

ANALYSIS OF MANUAL MATERIAL HANDLING TECHNIQUE AND ITS ASSOCIATION WITH LOW BACK PAIN (LBP) AMONG FISHERMEN IN KANGKUNG VILLAGE, BANDAR LAMPUNG

Diana Mayasari^{1*}, Fitria Saftarina¹, Merry Indah Sari², Ahmad Sirajudin³

¹University of Lampung, faculty of medicine, departement of community medicine

Prof. Soemantri Brojonegoro Street No.1 Gedong Meneng Bandar Lampung District

35145 Indonesia *dianamayasari.dr@gmail.com

²University of Lampung, faculty of medicine, departement of medical education

Prof. Soemantri Brojonegoro Street No.1 Gedong Meneng Bandar Lampung District

35145 Indonesia

³ University of Lampung, faculty of medicine

Prof. Soemantri Brojonegoro Street No.1 Gedong Meneng Bandar Lampung District

35145 Indonesia

Low Back Pain (LBP) is a sensation of pain in the lower back that may derives 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 unavoided to do a job as a fisherman especially in Kankung Village. Our preliminary study found that 9 of 10 fisherman in Kankung village had a complain of pain at the lower back of the body. This study was 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 cross sectional design. This study involved 101 subjects which were taken by consecutive sampling technique. Data was collected by interview and physical examination using 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 was 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, E-mail: dianamayasari.dr@gmail.com

1. Introduction

Low Back Pain (LBP) is a perceived pain in the lower back which source may derives 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 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 work-related health problem, and 16 percent had musculoskeletal disorder called low back pain.[3]

Several study 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. Beside, 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. Work 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 is 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 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 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]

Fisherman is a job which much rely on muscle activity, so that fisherman is at risk risk of low back pain.[9] Unergonomic work posture among fisherman will lead to various musculoskeletal system disorders where one of which 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 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 fisherman.[11]

From the observation to fisherman in Kangkung village during manual activity we found that there were still many mistakes in manual material handling, and those unergonomic manual activity can trigger the occurrence of low back pain. While the results of interviews with ten fishermen in Kangkung village, we found that 9 out of ten fisherman suffered from LBP. Based on above datas, 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. This research was conducted in Kangkung village on November-December 2016. The subject of this study was 101 fisherman selected by consecutive sampling technique. The subject selection in this study is based on the inclusion criteria of 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 in this study was primary data obtained from the questionnaire about subject's identity, age, work periode, working time, load lifting mass, load lifting frequency, manual material handling technique. LBP was assessed by filling out questionnaires and physical examination using Lasseque Test, BMI was assessed using anthropometric measurement.

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

The data then were analyzed using statistical program on computer with 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, have normal nutritional status, have worked > 5 years and worked > 8 hours / day. Data also shown that most of the subjects perform a risky manual material handling technique, with load lifting frequency > 25 times and load mass > 40 kg. (Tables 1-2)

Tabel 1. Distribution of responden characteristic

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 periode		
<5 years	14	13,9
≥5 years	87	86,1
Working time		
≤8 hours	13	12,9

>8 hours	88	87.1
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Tabel 2. Distribution of occupational risk factors in fisherman at Kangkung villange

Risk Factor	Frequency (n)	Percentage (%)
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

Bivariate analysis showed that there was a significant association between 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 with the occurrence of low back pain among fisherman. Tabel 3.

Fisherman activity in Indonesia is still dominated by activity that rely on human strength. Fisherman's duties is not only to catch fish in the sea, but 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 have to lift the nets full of fish and heavy, and this activity is oftenly done manually and cause the fisherman to work with the bent body posture. After returning from the sea, ship's crew had to unload the fish and it was so heavy repeatedly. Most of the fisherman do not know how to lift goods manually in a correct and safe technique. From the survey using questionnaire on manual material handling techniques among fishermen in Kangkung Village known that most fisherman performed manual material handling in a techniques that are at risk for health, for example are 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 occurence of LBP was 15 times greater in the subject with high risk MMH technique compared to fisherman who performed correct the manual material handling technique.

The result of this study showed that most of workers were performed high risk MMH technique and this result is supported with a study by Sonda [7] on cargo workers which found the similar result. LBP occured in workers who performed manual material handling technique oftenly 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 is normaly work 6-8 hours in a day. The duration of working can affect energy reserve in worker 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 negative tendency in health if they are forced to work longer.[15] Most of fisherman in Kangkung Village work longer than 8 hours in a day. But the results of this study showed that there was no significant association between the duration of working hour with 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 which is lowering the incidence of low back pain.[16]

Work period relates to the length of time a person had been working in certain job. It is important to be asked in the anamnesis of LBP since back pain is a disease that takes 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 fisherman 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 work place and would lead to permanent narrowing on intervertebral disc, this could also lead to the degeneration of vertebra along with the increase of one's age [18]. The results of this study also in accordance with the theory from Tarwaka [13] which states that work period has a correlation with the continuous static work load if one is working on unergonomic situation and this would make LBP grow easier.

This study found that most respondents (87.1%) had load mass ≥ 40 kg and that most fisherman (75.2%) who suffered from LBP were from the group with load mass ≥ 40 kg and the risk was 7 times greater compared to fisherman whose load mass < 40 kg. The result of this study 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: for adult male (22-45 years) maximum load mass is 40 kg, adult female (22-45 years) maximum load mass 10 kg [20]. Activities or movements that require high energy will give high mechanical burden to the muscles, tendons, ligaments and joints. Heavy burden will cause irritation, inflammation, muscle fatigue, muscle damage, tendons, and other tissues [21].

In the working process fisherman had to lifted and transported goods repeatedly. From this study, it was known that most respondents (71.3%) lifted and transport 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 bivariate analysis there was a significant association between lifting frequency with the incidence of LBP ($P\ value=0.012$). The results of this study is 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 long period of time will cause the degeneration process of the spine. 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 receive pressure continuously without getting a chance for relaxation [13].

From the study of this study was 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 aging process and increased the risk of musculoakeletal disorders complaints.[24] At the age of 30 degeneration process began in the form of tissue damage, tissue replacement into fibrotic tissue and reduction of joint liquid. This causes the decrease in stability of bone and muscle system [25]. In general, muscle problems are commonly experienced at the age 35 and will increase along with aging process. A study of static muscle strength showed that maximum muscle strength in man is occurred at the age 20-29 years, then muscle strength will decrease along with the degenerative process. In workers, LBP are more common in those who perform heavy manual handling work.[13]

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

4. Conclucions

Low back pain is a musculoskeletal disorder that has a high insidence in fisherman and Manual material handling is a significant risk factor since most fisherman performed incorrect manual material handling technique. 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 study had got ethical approval from the Ethical Research Committee in Faculty of medicine Lampung University with ethical approval letter number 200/UN26.8/DL/2017.

Competing interest

I do not have any competing interest upon this study.

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