

# Risk analysis of MUSCULOSKELETAL DISORDERS (MSDs) on Logistic Distribution Workers in Warehouse of PT. X Surabaya

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**Abstract**— This research discussed about risk of Musculoskeletal Disorders (MSDs) on logistic distribution workers in warehouse of PT X Surabaya. MSDs are tissue damage on skeletal muscle parts (joint, ligament and tendon\_) caused by body receiving static load or working on awkward posture repeatedly in long term. This research was semi quantitative descriptive analytic research with cross sectional study design. Working posture used REBA (Rapid Entire Body Assessment) method, MSD complaint used Nordic Body Map and working load used Calorimeter Heart Rate Watch. Research result showed that home theater system experienced the highest MSDs complaint. Furthermore statistical test used Spearman and Pearson correlation which found that variable related to musculoskeletal complaint is lifting load. P value ( $0,044 < 0,05$ ), frequency of Pvalue ( $0,045 < 0,05$ ), working duration of Pvalue ( $0,013 < 0,05$ ), and sleeping time of Pvalue ( $0,030 < 0,05$ ) on logistic distribution workers in warehouse of PT X Surabaya. Research result concluded that risk level of MSDs incidence on logistic distribution workers were high, caused by awkward posture, duration, frequency and repetition in working.

**Keywords**— Musculoskeletal, Logistic distribution Workers, REBA (Rapid Entire Body Assessment).

## I. INTRODUCTION

Self-reported Work-related Illness (SWI) in UK reported that years 2014-2015 it was predicted that prevalence of 553.000 people in England suffered Musculoskeletal disorder caused or worsened by past occupation. This data were equal to 169.000 per 100.000 people (1,69%) who worked in last 12 months in England. Prevalence of data showed 595.000 people had disorder on lower part of body or neck and 510.000 people had disorder on lower part of body. These data were about one third (169.000 people) constituted new incidence. Following are prevalence of musculoskeletal disorder incidence in UK from 2009 to 2015.

Result of survey fit worker (2008) showed that lifting workers were categorized as manual material handling

(MMH) where this job necessitated workers to spend huge energy for pushing, pulling, holding, and carrying. MMH had high percentage (ranked third) as occupation which caused accident (injury) most in 2008 in England. According to Health and Safety Executive (2012), Manual handling caused more absence day when working or about 1,6 million days in 2009 to 2013. It is caused by many workers were absent due to injury (an average more than 3 days).

The study of MSDs in a variety of industries have been carried out and the results showed that part of the muscle that is often complained is the skeletal muscle (skeletal) muscle that covers the neck, shoulders, arms, hands, fingers, back, waist and bottom muscles. Among the skeletal muscle complaints, experienced by many workers is the muscles of the lumbar (low back pain = LBP). The report from the Bureau of Labor Statistics (LBS) United States Department of Labor published in 1982 showed that nearly 20% of all cases of occupational illness and 25% of compensation costs incurred in connection with the complaint / pain. The amount of compensation costs to be incurred by the company is not known. Results published by NIOSH estimates indicate that the cost of compensation for skeletal muscle complaints had reached 13 billion US dollars every year. The fee is the largest compared to the cost of compensation for pain complaints due to other work.<sup>[1]</sup>

Research in the United States, found that employers in private industry (which represents 75% of the 135 million workers) reported about 7 million cases of musculoskeletal injuries related to work each year. It is also estimated that there are 5 to 6 million cases of work-related back pain each year across the US working population, which led to a loss of 100 million working days. Musculoskeletal disorders is also a great cost, when combined with indirect costs to employers (loss of productivity) and the individuals affected, account for one third of US workers compensation costs.<sup>[2]</sup>

Ergonomic problems would be more common in working conditions to repeat the same motion throughout the working day, working in awkward position or static,

lifting heavy or awkward, used excessive force to perform the task, and exposed to excessive vibration or work at extreme temperatures.<sup>[3]</sup>

In industry, to remain competitive and stay in business are increasingly required high production rates and advances in technology, so that the productivity of workers driven higher. Examples of jobs at risk of musculoskeletal include frequent lifting, carrying, and push or pull the load without the help of other workers or the device, increasing specialization which requires workers to perform only one function or movement for a long period of time every day, to work more than 8 hours a day, work more quickly, such as in the assembly industry, and a tighter grip when using tools.<sup>[4]</sup>

In Indonesia, statistical data has not been found since it is caused by inadequate data collection and researches about working injury cause. In fact, it is very important to perform since working with MMH, particularly lifting workers have very high risk related with working safety such as injury in relation with muscle tissue, tendon, ligament, cartilage, nerve system, bone structure, and blood vessel or commonly known as Musculoskeletal Disorders (MSDs).

PT X Surabaya provided both domestic and international delivery service. In performing their job, workers do many manual handling jobs including lifting, pushing, pulling, carrying package with awkward position, frequency more than 40 times in single day and working duration about 8 hours per day. Material manual handling activity performed by workers when lifting electronic goods should bear about 19 kilograms in average per day. Sometimes pushing goods activity for repacking in lifting truck was performed by a single worker. This condition causes complaint (pain) on workers body.

## II. METHOD

This research was observational research using cross sectional study design. It was conducted in warehouse of PT X Surabaya. Time of research was on May 2016. Population of research was 35 workers of logistic distribution. It had sample 32 workers in lifting division for lifting refrigerator, washing machine, and home theater system. Research result data were obtained from interview and direct observation on workers. Data were served in table form and equipped with narration.

## III. RESULT

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Table.1: Result of MSDs complaint Checklist using Nordic Body Map based on job type in warehouse of PT X Surabaya, 2016

Job Type	MSDs Complaint				Total
	Low	Medium	High	Very High	
Refrigerat or Washing Machine	4	3	3	0	10
Home Theater	1	7	4	0	12
Home Theater	1	2	7	0	10
<b>Total</b>	<b>6</b>	<b>12</b>	<b>14</b>	<b>0</b>	<b>32</b>

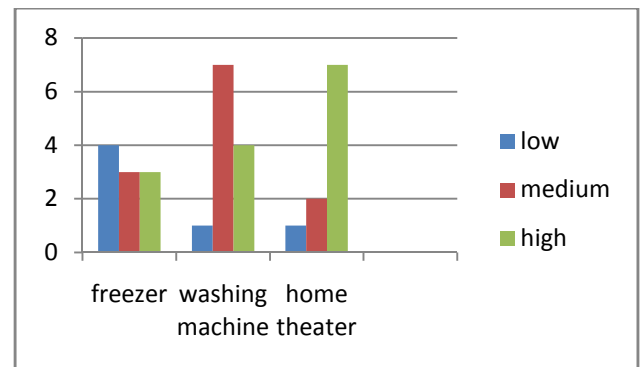


Fig. 1: Result of MSDs complaint Checklist using Nordic Body Map

Correlation test results of independent variable, age, years of service, exercise habit and working load have no correlation with MSDs complaint, it can be seen from P value higher than 0,05. Variables of lifting load, frequency, sleeping time, and working duration have correlation with MSDs complaints as it can be seen from P value lower than 0,05 (Table 2).

Table.2: Results of correlation test between individual characteristic and job with MSDs complaint on workers in warehouse PT X Surabaya 2016

Variable	MSDs Complaint	
	Pvalue	Correlatio n
Age	0,317	0,183
Years of Service	0,585	0,100
Lifting Load	0,044	0,358
Frequency	0,045	0,356
Working Duration	0,013	0,434
Working Load	0,744	0,060
Exercise habit	0,908	0,021
Sleeping time	0,030	0,383

#### IV. DISCUSSION

##### **MSDs Subjective Complaint on Logistic Distribution Workers in Warehouse of PT. X Surabaya**

Refrigerator logistic distribution worker showed most complaint on waist. It is caused by trunk position were frequently slanting toward left or right when lifting refrigerator. When carrying load, workers were in twist or rotating position and this caused muscle strain in upper part of body. It is seen from many complaints by operator concerning the area which includes right shoulder and nape.

Workers distribution in refrigerators there were 10 people, so the people do as many reps as 40 times. Another cause of their complaint MSDs to workers refrigerators are static working postures, which the operator in a standing position for a long time and movement are very minimal. This will lead to an increase in the load on the muscles and tendons, which causes the blood flow to muscle is blocked and cause fatigue, numbness and pain<sup>[5]</sup>.

Most MSDs complaint by washing machine lifting workers was in right lower arm, waist and right wrist. Among three types of lifting and carrying job, only washing machine lifted by two workers since washing machine has wider shape hence it is impossible to be lifted by one worker. But all workers had awkward position in lifting and carrying washing machine. For example, for carrying load body position taken was bending.

Among three job types in this research home theater system workers had highest complaint. Body parts which most complained were right wrist and right thigh. It is caused by repeated and continuous movement in longer term on right wrist that is clutching and holding continuously when taking and putting home theater system.

Home theater system lifting worker have higher risk than freezer and washing machine lifting workers since from posture assessment, they assume awkward position with home theater system lifting workers scored highest over normal position, such as on their wrist, thigh, knee, calf, and leg which will increase muscle working burden hence MSDs incidence probability will be greater.

##### **Analysis of relationship between Job Factor and Individual Factor with MSDs Complaint of Logistic Distribution Workers in Warehouse of PT. X Surabaya**

Most of lifting workers who were 20-30 years old were 17 (53%) workers. Of 17 workers 3 (18%) workers suffered low MSDs, 8 (47%) had mild MSDs and 6 (35%) had high MSDs. Meanwhile those who were aged 31-40 years old 13 (41%) were workers. Of 13 workers 3 (23%) had low MSDs, 3 (23%) had mild MSDs, and 7

(54%) had high MSDs and those who were >40 years old were 2 workers (6%). Of the two workers 1 (50%) worker had mild MSDs and 1 (50%) had high MSDs.

It is not in accordance with normal condition as stated by Bridger (2003) that muscle strength peak resides on range 25 – 35 years old of age, since in percentage 25-35 years old group had more MSDs than group aged <25 years old. The most influencing thing is job factor since workers spend most their time in working area.

Exercise habit, of 20 (62%) workers had never exercised and 12 (38%) had exercise at least once a week. Of group with no exercise, 4 (20%) workers had low MSDs, 7 (35%) had mild MSDs and 9 (45%) had high MSDs whereas from group with exercise at least once a week 2 (16%) workers had low MSDs, 5 (42%) had mild MSDs and 5 (42%) had high MSDs.

Peak muscle strength in both women and men are in the age range 25-35 years. Most of the older workers between the ages of 50-60 years can only produce 75-85% of muscle strength and muscle strength of women is two-thirds of the muscle strength of men.<sup>[6]</sup>

Muscle complaints rarely found in someone who has adequate rest periods. The National Sleep Foundation recommends that adults should get time to sleep between 7-9 hours<sup>[7]</sup>.

Posture deviates significantly to the normal position while doing work. Janggal posture will increase the workload of the muscle so its a significant contributor to musculoskeletal disorders. Besides increasing the required power also causes muscle power transfer to the skeletal system becomes inefficient<sup>[8]</sup>.

Load or exertion is the amount of physical effort required to complete a task or movement. Works using a large force will provide a large mechanical load on the muscles, tendons, ligaments and joints. With the heavy load can lead to fatigue the muscles, tendons, and other tissues, irritation and inflammation. Power required will increase<sup>[9]</sup>.

Work that uses the same muscles for a long duration may increase the potential for fatigue, either locally or can be also the whole body. Generally speaking, the longer the duration of the risky job, then the time required for recovery will be longer. So we can say that the duration is a factor that contributes to other risk factors, which amount depends on the nature of the risk factors that expose workers<sup>[10]</sup>

Repetitive movements at work, can be characterized either as the speed of movement of the body, or can be expanded as a movement that is done repeatedly with no variation movement. The position or posture is wrong with the frequency of job which can often lead to diminished blood supply, lactic acid accumulation, inflammation, stress on the muscles, and mechanical

trauma. Frequency going wrong posture associated with repetitive motion how many times it happens to do a job. Complaints of muscle occurs because the muscles receiving pressure due to work load continuously without the opportunity for relaxation<sup>[11]</sup>

Vibration is divided into two kinds: first, excessive vibration, usually from a vibrating tool. This can reduce blood flow, nerve damage, and contribute to muscle fatigue. Second, whole body vibration, such as truck drivers or operators of underground railway. This can affect the skeletal muscle and cause low back pain<sup>[12]</sup>.

Despite with Eriksen et al result in Norwegia in 1999 stating that worker who had no exercise with once or more a week had low back pain probability of 1,55 times compared with workers who had exercise one or more a week. This research found different result. Group with higher MSDs was group with exercise.

13 workers (41%) had years of service < 6 years and 19 workers (59%) had >6 years of service. Of group with years of service < 6 years, 4 (31%) workers had low MSDs, 4 (31%) had mild MSDs, and 5 (38%) had high MSDs whereas from group with years of service >6 years 2 (11%) had low MSDs, 8 (42%) had mild MSDs, and 9 (47%) had high MSDs. It is not in accordance with Budiono (2004) who stated that physical pressure in specific time caused lessening muscle performance, symptom showed either by lower movement.

Other individual factor is operator sleeping time with result: of all respondents 14 workers (44%) had sleeping time less than seven hours whereas 18 workers (56%) had sleeping time equal or more than 7 hours. In group with sleeping time < 7 hours, 1 (7%) workers had low MSDs, 4 (29%) had mild MSDs, and 9 (64%) had high MSDs. Meanwhile, in group with sleeping time > 7 hours 5 (28%) workers had low MSDs, 8 (44,4%) had mild MSDs, and 5 (28%) had high MSDs.

It is in accordance with Courtiol (2010) stating that muscle complaint is seldom found in person with adequate sleeping time. National Sleep Foundation recommended that adult should have sleeping time between 7-9 hours. In this research MSDs were found higher in group with sleeping time <7 hours than group with sleeping time > 7 hours. Statistical test result showed that individual factors such as age, exercise habit and years of service had no significant correlation with job such as load lifting, frequency, working duration, and sleeping time had significant relationship with MSDs. It showed that occupation as logistic distribution workers have high risk on MSDs incidence<sup>[7]</sup>.

## **V. CONCLUSION**

Workers become respondents and 100% experienced MSDs. 6 respondents had low MSDs, 12 respondents had

mild MSDs and 14 had high MSDs. Main causes of MSDs on logistic distribution workers in Warehouse of PT X Surabaya were sleeping time, lifting load, working posture, duration and working repetition.

Recommendation to add forearm forklift lifting strap or magic rope, providing gloves, initiating lifting and carrying training.

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