

MUSCULOSKELETAL DISORDERS AMONG OFFSHORE-STRUCTURE
FABRICATION YARD WORKERS

EMILY CH'NG HUEY LING

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Specially dedicated to...
God, my darling husband Daniel, dearest Dad and Mom,
and Sister,
for their love, support and prayers.

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ABSTRACT

Many researches in the area of ergonomics are focused on musculoskeletal disorders (MSDs) among workers in various line of work such as manufacturing, agriculture and construction. However, there is very little research done on MSDs among workers in heavy industries. The intention of this study is to establish the prevalence of MSDs among offshore-structure fabrication yard workers. A cross-sectional study was conducted among 132 yard workers. Preliminary direct observation on the workers general working conditions were carried out. Data on MSD symptoms of pain/discomfort were then collected via modified Standardized Nordiq questionnaires with some additional questions on the risk factors related to work-related MSDs. Overall, there are 82 (62.1%) workers who reported pain/discomfort and 50 (37.9%) others without pain/discomfort. Out of the 82 workers who had pain/discomfort within the last 12 months, 39% are welders, 9.8% are grinders, 18.3% are fitters, 7.3% are riggers, 8.5% are crane operators, 3.7% are helper welders and 13.4% are foreman and supervisors. The highest area reported of pain/discomfort is at the low back/waist (41.7%), followed by shoulder (18.9%) and neck (16.7%). Repetitive movement (OR =3.050) and bending (OR=2.417) are significant predictors of low back pain/discomfort. In conclusion, some ergonomic suggestions were provided to reduce to risks of MSDs in the workplace.

ABSTRAK

Banyak kajian yang dibuat dalam bidang ergonomik bertumpu kepada *musculoskeletal disorders* di kalangan pekerja di industri pembuatan, pertanian dan pembinaan. Tetapi, tidak banyak kajian tentang MSD yang dibuat di kalangan pekerja di industri berat. Maka, tujuan kajian ini ialah untuk mengkaji MSD di kalangan pekerja di satu *offshore-structure fabrication yard*. Kajian ini dijalankan ke atas 132 pekerja. Sebelum itu, pemerhatian ke atas kondisi kerja pekerja dilakukan. Data berkenaan simptom MSD seperti kesakitan dan/atau ketidakselesaan badan didapati daripada borang soal selidik. Keseluruhannya, 82 (62.1%) pekerja melaporkan kesakitan dan/atau ketidakselesaan manakala 50 (37.9%) pekerja tidak melaporkan sebarang kesakitan dan/atau ketidakselesaan. Antara 82 pekerja yang mengalami kesakitan/ketidakselesaan dalam 12 bulan lepas, 39% terdiri daripada *welder*, 9.8% *grinder*, 13.8% *fitter*, 7.3% *rigger*, 8.5% operator kran, 3.7% pembantu *welder* dan 13.4% penyelia. Bahagian badan dengan kes kesakitan/ketidakselesaan yang tertinggi adalah di bahagian belakang bawah/pinggang (41.7%), diikuti bahu (18.9%) dan leher (16.7%). Pergerakan berulang-ulang (OR = 3.050) dan membongkok (OR = 2.417) merupakan factor signifikan kesakitan/ketidakselesaan bahagian belakang bawah. Beberapa cadangan telah di kemukakan untuk mengurangkan risiko berlakunya MSD di tempat kerja.

CHAPTER 1

INTRODUCTION

1.1 Introduction

The industries today are alert on the rise of musculoskeletal disorders among their workers (Choobineh *et al.*, 2007). They have also begun to take heed and understand the factors in the job and workplace that may contribute to musculoskeletal disorders. Ergonomists everywhere around the world (Westgaard, 2000, Guo *et al.*, 2004, Morken, *et al.*, 2007) has realize the prevalence of musculoskeletal disorders among workers in the various industries hence providing numerous published findings to educate and propose improvements that can be done to reduce such impairments. In the United States, there were 317,440 cases of musculoskeletal disorders which cause people many frequent visits to the clinic and about 10 days away from work to treat and recover from musculoskeletal disorders (Bureau of Labor Statistics, U.S. Department of Labor, 2009). In the United States, apparently the number of musculoskeletal cases are decreasing, declined about 5 percent (17950 cases in 2007), and by 11 percent from 2006 (Bureau of Labor Statistics, U.S. Department of Labor, 2009). The decrease in number of musculoskeletal disorder cases in the United States could be due to the enforcement of safety and extensive educational awareness program done by the Occupational, Safety and Health administration. Musculoskeletal disorders are also a concern in the European Union (Bevan *et al.*, 2009). According to them it reported that 100 million Europeans suffer from work-related chronic musculoskeletal p

Musculoskeletal disorders have been investigated by many researchers and found to have affected workers from many industries, ranging from construction (Holstrom and Engholm, 2003; Vingard *et al.*, 1992), medical (Smith *et al.*, 2004), agriculture (Hartman *et al.*, 2005), electronics (Chee *et al.*, 2004,) and telecommunications (Ismail and Shaharuddin, 2008). The prime focus of this research is workers from a heavy industry which is not exempted from experiencing musculoskeletal disorders as well. In this chapter, we will look into the background of the study, problem statement, research objectives, scope, and significance of research, research structure and conclusion.

1.2 Background of study

In today's industry, resources, skills, innovation and technology, and strategic plans contributes to the increased of a company's productivity. Among all these, workers are the main asset of a company, and companies need to ensure that they have good workforce health. Apart from safety, ergonomic aspects play an important role in determining the level of comfort in the workplace or jobs which workers are subjected to.

Muscle and joint pain costs European economies up to €240 billion a year (The Work Foundation, UK, 2009). In a report by Bevan, *et al.*, (2009) claims that cost of back pain have been estimated to exceed €12 billion. About 85 percent of people with back pain take less than 7 days off. This shows that musculoskeletal disorders cost not only in monetary terms, but also in cases of high medical leave taken to treat such problems.

The Malaysian Social Security Organization (SOCSO) has compiled the number of accidents due to over-exertion or strenuous movements for the year 2006. Figure 1.1 shows the breakdown of the number of accident cases and the categories

while Figure 1.2 shows the number of occupational diseases by causing agent for the year 2006.

| SEBAB KEMALANGAN / CAUSE OF ACCIDENTS | Bil Kes Dilaporkan No. of Cases Reported |
|--|---|
| PERGERAKAN YANG BERAT / OVER-EXERTION OR STRENUOUS MOVEMENTS | |
| 1) Terseliuh apabila mengangkat objek / Over-exertion in lifting object | 493 |
| 2) Terseliuh apabila menolak/menarik objek / Over-exertion in pushing or pulling objects | 157 |
| 3) Terseliuh semasa mengurus/melontar objek / Over-exertion in handling or throwing objects | 154 |
| 4) Pergerakan yang berat / Strenuous movement | 161 |

Figure 1.1: Number of accident cases reported by SOCSO due to over-exertion or strenuous movements.

| AGEN PENYEBAB AGENTS CAUSES | BIL KES DILAPORKAN NO. OF CASES REPORTED |
|---|---|
| III. Occupational musculo-skeletal disorders 2310 Musculo-skeletal diseases caused by specific work activities or work environment where particular risk factors are present Examples of such activities or environment include; a) rapid or repetitive motion; b) forceful exertion; c) excessive mechanical force concentration; d) awkward or non-neutral postures; e) vibration Local or environmental cold may potentiate risk | 14 |

Figure 1.2: Number of occupational diseases by causing agent for the year 2006.

It was revealed that Malaysia had the lowest number of occupational disease among the other Asian countries (Azman, M. 2007). This however does not mean that the occupational diseases are decreasing. Figure 1.3 shows the trend of occupational diseases in Malaysia from year 1995 to 2006. He added that in Malaysia, there is increase in the number of cases of noise induced hearing loss, occupational lung disease and musculoskeletal disease. In Malaysia, detection of occupational disease is low and is estimated less than 1 percent of the total

compensation paid. Occupational disease is only 0.5 percent of the total employment injury. According to him, if occupational disease is unanticipated, unrecognized, not monitored, no medical surveillance conducted, undiagnosed, untreated and unregistered, there is no way to compensate workers.

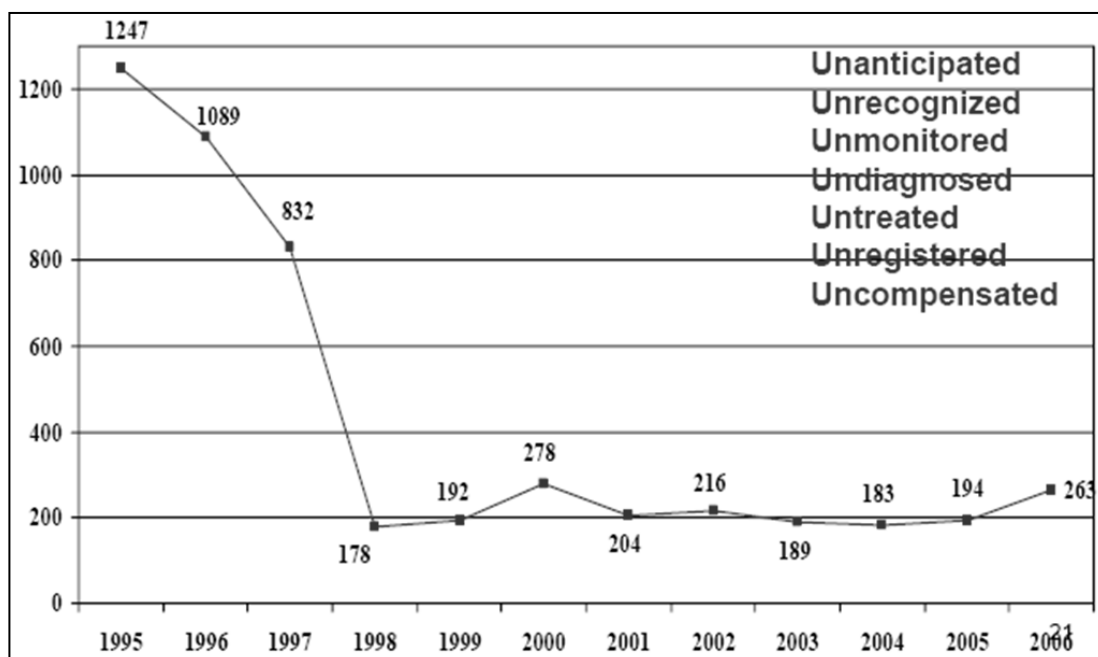


Figure 1.3: Trend of occupational diseases in Malaysia from year 1995-2006
(Azman Mohamad, 2007)

To summarize, there may be cases of occupational diseases, including musculoskeletal disorders which are not reported due to the above reasons mentioned. Thus, this research zooms into one of the heavy industry workforce in Malaysia to find out the existence of such cases, and the types of musculoskeletal disorders present among their workers.

1.3 Problem Statement

Heavy industries, according to the Oxford Dictionary are industries which are concerned with production of metal and machines. According to the Business Dictionary, heavy industries are industries such as automobile, mining, petroleum,

ship building and steel industries which require very large capital investment in weighty machinery and huge plants.

Thus, offshore structure fabrication yard can be categorized as a heavy industry as these yards fabricate steel structures such as jackets and topsides. Among the works done in a fabrication yard include metal works, welding, grinding, cutting, electrical and instrumentation works, and sandblasting. Such jobs may involve tasks performed in awkward body postures, at non adjustable workstations, on scaffolds, and in enclosed or confined spaces (Sabella, 2003; United States National Shipbuilding Research Program Report, 2004). Such postures and conditions are the risk factors associated to musculoskeletal disorders (Torell, *et al.*, 1988; Mooney, *et al.*, 1996). Blue collar workers are usually exposed to work requiring manual material handling, strenuous shoulder or hand movements, awkward postures and exertion (Alexopoulos, *et al.*, 2006).

There is very little research done on musculoskeletal disorders in heavy industry. Torell *et al.*, (1988) and Alexopoulos *et al.*, (2006) researched on musculoskeletal disorders in workers in the shipyard, while Landau, *et al.*, (2008) researched on musculoskeletal disorders in the automotive industry. Thus, this study is important to evaluate the occurrences of musculoskeletal disorders or its symptoms among workers in a heavy industry in Malaysia, namely an offshore structure fabrication yard. With that in mind, the purpose of this study is to create more awareness whether musculoskeletal disorders affect workers working in such yards, the areas of body affected and the risk factors which are associated to the development such disorders.

1.4 Research Objectives

The objectives of this research are:

- 1) To establish the prevalence of Work-related Musculoskeletal Disorders (WMSD) symptoms of pain/discomfort among the workers in an offshore structure fabrication yard in Malaysia.
- 2) To identify the area of reported pain/discomfort if prevalence is established.
- 3) To account the incidence and severity of pain/discomfort among workers.
- 4) To determine the presence of any relationship between the workers age, working experience and other risk factors with WMSDs.
- 5) To conduct a Rapid Upper Limb Assessment (RULA) on selected extreme work postures
- 6) To propose some improvements that could be implemented to reduce cases of MSD.

1.5 Scope of Research

The research covers the following scope:

- 1) An offshore structure fabrication yard in Malaysia focusing on the workshops.
- 2) Workers between 18-58 years of age.
- 3) Workers who do not have any body pain/injury prior working in the workshops.

1.6 Significance of Research

The significance of the research would be the enlightenment of the workers of the industry itself, the management as well as other researcher's on the prevalence of Work-related Musculoskeletal Disorders in heavy industries in Malaysia. This study is important because many researches are focused on musculoskeletal disorders in other industries, especially electronics and nursing, but very few were conducted among workers in yards. This research also serves as an eye opener for industries to take preventive measures to reduce the cases of work-related musculoskeletal disorders among their employees.

1.7 Research Structure

This research comprises six chapters. Chapter one covers the introduction, whereby the objectives, scopes and significance of this research are clearly underlined. Chapter two is the literature review which covers the findings from researchers on work-related musculoskeletal disorders from various industries, and the risk factors associated to musculoskeletal disorders. In chapter three, the methodology in which the research is carried out is discussed. The fourth chapter results from the questionnaires, as well as the analysis of the data obtained. In chapter five, discussions are made in view of the results obtained from the previous chapter. In the final sixth chapter, conclusions are made to wrap up the entire research. Recommendations for future works are also given for future study in this area of research.

1.8 Conclusion

This chapter has justified the purpose to carry out the research, background of the study, problem statement, and objectives of the research, scope and the research structure. The next chapter focuses on the literature of the area under investigation.

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