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Prevalence of Low Back Pain and Associated Risk Factors among Car Mechanics in Malacca, Malaysia

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Abstract

Background: Work-related low back disorder is one the common musculoskeletal disorders that has been concurrently associated with the work characteristic and position during work. The working posture of car mechanics that involves high force exertion, vibration, prolonged standing and awkward working position has directly contributed to the development of low back pain. Although previous study has addressed on this issue, there is a paucity of information in regards to the prevalence, risk factors of low back pain and the association between these two variables. Thus, the current study was conducted to address this issue with following objective:

Objective:

1. To determine the prevalence and the risk factors of work-related low back pain among car mechanics in Malacca City, Melaka, Malaysia.
2. To examine the association between low back pain and risk factors of work-related low back pain among car mechanics in Malacca City, Melaka, Malaysia.

Materials & Methodology:

This cross-sectional study includes 120 car mechanics selected from 43 car workshops in Malacca city by simple random sampling method. Musculoskeletal disorders and disability data was gathered by using standardized Nordic self-report questionnaire and Oswestry disability index. Descriptive statistics were present for all categorical variables. Chi-Square were used to determine the association between low back pain and the related risk factors.

Results: The findings of the current study showed that 80.0% of car mechanics experienced low back disorder in Malacca city. The risk factors such as BMI, rest time/rest period and squatting for long period showed a significant association with low back trouble. **Conclusion:** The inappropriate working posture and contributing risk factors has led to steady increase of low back pain among car mechanics. An early education of healthy lifestyle involving exercise and good diet as well as practice of effective ergonomics intervention should be encouraged among them in order to prevent further injury and eliminate low back pain.

Keywords

Low back pain, Car Mechanic, Prevalence, Risk factors

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Introduction

Musculoskeletal disorders (MSDs) has been referred as conditions that include a wide range of inflammatory and degenerative conditions affecting the muscles, tendons, ligaments, joints, peripheral nerves, supporting blood vessels and supporting structures of the body (Punnett & Wegman, 2004). Skeletal muscle can generate large internal forces on the joints, tendons and nerve during movement that may lead to MSDs (Cutlip et al., 2009). Work-related musculoskeletal disorder (WMSDs) is defined as MSDs have been identified to be caused particularly by work characteristic or workplace environment (Akodu. A. et al., 2008). According to the Occupational Safety and Health Administration (OSHA) of the US, some of the physical factors associated with the occurrence of MSD at the workplace were awkward posture, repetitive motion, motion force, vibration and temperature.

Low back pain (LBP) is defined as musculoskeletal disorders and discomfort, localized between the coastal margin (bottom of ribs) and above the inferior gluteal folds (top of legs), ith or without leg pain from any cause (Louw, Morris, & Grimmer-Somers, 2007). In a study conducted to investigate the symptoms in various body parts among car tyre service center workers have reported that 30% of work-related musculoskeletal disorders were lower back pain with majority of injury arising 83.3% from lifting heavy object (Abd Rahman, Aziz, & Yusuff, 2010). In addition, a previous study among 191 auto mechanics in Klang Valley, Malaysia reported 66.5% of low back disorder prevalence cases (Nasaruddin, Tamrin & Karuppiah, 2014). The poor workplace ergonomic has been the major contributor to the escalation of the WMSDs among the workers (Thompson et al., 2003).

Previous studies done in Malaysia investigated the postural analysis, various forceful exertion task and reported that auto repair mechanics suffer from MSD of various parts of the body contributing 66.5% in lower back region (Nasaruddin, Mohd Tamrin, & Karuppiah, 2014). Nevertheless, there is limited studies focused to address the level of disability caused by the low back disorder and its associated risk factors among the car mechanics. Therefore, the purpose of the current study is to determine prevalence and associated risk factors of low back problem along with the level of disability among car mechanics in Malacca City, Melaka, Malaysia.

Methodology

A cross-sectional study was conducted to investigate the association between low back pain and the contributing risk factors among car mechanics in Malacca city. 120 participants were recruited using random sampling method. The study included the participants of both genders from age group 25 to 60 years' old who works 6 hours daily. Participants excluded if they have mental, physical and psychological disabilities, pregnant women, any form of previous surgery and currently under any form of pain relieving medications. All procedures were approved by the INTI International University Research and Ethics Committee.

A questionnaire was developed to obtain basic demographic data's which includes modifiable demographics such as BMI, physical exercise duration, cigarette smoking, sleeping time, and working time that might influence low back pain. Standardized Nordic Musculoskeletal

Questionnaire (Kuorinka et al., 1987) used to evaluate the musculoskeletal problems. The questionnaire used to screen the musculoskeletal symptoms/disorders related to occupational setting (Crawford, J. O., 2007). The pain-related disability due to low back pain (LBP) assessed using Oswestry Low Back Pain Disability Questionnaire (Fairbank et al., 2000). The Statistical Package for Social Sciences (SPSS) version 26.0 used to analyze the data. Descriptive statistics were present all categorical variables by frequency tables. Chi-Square used to examine the association between low back pain and the related risk factors. The level of significance for acceptance was $p<0.05$.

Results

The current study results present the prevalence of low back, contributing associated risk factors and the level of disability among the car mechanics. All the participants in the study were male (100%), followed by majority aged between 25-35 (37.5%), under normal BMI (52.5%), do not perform exercise (45.0%), non-smokers (52.5%) and sleep time more than 7 hours per day (40%). The detailed demographics details were shown in the table below.

Table 1. Demographic details of the car mechanics

Category	Sub-category	Frequency (n)	Percentage (%)
Gender	Male	120	100
Age (years)	25 – 35	45	37.5
	36 – 45	33	27.5
	46 – 55	24	20.0
	56 – 60	18	15.0
BMI	Underweight	12	10.0
	Normal	63	52.5
	Overweight	31	25.8
	Obese	14	11.7
Physical exercise	Not doing exercises	54	45.0
	1 day/week	32	26.7
	2 days/week	16	13.3
	3 days/week	7	5.8
	≥4 days/week	11	9.2
Physical exercise (hour) each day	Not doing exercises	54	45.0
	<1hr/day	21	17.5
	1 – 2 hrs/day	19	15.8
	2 – 3 hrs/day	22	18.3
	≥3 hrs/day	4	3.3
Smoking (piece)	None	63	52.5
	1 – 5	12	10.0
	6 – 10	10	8.3
	11 – 15	15	12.5
	16 – 20	6	5.0
	≥20	14	11.7

Sleeping time (hour) per day	<5	19	15.8
	5 – 6	23	19.2
	6 – 7	30	25.0
	≥7	48	40.0

Based on the prevalence analysis, 80% have complained back trouble at any point of the career. In the last 7 days, 85.8% have reported no back pain in their job. In addition, 25% have reported of reduced daily activities while 19.2% reduced in leisure activities. The detailed prevalence of low back pain has been shown in the Table 2 below.

Table 2. Prevalence of low back pain among the car mechanics

Category	Sub-category	Frequency (%)
Presence of low back trouble (ache, pain or discomfort)	Yes	96 (80%)
	No	24 (20%)
Total length of time have had low back trouble during the last 12 months	0 days	69 (57.5%)
	1 – 7 days	33 (27.5%)
	8 – 30 days	11 (9.2%)
	> 30 days, not daily	5 (4.2%)
	Everyday	2 (1.7%)
Low back trouble reduces the activity during the last 12 months	Yes	30 (25%)
	No	90 (75%)
Low back trouble has reduced the leisure activity during the last 12 months	Yes	23 (19.2%)
	No	97 (80.8%)
Presence of low back trouble at any time during the last 7 days	Yes	17 (14.2%)
	No	103 (85.8%)

Table 3 represents the risk factors and working characteristic that contributes to the development of low back among car mechanics.

Table 3. Risk factors of low back pain among car mechanics

	Characteristics	Frequency(n)	Percentage (%)
Work experience (year)	1 – 9	35	29.2
	10 – 19	29	24.2
	20 – 29	29	24.2
	≥30	27	22.5
Working hours	6 – 8	6	5.0
	8 – 10	92	76.7
	10 – 12	22	18.3
Rest time	Non-stop	9	7.5
	< 30 minutes	17	14.2
	30 minutes – 1 hour	86	71.7
	1 – 2 hours	8	6.7
Lift heavy load	Yes	119	99.2
	No	1	0.8
	No	15	12.5

Stand for long period (hour)	< 1	20	16.7
	1 – 2	24	20.0
	2 – 3	15	12.5
	3 – 4	26	21.7
	≥4	20	16.7
Squats for long period (hour)	1 – 2	27	22.5
	2 – 3	33	27.5
	3 – 4	13	10.8
	≥4	7	5.8

Table 4 represents the level of disability based on the Oswestry low back pain disability questionnaire (ODI). The car mechanics have shown minimal disability level. The detail score shown in table below.

Table 4. Oswestry Low Back Pain Disability Questionnaire (ODI)

	Total number (n)	**Mean**	**Standard Deviation**	**Interpretation of score**
ODI score	120	2.367	3.85	2.367/50 x 100% = **4.73%** (minimal disability)

Table 5 displays the chi- square analysis between the associated risk factors and low back pain. Based on the analysis, only the BMI, resting time and squatting for a long period of time has shown to be significant.

Table 5. Association between the contributing risk factors and the low back pain

Associated risk factor	**P- value**
Age (year)	0.216
BMI	**0.004***
Physical exercise (hour)	0.076
Physical exercise (day)	0.250
Smoking (piece)	0.882
Sleeping time (hour)	0.808
Work experience (year)	0.782
Working hours	0.775
Working days	0.508
Resting time	**0.014***
Lift heavy load	0.616
Stand for long period (hour)	0.108
Squats for long period (hour)	**0.033***

*Significant at $p < 0.05$ (Pearson's Chi-Square test)

Discussion

The results of the current study showed that the prevalence (80%) of low back pain among the car mechanics is considerably high. The results obtained from the current study were in line with previous study conducted in Nigeria among automotive maintenance mechanics with prevalence of 76.02% (Abaraogu, Ezema, Igwe, Egwuonwu, & Okafor, 2016). The WMSDs among the Iranian auto mechanics showed a prevalence of 62.6% (Moradi et al., 2017) while 67% of low back pain among automobile mechanics in Bangladesh (Akter, Rahman, Mandal, & Nahar, 2016). The increasing trend of low back pain among the car mechanics is alarming and hence, there is a substantial need for an early intervention to reduce the symptoms and enhance the productivity of the workers.

There was a significant association between BMI and low back pain in the current study. Previous studies have shown a significant association between BMI and low back pain (Hershkovich et al., 2013; Heuch, Hagen, Kurt, Heuch, Nygaard, & Zwart, 2010). Further, another study has shown with increase of BMI, the risk towards back pain also increase concurrently (Kwagyan. J. et al., 2005). This can be explained as higher body weight increases the mechanical load that will be placed on the spine as well as associated with degeneration of the lumbar spine discs and indirectly, upscale the risk for obese person to injuries (Liuke et al., 2005; Shiri, Karppinen, Leino-Arjas, Solovieva, & Viikari-Juntura, 2010). Further, another research has reported the increase of cytokines production in adipose tissue which results in the activation of proinflammatory responses contributing to the upscale of pain (Tilg & Moschen, 2006). In the long run, the increase of the back pain may cost for both the employers and employees as there will be more medical and insurance claims as well as lost in productivity. Thus, the current study results portray that an early education on a good balanced diet, physical activity and regular health checkups is crucial to reduce the risk of back pain among the car mechanics.

This study also reports that resting time was significantly associated with low back pain among car mechanics, p-value 0.014. Previous research shown that periodic rest breaks could reduce the onset and severity of acute LBP also increases the work productivity (Sheahan, Diesbourg, & Fischer, 2016). The possible explanation for this could be prolonged muscle activation in static position may produce localized muscle tension, muscle fatigue causing impairment of neuromuscular system also increases the mechanical stress on ligaments and intervertebral discs leads to LBP. Earlier studies concluded that providing a break during work may have significant difference in the muscle discomfort(Nakphet,Chaikumarn & Janwantanakul, 2014).

Squatting for long period was also shown significantly associated with low back trouble in this study, which is value 0.033. Prolonged stay in squatting position produce the compression force and stress on both of intervertebral discs and paraspinal muscles, but also generate loads on lower limbs. Moreover, squatting for long period without a stool supported were leading to pain and discomfort on lower back even though the discomfort level for lower back is not significantly high as lower limb (Chung. M. et al., 2003). In contrary to the current study a systematic review done by (Roffey, Wai, Bishop, Kwon, & Dagenais, 2010) concluded that no significant association between awkward occupational postures and LBP, with only two studies shown significant

associations in most of their risk estimates compared with six studies showed non-significant associations.

In current study, most of the risk factors showed no significant association with low back disorder and minimal disability index on low back pain possibly due to low sample size and data collection was limited by searching from only certain places that contain of large amount of vehicle workshop. Moreover, the current study has insufficient findings among female car mechanics and association between gender and reporting low back trouble. Future research recommended to be conducted with a larger number of sample size and more equal proportionate population of gender.

In conclusion, the current study showed high prevalence rate of low back pain and significant association with BMI, resting time and hours spent in squatting position. The results of the current study would be able to further increase the awareness towards the practice of good ergonomics among the car mechanics to increase the work productivity and enhance the quality of life.

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