.8/DL/2017.

## Competing Interest

Authors declare that there is no competing interest.

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