PUBLIC HEALTH RESEARCH

Personal and Psychosocial Risk Factor for Low Back Pain among Automotive Manual Handling Workers in Selangor, Malaysia

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ABSTRACT

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Introduction	It is well known that low back pain among working population is a global problem throughout the world. However, the current situation of occupational low back pain in Malaysia is still vague due to limited number of studies conducted locally.
Objective	A cross sectional study was conducted among three automotive industry workers in Selangor, Malaysia from October 2010 to April 2011.
Methods	This study aims to determine the prevalence and risk factors of low back pain among automotive industry workers performing manual material handling tasks using self-administered questionnaire survey.
Results	A modified Standardised Nordic Questionnaire was used to assess low back pain problem, to obtain personal and psychosocial risk factors information. The prevalence of low back pain showed increment in the point prevalence of 57.9%, 49.5%, and 35.1 % for 12 months, one month, and of 7 days respectively. Working hour, frequency of overtime, stress at work, work pace, and faster movement were found to be significantly associated with the 12 months prevalence for low back pain.
Conclusions	This finding indicates that psychosocial risk factors are associated to the occurrence of low back pain.
Keywords	Low back pain - manual material handling (MMH) - risk factors.

INTRODUCTION

The development of Malaysia's economic status embarked since the involvement on commercial car manufacturing industry in 1983. Since then, a lot of manufacturing plant was built to accommodate the needs of the automotive sector. Aside from assisting the country's economic status, it also creates job opportunities for Malaysian citizens and foreign workers. In 2007, there were 1, 800, 353 workers in manufacturing industry and of that 24, 146 worked in motor vehicle manufacturing industry[1]. The number of workers in the later industry increased to 26, 367 workers in 2013[2]. Impact from the existence and development of this industry, Malaysia is not exempted from facing the same scenario experienced by the industrialized countries in which the issue of work-related musculoskeletal disorders arises as a result of manual material handling tasks.

Car manufacturing industry recorded third-highest number of Cumulative Trauma Disorder (CTD) related injuries compared to other industry with the incidence rate of 963.5 per 10,000 cases of repeated trauma workers[3]. A study conducted among employees working on the assembly line in the automotive industry shows that 39% of musculoskeletal disorders suffered by the employee is at the bottom spine, followed by the head-neck-shoulder with 18% and the lower body region by 16%[4]. In 2011, musculoskeletal disorders recorded 33% of all cases of occupational disease and injury in the United States, and of these, 42% of the musculoskeletal disorders are injuries to the back of the body[5].

In Malaysia, the occupational diseases problem began to get the attention of various parties. In 2006 there were 14 cases of musculoskeletal injury reported by the Social Security Organisation (SOCSO)[6]. In 2011, this number had increased to 268 cases[7]. However, this number is still small compared to 387, 820 cases of musculoskeletal injury reported by the Bureau of Labor Statistics, U.S. Department of Labor in 2011[5]. The small number of cases might be because of under reporting due to lack of awareness on the importance of reporting the occupational diseases among employees. Furthermore, some employers were reluctant to report these cases to the authority.

A systematic review on global prevalens of low back pain shows that the prevalence of low back pain is a major global problem[8]. Psychosocial risk factors known to be one of the factor contributed to low back pain. A systematic review on occupational psychosocial risk factors shows that the psychosocial work risk factors is a signifant risk for predicting back pain[9]. However, the actual situation of occupational diseases in Malaysia is still unclear due to under reporting and lack of study carried out focusing on low back pain. Therefore, this study was conducted to evaluate the prevalence and low back pain characteristics among automotive industry manual workers along with personal and psychosocial risk factors associated with it.

METHODOLOGY

Study Design and Sampling

A cross sectional study was conducted among workers in three automotive industries in Selangor, Malaysia which aims to evaluate the low back pain problem and its association with personal and psychosocial risk factors. A stratified random sampling of the automotive industry was carried out where the industries selected were based on the work process with major manual handling such as assembly, stamping and die-casting. Three industries that met these criteria were invited to participate in this study. A convenient sampling was carried out among the workers using a self-administered questionnaire which includes the personal background and lifestyle, working background and history, and workload demands. The personal risk factors assessed in this study were age, ethnicity, Body Mass Index (BMI), smoking status, exercise and leisure physical activity. The length of service, working schedule, working hour, previous workplace and manual material handling (MMH) activity in previous workplace were assessed for the work background and history. For the workload demands, the items assessed were rest time, working overtime, stress at work, work pace, faster movement, repetitive task and fatigue after work. The low back pain characteristics were evaluated through modified Standardised Nordic Questionnaire[10]. The pain intensity and discomfort during working hour, after work, before sleep, after sleep, during weekend, worst episode of low back pain and overall rating of pain and discomfort also were evaluated through the questionnaire. The pain intensity and discomfort level were classified into Likert-scale ranging from 1 to 5 with (1=no pain, 2=mild pain, 3, moderate pain, 4= painful and 5=severe pain). These questionnaires were validated taking into considerations of local experts opinions on workers safety and health and pre-tested in a pilot study with the value of Cronbach alpha 0.861, which indicates a good reliability.

A total of 230 questionnaires were distributed among automotive manual material handling workers who met the inclusion criteria; Malaysian citizen, involved in manual material handling, and had worked for more than one year.

Statistical Analysis

The descriptive statistics includes the frequency, percentage, mean, range and standard deviation analysis. To facilitate the inferential statistical analysis, the continuous variables; age and Body Mass Index (BMI) were categorized into group

(age: <30 and >31 years old), (BMI: normal, and overweight). The pain intensity and discomfort level also were categorized into pain, moderate pain and severe pain (1=no pain, 2-3, moderate pain, and 4-5=severe pain).

The inferential statistics such as Chi-square were use to test the significance different between group with low back pain and also to assess the association of low back pain and risk factors. All the descriptive and inferential statistics analyses were conducted using the SPSS for Windows (Version 20).

RESULTS

Socio demographic Data

A total of 202 respondents participated, making the response rate of 87.8 % for this study. Their mean ages were 30.82 ± 7.158 ranged from 18-53 years old. Majority of the respondents were male (95.5%), smokers (61.4%) with mean number of cigarettes smoked per day were 8.77±5.517 ranging from 1 to 20 ciggarettes per day, and have normal BMI (65.9%). A total of 72.3% and 70.8% respondents claimed to practice a good lifestyle with exercise and involved in physical activity during leisure time respectively.

Work background and history Data

Most of the respondents are permanent workers (62.9%), and worked at least 5 years (53%) at the current manufacturing plant. The majority of the respondents worked for up to 6 days a week (92.6%) and for more than 8 hours daily (80.2%). More than half (56.9%) of the respondents has previously worked at other manufacturing factory and of that, 49% of them claimed their previous job involved in manual material handling.

Prevalence of Low Back Pain

This study found that the percentage of low back pain 12 months prevalence were 57.9%, one month prevalence 49.5% and 7 days prevalence 35.1 %. Figure 1, shows majority of the respondent's rate pain/discomfort at moderate level for most of the specific time with 73.4% during working, 65.5% before bed, 64.1 after work, 59.2% during weekend and 54.6% after bed. Worst episode of low back pain did not show much different between moderate pain and severe pain where both scored 47.2% and 47.9% respectively. Overall score of pain or discomfort shows that 56.3% and 40.1% of respondents claimed the pain and discomfort were at moderate and severe level. From 71.3% respondents who had low back pain, only 36% of the respondent stated that the pain/discomfort last for less than 24 hours, 49% last for up to 5 days, while the rest claimed the pain or discomfort could last for up to 20 days.

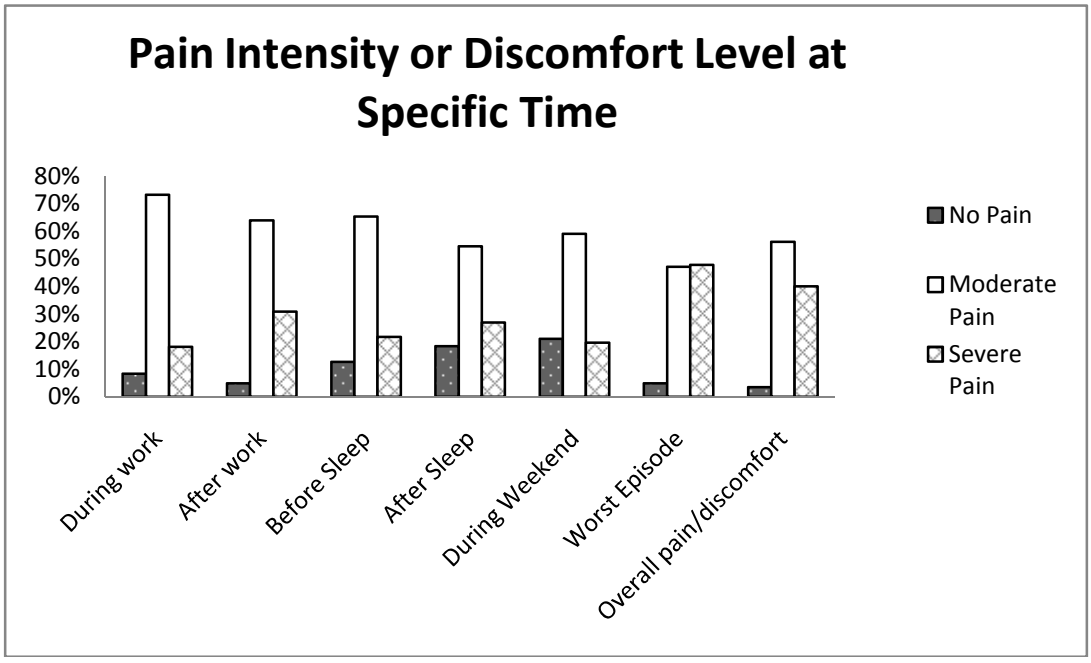

Figure 1 Pain intensity or discomfort level at specific time

Personal Risk Factors associated with Low Back Pain

Association between the risks of low back pain with personal risk factor were analysed using Chi-Square test. Results in Table 1 shows, only 7 days low back pain point prevalence shows a significant association with age while the rest of the personal risk factors show no association. Prevalence was higher among respondents age below 30 compared to older workers.

Table 1 Personal risk factors associated with LBP among automotive workers

Factors	LBP last 12 months		LBP 1 month		LBP last 7 days	
	n(%)	p value	n(%)	p value	n(%)	p value
Age						
<30	69(59)	0.093	55(55)	0.769	46(64.8)	0.023*
>31	48(41)		45(45)		25(35.2)	
Ethnicity						
Malay	103(88)	0.965	86(86)	0.357	59(83.1)	0.105
Non Malay	14(12)		14(14)		12(16.9)	
BMI						
Normal	74(69.8)	0.493	58(65.9)	0.087	46(71.9)	0.965
Overweight	32(30.2)		30(34.1)		18(28.1)	
Smoking						
Yes	70(59.8)	0.594	64(64)	0.450	49(69)	0.101
No	47(40.2)		36(36)		22(31)	
Regular exercise						
Yes	87(74.4)	0.438	73(73)	0.820	52(73.2)	0.822
No	30(25.6)		27(27)		19(26.8)	
Physical activity						
Yes	84(71.8)	0.713	71(71)	0.949	51(71.8)	0.811
No	33(28.2)		29(29)		20(28.2)	

* Significant, p<0.005

Occupational psychosocial risk factors associated with low back pain

Occupational psychosocial risk factors consist of work background and history, and workload demand. Working for more than eight hours a day compared to less than eight hours a day showed a significant difference in the 12 months prevalence of low back pain. Meanwhile, other occupational psychosocial work risk factors for work background and history did not show any significant difference (Table 2). From the tables 3, most of respondents' workload demands factors show significant associations with low back pain except for repetitive movement. Overtime, stress at work, work pace, and faster movements has a significant association with the prevalence of 12 months, 1 month and 7 days prevalence of low back pain. However, adequate time rest and fatigue after work only showed a significant relationship with the prevalence of 7 days and 1 month respectively.

Table 2 Work background and history associated with low back pain

Factors	LBP last 12 months		LBP last month		LBP last 7 days	
	n(%)	p value	n(%)	p value	n(%)	p value
Length of service						
1-5 years	60(51.3)	0.573	52(52)	0.784	43(60.6)	0.111
>6 years	57(48.7)		48(48)		28(39.4)	
Working schedule						
Normal	51(43.6)	0.993	50(50)	0.068	34(60.6)	0.362
Shift	66(56.4)		50(50)		28(39.4)	
Working hour						
8 hours	11(9.4)	0.018*	11(11)	0.178	11(15.5)	0.735
>8 hours	106(90.6)		89(89)		60(84.5)	
Previous workplace						
Yes	67(57.3)	0.910	58(58)	0.761	37(52.1)	0.309
No	50(42.7)		42(42)		34(47.9)	
MMH activity in previous workplace						
Yes	56(47.9)	0.702	49(49)	0.998	32(45.1)	0.410
No	61(52.1)		51(51)		39(54.9)	

* Significant, p<0.005

Table 3 Workload demand associated with low back pain

Factors	LBP last 12 months		LBP last month		LBP last 7 days	
	n(%)	p value	n(%)	p value	n(%)	p value
Adequate rest time						
Yes	43(37.1)	0.184	35(35)	0.0084	19(26.8)	0.002*
No	73(62.9)		65(65)		52(73.2)	
Overtime						
1-2 times/week	16(13.8)	0.001*	15(15)	0.008*	10(14.1)	0.003*
3-4 times/week	44(37.9)		36(36)		22(31.0)	
Everyday	56(48.3)		49(49)		39(54.9)	
Stress at work						
Yes	82(70.7)	0.000*	71(71)	0.000*	49(69)	0.007*
No	34(29.3)		29(29)		22(31)	
Work pace						
Slow	5(4.3)	0.002*	3(3)	0.002*	2 (2.8)	0.001*
Moderate	74(63.8)		64(64)		42(59.2)	
Fast	37(31.9)		33(33)		27(38.0)	
Faster movement						
Yes	81(69.8)	0.002*	72(72)	0.001*	50(70.4)	0.037*
No	35(30.2)		28(28)		21(29.6)	
Repetitive task						
Yes	101(81.1)	0.585	85(85.9)	0.977	61(87.1)	0.717
No	15(12.9)		14(14.1)		9(12.9)	
Fatigue after work						
Sometimes	45(38.8)	0.162	35(35.4)	0.031*	26(37.1)	0.224
Always	71(61.2)		64(64.6)		44(62.9)	

* Significant, $p<0.005$

DISCUSSION

The prevalence of low back pain among manual material handling workers in automotive industry in Selangor were high compared to other study conducted by Deros et al.[11] and Ghaffari et al.[12] among car manufacturing company workers but lower than study done by Mohd Nizam & Rampal[13] among workers in oil plantation and by Tamrin et al.[14] among commercial bus driver. However, the 12 months prevalence of this study were almost similar with study done by Smith et al.[15] among nurses. The difference in the findings may be due to different demographic and work task. The discomfort or pain rating score were similar with study conducted by Gangopadhyay et al.[16] and Rahmah et al.[17]. The increased in prevalence rate with time in this study shows that there is a cumulative effect on the occurence of low back pain[4].

Majority of repondents stated that their low back pain or discomfort last for more than 24 hours up to 5 days. This finding is similar with a study among delivery drivers[18]. However, a study among forestry workers reported differently where majority of the respondents claimed that the pain last to 8 days up to 30 days[19]. The difference in duration of pain might be due to different workload demand, difficulty of task and energy required for different task and job. In addition, lack of adequate rest might contribute to the late recovery of discomfort and pain.

This study found that none of the personal variables were found to be statistically significant with low back pain except for age. This finding is different than other studies that reported smoking[20], and Body Mass Index[21,22] as significant risk factors for low back pain.

Systematic review on the prevalence of low back pain in Africa shows that the prevalence of back pain increased with age[23]. In contrast with this study, it was found that 7 days prevalence of low back pain was found to be statistically significant among respondents aged less than 30 years. This might be due to selection of young and healthy workers by employer as young workers are normally healthy and have stronger energy to perform heavy task. In addition, young workers also often assigned to perform heavy tasks that do not require experience and skills, which contribute to the tendency of getting back pain[24]. Furthermore, older workers who retire early may also contribute to the lack of prevalence among the elderly.

Shift work has the potential to be a stressor that may affect the quality and quantity of sleep, as well as increasing pressure on the muscles that can cause back pain[25]. In this study, shift working schedule was not found to be a associated with low back pain and this finding are consistent with findings from other studies[26,27].

This study also shows an association between 12 months point prevalence and low back pain among respondents working more than 8 hours a day. It is found that there is an increased risk of getting neck, shoulder and back pain working overtime among nurses[28]. The risk of getting low back pain also was found to be three times higher with the increased numbers of working hours per week among Hispanic carpenter[22]. This may be due to lack of time to rest which exaggerated the risk of getting low back pain.

Working in a stress condition was found to be associated with low back pain. This finding is supported by previous studies[22,23,15]. This might be due to the lack of capabilities on handling stress among blue collar workers. According to McLeod[29], logically, the management workers face more stressful situation than the production workers in daily working task, however, the management workers were more knowledgeable, capable and have experienced in dealing and handling problems compared to production workers which is less capable dealing with problems causing the production workers more depressed. Mental stress can also increase the static muscle activity which associated with muscle disorders[30].

This study did not find any significant association between repetitive movement and low back pain even though other study has shown the association[12]. This may be due to the variation of task performed by workers in the manufacturing plant.

Work pace speed was found to be significantly associated with the prevalence of back pain with high percentage of prevalence is from respondents who work with medium speed. This shows that work task with medium to fast work pace are at high risk of getting low back pain. This result is parallel with the findings that faster movement also found to be significantly associated with low back pain. Fatigue after work was also found to be associated with low back pain among respondents who often feel tired after work. Due to the fact that workers at the factory have to achieve daily production target and to ensure this goal is achieved, the employees have to work actively and move faster. This scenario lead to inadequate rest experienced by workers which can cause fatigue, thus, this could likely contribute to back pain problem.

CONCLUSIONS

This study had shown the prevalence of low back pain is a significant problem among automotive industry manual material handling workers. It was found that personal factors do not significantly associated with low back pain except for age. The 12 month, one month and 7 days point prevalence of low back pain was associated with the frequency of overtime, stress at work, work pace and faster movement. These findings suggest that occupational psychosocial work factors have significant associations to low back pain among manual material handling workers in automotive industry as compared to personal factors. Further study of the risk factors using other study design such as cohort study and retrospective study case control were suggested to explore the cause-effect relationship to low back pain. Extensive investigations of other risk factors such as working posture and lifting activity need to be done to further understand the mechanism of risk factors leading to low back pain.

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