

## PREVALENCE OF MUSCULOSKELETAL SYMPTOMS AMONG PRODUCTION LINE WORKERS IN A PRINTING MANUFACTURING COMPANY, MALAYSIA

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### ABSTRACT

**Background:** Leading cause of occupational injury in the developed and developing countries relates to musculoskeletal disorders (MSDs) and also is a main cause of work-related disability and lost-time illnesses. The objectives of this study are to determine the prevalence of self-reported musculoskeletal symptoms among printing production line workers and to examine the relationship between musculoskeletal symptom and individual risk factors.

**Material and Method:** A cross-sectional study was carried out in a commercial printing company in Klang Valley, Malaysia. Respondents were randomly selected based on the inclusive criteria and a total of 250 printing production line workers were involved in the study. An Interview section of each respondent was conducted to obtain the information and musculoskeletal symptoms through validated Malay version of Standardized Nordic Questionnaire (SNQ).

**Result:** The response rate was 85.9%. The prevalence of musculoskeletal symptoms was 79.6%. The most common musculoskeletal symptoms were from the lower back (48.0%), shoulders (44.4%), knees (32.8%), and neck (29.6%). Respondents to be a male, heavy body weight, and high body mass index (BMI) had significantly associated with musculoskeletal symptoms on lower back ( $p < 0.05$ ). There were significant association between heavy body weight and long duration of employment with musculoskeletal symptoms on knees ( $p < 0.05$ ).

**Conclusion:** The prevalence of musculoskeletal symptoms among the printing production line workers was high and it was related to a person's individual factors. Gender, weight, BMI, and duration of employment were implied increase risk of musculoskeletal disorder (MSD).

**Keyword:** Musculoskeletal disorder (MSD), printing workers, Standardized Nordic Questionnaire (SNQ)

## 1.0 Introduction

Musculoskeletal disorders (MSDs) continue to be the leading causes of occupational injury in the both industrially developed and developing countries and are the main cause of work-related disability and lost-time illnesses (Azam et al., 2008; Ghasemkhani et al., 2006). This may be associated with lost of productivity (Schneider et al., 2010). The MSDs are multi-factorial in origin. Among the risk factors considered are individual factors. The relationship between individual factors and musculoskeletal symptoms has been widely reported in different epidemiologic studies (Johnson et al., 2009; Uzgoren et al., 2007; Janwantanakul et al., 2008). The role of individual factors in the development and persistence of musculoskeletal symptoms are relatively importance, which is thought to alter personal responses to workplace exposures (Punnett et al., 2004).

The printing industry is among the oldest manufacturing sectors in Malaysia. However, there is little information about the magnitude of musculoskeletal problems and the measurement of individual factors is limited on MSDs among workers in printing manufacturing company. Understanding how individual characteristics can influence the risk arise from a working environment can assist in the selection of possible intervention measures (Morken et al., 2000).

In Malaysia, the first study of occupational disease patterns among non-governmental employees showed that annual incidence of MSDs increased by 174% (SOCSCO, 2006). However, there still have many under reporting MSDs cases due to the lack of recognition of work-relatedness by employees (Menzel, 2008). The objectives of the study were to determine the prevalence of self-reported musculoskeletal symptoms among printing production line workers and to examine the relationship between musculoskeletal symptom and individual risk factors.

## 2.0 Materials and Methods

This was a cross-sectional study design and the study was conducted in a printing manufacturing company in Malaysia. There consists of 530 workers in the production department and the ratio of male to female is in 3:1. Subjects were production operators from press and post-press units in the production plant with at least one year of job tenure and ages between 17-55 years old were randomly selected. Exclusion criteria for subjects were musculoskeletal diseases or occupational or non-occupational accidents affecting musculoskeletal system.

The Malay version of Standardized Nordic Questionnaire (SNQ) was an instrument used to obtain information on the MSDs (Kourinka et al., 1987). Prior to the study, the questionnaire was pre-tested. The questionnaire consists of 2 parts and a diagram showing clearly of 9 anatomical sites to assist the subjects for the assessment of musculoskeletal symptoms. First part was on the socio-demographic and working experience and the second part was on the musculoskeletal symptoms and related anatomical sites. The term of musculoskeletal symptoms can be defined as ache, pain or discomfort in at least one of the anatomical sites (neck, shoulders, elbows, wrists/hands, upper back, lower back, hips/thighs, knees, and ankles/feet) during the last 12 months.

The data was analysed by using Statistical Package of Social Science (SPSS) version 19.0. Descriptive statistical analysis was used to describe the characteristics of studied variables as mean, standard deviation and frequency. Logistic regression analysis was performed to determine the risk factors of musculoskeletal symptoms. The significance level of all statistical analyses was set at  $p < 0.05$ .

### 3.0 Results and Discussion

#### 3.1 Socio-demographic

A total of 250 (85.9%) subjects responded to the questionnaire from 291 selected. Table 1 showed the socio-demographic of the respondents.

**Table 1: Socio-demographic of respondents**

Characteristics	Frequency (%)	Mean $\pm$ SD
Age (year)		33.46 $\pm$ 8.92
<b>Gender</b>		
Male	174 (69.6%)	
Female	76 (30.4%)	
<b>Marital status</b>		
Single	93 (37.2)	
Married	157 (62.8)	
<b>Education level</b>		
Primary	22 (8.8)	
Secondary	196 (78.4)	
Tertiary	32 (12.8)	
<b>Weight (kg)</b>		64.22 $\pm$ 12.45
<b>Height (m)</b>		1.65 $\pm$ 0.08
<b>Body Mass Index (kg/m<sup>2</sup>)</b>		23.43 $\pm$ 3.94
<b>Duration of employment (year)</b>		9.97 $\pm$ 7.59

N=250

The mean age was  $33.5 \pm 8.9$  years. They were 69.6% male and 30.4% female. Most were married (62.8%) and had secondary education level (78.4%). The respondents' weight with an average of  $64.22 \pm 12.45$  kg and height  $1.65 \pm 0.08$  m with a mean of BMI  $23.43 \pm 3.94$  kg/m<sup>2</sup>. The mean duration of employment was  $9.97 \pm 7.59$  years.

#### 3.2 Prevalence of musculoskeletal symptoms in printing production line workers during the last 12 months

The prevalence of musculoskeletal symptoms was 79.6%. Table 2 showed the prevalence of musculoskeletal symptoms in printing production line workers during the last 12 months.

**Table 2:** Prevalence of musculoskeletal symptoms in printing production line workers during the last 12 months

Musculoskeletal symptoms	Frequency	Percentage (%)
Yes	199	79.6
No	51	20.4

N=250

A total of 20.4% of the respondents did not have experienced ache, pain or discomfort in one or more of the nine defined anatomical site during the last 12 months (Table 2).

The result found that the prevalence of musculoskeletal symptoms for newspaper and commercial print workers was 65.9% (Judy & Cole, 2001). For others sector, the reported prevalence was 68.0%, 73.6%, 79.0%, 80.5%, and 93.0% in physiotherapist, rubber production workers, truck assembly workers, semiconductor workers, and handmade brick workers (Glover et al., 2005; Choobineh et al., 2007; Hussain et al., 2004; Rampal et al., 2004; Trevelyan et al., 2001). The prevalence rate in this study slightly difference of those reported in previous studies. Not easy to make a direct comparison with different occupations since exposures were likely to vary among tasks.

### **3.3 Prevalence of musculoskeletal symptoms in printing production line workers by anatomical site**

There was approximately 80.0% complained in at least one of the anatomical area. This study revealed that large proportion of the respondents experienced musculoskeletal symptoms in the last 12 months. The prevalence of musculoskeletal symptoms by anatomical site is shown in Table 3.

**Table 3:** Prevalence of musculoskeletal symptoms in printing production line workers by anatomical site

Anatomical site	Frequency	Percentage (%)
Neck	74	29.6
Shoulder	111	44.4
Elbow	24	9.6
Wrist/hand	52	20.8
Upper back	72	28.8
Lower back	120	48.0
Hip/thigh	26	10.4
Knee	82	32.8
Ankle/feet	49	19.6

N=250

The lower back were the area with the highest prevalence of musculoskeletal symptoms (48.0%), followed by shoulder (44.4%), knee (32.8%), neck (29.6% %), upper back (28.8%), wrist/hand (20.8%), ankle/feet (19.6%), hip/thigh (10.4%), and elbow (9.6%) in respondents.

The prevalence was high among the studied population as compared to previous study (65.9%) which conducted in similar business-oriented industry in British Columbia (Judy & Cole, 2001).

The most commonly affected regions were lower back, shoulders, knees, and neck. The lower back was the commonest problems among respondents and almost half of them had low back pain. This could be attributable to awkward working posture due to manual material handling, bending forward to move the finishing paper product to pallet, and standing in a workstation for long hours without an adequate rest, which were common at almost all workstations and work tasks observed in the company. They could not leave the workstation unless the task is finished since the work is continuous.

The workers might feel exhausted for the prolonged standing position. Seats were not provided since the task requires standing and awkward posture most of the time and this could be another possible explanation for the higher rate of musculoskeletal symptoms on knees. This result is consistent with findings from previous studies by Andersen et al. (2007) which revealed that lifting, repetitive task, pulling, and standing were associated with any regional pain among general working population.

### ***3.4 Socio-demographic factors associated with musculoskeletal symptoms by anatomical site in printing production line workers***

The relationship between individual factors and musculoskeletal symptoms by anatomical site is showed in Table 3.4. Results indicated that gender had significant association with musculoskeletal symptom on lower back. Male has 1.92 times the odds compared to female have MSD on lower back (95% CI: 1.11 to 3.34,  $p=0.02$ ). As the table 3.4 shows, weight associated with musculoskeletal symptoms on lower back and knees. A respondents with an increase in 1kg of weight has a 1.03 times the odds of having MSD on lower back (95% CI: 1.00 to 1.05,  $p<0.001$ ) and has a 1.02 times the odds to have MSD on knees (95% CI: 1.00 to 1.04,  $p<0.05$ ).

Relationship between BMI and MSD on lower back was statistically significant. An increase in 1 units of BMI has a 1.07 times the odds of having MSD on lower back (95% CI: 1.00 to 1.14,  $p=0.038$ ). A significant association was observed between duration of employment and musculoskeletal symptoms on knees. A respondent with an increase in 1 year of job tenure has a 1.04 times the odds to have MSD on knees (95% CI: 1.00 to 1.07,  $p<0.05$ ).

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**Table 3.4:** Individual factors associated with musculoskeletal symptoms by anatomical site in printing production line workers

Variable	Neck	Shoulders	Lower back	Knees
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
<b>Age</b> (year)	1.03 (0.99,1.06)	1.03(0.99,1.06)	1.02 (0.98,1.05)	1.02 (0.99,1.05)
<b>Gender</b>				
Male	0.80(0.45,1.43)	0.67(0.39,1.15)	1.92(1.11,3.34)*	1.18(0.66,2.11)
Female	-	-	-	-
<b>Marital status</b>				
Single	-	-	-	-
Married	0.69(0.40,1.21)	0.77(0.46,1.30)	1.12(0.70,1.87)	1.55(0.88,2.72)
<b>Education level</b>				
Primary	-	-	-	-
Secondary	1.33(0.47-3.77)	1.49(0.59-3.70)	1.42(0.58-3.46)	1.93(0.68-5.46)
Tertiary	2.64(0.78-8.93)	1.19(0.39-3.67)	1.12(0.37-3.38)	0.79(0.21-2.98)
<b>Weight</b> (kg)	0.99(0.96,1.01)	1.00(0.98,1.02)	1.03(1.00,1.05)**	1.02(1.00,1.04)*
<b>Height</b> (m)	0.74(0.02,24.26)	0.96(0.04,23.91)	7.37(0.29,185.16)	25.94(0.79,853.67)
<b>BMI</b> (kg/m <sup>2</sup> )	0.97(0.91,1.04)	1.01(0.94,1.07)	1.07(1.00,1.14)*	1.04(0.98,1.11)
<b>Duration of employment</b> (year)	1.03(0.99,1.06)	1.02(0.99,1.06)	1.02(0.99,1.06)	1.04(1.00,1.07)*

\* Significant at p&lt;0.05

\*\* Significant at p&lt;0.001

Logistic regression test applied

Study showed that gender was associated with prevalence of musculoskeletal symptoms on lower back. More male had musculoskeletal symptom. The survey from Croasmun (2004) found that male were more likely to say that their back discomfort or pain is work-related, while female tend to believe that their back discomfort or pain originates in the home. Therefore, the lower back problem was high among male workers in the workplace.

The results of analysis show that weight and BMI was significantly associated with musculoskeletal symptoms on lower back. The studies from Morken et al. (2000) and Shiri et

al. (2009) present similar findings. They identified that workers being overweight seem increase the risk of low back pain by putting extra stress on their back. Besides, weight shows a significant association with musculoskeletal symptoms on knees. Miranda et al. (2002) found that those overweight associated with knee pain among working population. Overweight enhanced the effect of mechanical stress on the weight-bearing joints. Relationship between duration of employment and musculoskeletal symptoms on knees was statistically significant. It could be that the effect of dose-response relationship (Forde et al., 2005; Tsigonia et al., 2009).

This study has some limitations. This was a cross-sectional study where only the association between risk factors and musculoskeletal symptoms at a particular point in time could be determined. However, a cause and effect relationship could not be recognized. No causality can be demonstrated since both the dependent and independent variables are being measured at the same time. The MSD is a multi-factorial phenomenon significantly associated with several factors. The study did not access the relationship between MSD and other factors.

Hence, some of the factors which were not taken into account in this study might confound the incidence of MSD among workers in printing industry. This study relied on self-reported data and there was no medical test can really refute the existence of musculoskeletal symptoms. The recall bias may exist as well. In addition, the respondents tend to forget some information which can affect the outcome of the study. Consequently, respondents may either overestimating or underrating their musculoskeletal symptoms.

#### **4.0 Conclusion and Recommendation**

There was a high prevalence of musculoskeletal symptoms among printing production line workers with a high proportion experiencing symptoms in the lower back, shoulders, knees, and neck. The data obtained has estimated the baseline prevalence of MSD in printing industry and provided a better understanding about the relationship between individual factors and musculoskeletal symptoms. The findings demonstrated that the symptoms were related to gender, weight, BMI, and duration of employment.

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#### **Declaration**

Authors declare that there is no conflict of interest regarding publication of this article.

## Authors Contribution

Author 1: Prepared draft of manuscript  
Author 2: Editing draft manuscript  
Author 3: Editing draft manuscript  
Author 4: Editing draft and final manuscript

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