# PREVALENCE OF LOW BACK PAIN AND ASSOCIATED FACTORS AMONG TAXI DRIVERS IN JOHOR BAHRU

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.

MASTER OF SCIENCE IN OCCUPATIONAL SAFETY AND HEALTH MANAGEMENT
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## ABSTRAK

Sakit belakang di bahagian bawah merupakan masalah muskuloskeletal yang paling umum yang dialami oleh pemandu teksi di sektor pengangkutan. Masalah ini sering dikaitkan dengan aktiviti duduk bagi tempoh masa yang panjang semasa memandu, getaran seluruh badan (Whole Body Vibration) dan pengendalian barangan yang perlu diangkat secara manual. Statistik menunjukkan bahawa terdapat lebih kurang 73,893 orang pemandu teksi di negara ini dan dianggarkan 10.5% daripadanya di Johor Bahru. Ini mungkin kerana pembangunan pesat di kawasan bandar serta terletak berdekatan dengan jalan utama keluar masuk Singapura. Objektif utama kajian ini adalah untuk menentukan prevalens masalah sakit belakang di bahagian bawah dan faktor-faktor yang berkaitan di kalangan pemandu teksi di Johor Bahru pada tahun 2012. Saiz sampel untuk kajian ini adalah 228 responden dan hanya 224 responden telah bersetuju menjawab soal selidik, dengan memberi kadar respon sebanyak 98.2%. Keputusan kajian menunjukkan bahawa prevalens masalah sakit belakang di bahagian bawah dalam tempoh kajian 12 bulan adalah 49.1%. Sebahagian besar responden adalah dari etnik Melayu (84.4%) dan bukan perokok (90.2%). Kajian telah menunjukkan prevalens sakit belakang di bahagian bawah yang tinggi di kalangan responden yang memandu teksi jenis Wira (55.5 %), dan dari etnik India atau lain-lain (56.0%). Kajian menunjukkan hubungan yang signifikan di antara masalah sakit belakang di bahagian bawah dan status perkahwinan. Status Jisim Berat Badan (BMI) yang tidak normal menunjukkan perkaitan yang signifikan dengan masalah sakit belakang di bahagian bawah. Kajian ini juga menunjukkan hubungan yang signifikan di antara masalah sakit belakang di bahagian bawah dan pengendalian secara manual, yang meliputi mengangkat barang berat, membongkok, dan memusingkan badan. Masalah sakit belakang di bahagian bawah menunjukkan prevalens yang tinggi di kalangan pemandu teksi yang tidak puas dengan pekerjaan mereka (66.7%) dan di antara mereka yang tidak mempunyai sokongan di tempat kerja (53.8%). Kajian ini juga mendapati bahawa pemandu-pemandu teksi peka mengenai masalah sakit belakang di bahagian bawah dan keperluan untuk pencegahan dan rawatan awal. Oleh itu, intervensi yang berkesan perlu dilaksanakan untuk mengurangkan prevalens masalah sakit belakang di bahagian bawah di kalangan pemandu-pemandu teksi untuk mengekalkan mereka di sektor pengangkutan dan seterusnya meningkatkan produktiviti.

## ABSTRACT

Low back pain is one of the common musculoskeletal disorders affecting taxi drivers in the transportation sector. The problem is frequently associated with prolonged sitting while driving, whole body vibration and manual handling of goods to be delivered. There are approximately 73,893 licences issued for taxi drivers in Malaysia and 10.5% of them are based in the Johor Bahru, most probably due to located in town and near to Singapore. The main objective of this study was to determine the prevalence of low back pain and associated factors among taxi drivers in Johor Bahru for the year 2012. The sample size required for this study was 228 respondents but only 224 respondents were managed to be approached for administration of assisted questionnaire. The response rate of this study was 98.2%. Results showed that the prevalence of low back pain in the past twelve months was 49.1%. Majority of the respondents were Malay (84.4%), and non-smokers (90.2%). The prevalence of low back pain was higher among those who drove Wira taxis (55.5%), Indian and other ethnicities (56.0%).There was a significant association between low back pain and marital status. Abnormal Body Mass Index (BMI) status was significantly related to low back pain as well, supporting the postulated hypotheses. The study also revealed significant association between low back pain and manual handling, which includes lifting, bending and twisting the lower back. There was a higher prevalence of low back pain among taxi drivers who are not satisfied with their work (66.7%) and among those who lack support at work (53.8%). It was also found that the taxi drivers are highly aware of the low back pain problem and in need for early prevention and treatment. Therefore, necessary interventions need to be implemented to reduce the prevalence of low back pain among taxi drivers to retain them in the job and enhance productivity.

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May God redeem all their contributions, knowledge and sacrifice given by each and everyone involved.

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## ABBREVIATION

| | |
|---|---|
| UUM | Universiti Utara Malaysia |
| WHO | World Health Organization |
| MSD | Musculoskeletal Diseases |
| OSHA | Occupation Safety and Health Act |
| PRECEDE | Predisposing Reinforcing and Enabling Constructs in Educational Diagnosis and Evaluation |
| SPSS | Statistical Package for The Social Sciences |
| WHO | World Health Organization |
| BMI | Body Mass Index |
| CI | Confidence Interval |
| OR | Odds Ratio |
| < | Less |
| > | More |
| ≥ | More or equal to the |
| $\pm$ | Plus minus |
| % | Percentage |
| $X^2$ | Chi-square |
| n | Number of samples |
| et al. | Other authors |
| m | Metre |
| kg | Kilogrammes |

# CHAPTER 1

# INTRODUCTION

## 1.0 Background of the Study

Pain in the lower back is one of the major syndromes alleged in the modern living era. Almost everyone experience low back pain at some point in their lives. This pain varies from mild to severe. The pain can be short-lived or long-lasting. Lower back pain is a common concern in the industrialized nations affecting at nearly 70% worldwide (Thiago et al., 2012). In the United States, the number of prevalence suffering from low back pain is estimated to be 18% with an annual increase of 15% to 20% (Steven et al., 2001). Low back pain is usually self-limiting with a total of 50% affected and recovered within two weeks (Hulshof et al., 2007). Lower back pain stands as the most common reported problem after headache and tiredness (Gallais., 2008). Reports found more than 70% of the population in developed countries suffers from low back pain (William et al., 2009).

British Medical Journal (McIntosh & Hall, 2008) published an article stating, 30% of European workers reported that their job was the main factor causing low back pain and this prevalence rates differ from countries ranged between 13% and 44%. The pain is multifactorial and could be associated with both occupational and non-working related factors. These non-working related factors may include age, gender, smoking status, anthropometric measures, physical fitness level and medical history (Mark et al., 2009). Psychosocial factors, both either work or non-working related has been associated with low back pain as well (Anderson et al., 1997).

## 1.1 The Research Problem

In Malaysia, according to Deros et al. (2010), in Journal of Work Posture and Back Pain Evaluation had stated that there are only few studies of low back pain in Malaysia compared to worldwide where there are much research had been conducted. So far, the inadequate literature search did not publish any research or studies conducted on ergonomic

issues among taxi drivers in Malaysia. Nevertheless, there are studies conducted on the issue of low back pain among other group of workers, such as among doctors (Normadiah Jabar, 2005) and factory employees (Jasbeer Singh & Ismail, N.H., 1998). This research attempts to estimate the prevalence of low back pain among taxi drivers in Johor Bahru, Malaysia who are mainly involved in transporting people and things.

Based on Chen et al. (2005), the possibility of getting lower back pain due to prolonged driving has been a major subject in the recent years. Table 1.1 shows study by Lilia et al. (2008) in Occupational driving as a risk factor in low back pain and working as a driver and performing daily lifting tasks carries a significant risk of high scale (OR=10.4; 95% CI 2.0–52.5) when compared with working as driver but not lifting daily. These results are consistent with our research which mentions that frequency and continuity of the task is a relevant element for increasing low back pain risk. While Table 1.2 shows few studies on low back pain among different drivers such as truck driver, urban taxi driver, and bus drivers.

Table 1.1 Statistics of low back pain due to prolonged driving

Crude and Adjusted Odds Rations and Confidence Intervals for Variables with Interaction Effects (N=231)

| **Variable** | **Crude OR** | **CI 95 %** | **Adjusted OR*** | **CI 95 %** |
|---|---|---|---|---|
| No occupational driving nor lifting tasks | 1.0 | | 1.0 | |
| Occupational driving | 0.6 | 0.1-3.0 | 0.4 | 0.1-2.3 |
| Lifting tasks | 1.1 | 0.3-3.7 | 0.9 | 0.3-3.3 |
| Both driving and lifting tasks | 12.9 | 3.6-46.6 | 7.3 | 1.7-31.4 |
| No occupational driving nor lifting tasks daily | 1.0 | | 1.0 | |
| Daily occupational driving | 1.5 | 0.2-8.7 | 1.0 | 0.1-7.1 |
| Daily lifting tasks | 1.3 | 0.3-4.9 | 1.1 | 0.3-4.6 |
| Both daily driving and daily lifting tasks | 16.3 | 3.9-67.8 | 10.4 | 2.0-52.5 |
| No occupational driving nor lifting >25 times | 1.0 | | 1.0 | |
| Occupational driving | 0.7 | 0.1-3.5 | 0.5 | 0.1-1.6 |
| Lifting tasks >25 times | 0.9 | 0.2-3.6 | 0.7 | 0.2-2.1 |
| Both occupational driving and lifting >25 times | 9.2 | 2.4-36.7 | 5.2 | 1.5-18.0 |

Source: Journal of Occupational driving as a risk factor in low back pain (2008)

Table 1.2 Studies on prevalence of low back pain

| No | Percentage of Low Back Pain | Author |
|---|---|---|
| 1. | 60% prevalence of LBP among professional truck drivers | Robb and Mansfield. (2007) |
| 2. | 51% prevalence of LBP among Taipei urban taxi drivers | Chen et al. (2005) |
| 3. | 57% prevalence of LBP among 2045 professional urban bus drivers in Denmark | Netterstrom and Juel. (1989) |
| 4. | 60% prevalence of LBP among group of American and Swedish bus drivers | Magnusson et al. (1996) |
| 5. | 45% prevalence of LBP among professional urban bus drivers | Nejenson et al. (2010) |

The cause can be defined as postulated which occur once the body is exposed to a vibrant act during driving (Lilia et al., 2008). Although the exact mechanism that causes the negative effect to which the whole body vibrates is undefined but there are still a few hypotheses which have been researched on. There are still possibilities that the compressive loading on inter vertebral joints leads to fatigue and to which it induces micro fractures or fractures in the vertebra endplate thus causing a reduction in blood flow and nutrition diffusion (Timothy & Kathryn., 2001).

A study by Lilia et al. (2008) have accomplished that various years of exposure to whole body vibration that occurs in vehicles could accelerate the degeneration of the spine. Spine degeneration can then affect the disc degeneration and go ahead to disorders and injuries of lower back.

Other than that, the second postulated hypotheses is that the loading that accelerates muscular fatigue of the spinal muscles. The both hypotheses are known as ‘tissue fatigue failure (Hulshof et al., 2007). It is estimated that nine million men and women in Great Britain are exposed to vibration at work (Palmer, et al., 2000). Common reported sources of occupational exposures were forklifts, lorries, cars, vans, tractors, loaders and buses. It was found that in both men and women, there were significant trends for increased of low back pain in those most exposed compared with those slightest exposed (Walsh et al., 1992).

According to the statistics released by Vehicles Licensing Board from official website of Commercial Vehicle Licensing Board (LPKP) (see Table 1.3), under the Prime Ministers Department, there are 73,893 licences issued for taxis in Malaysia. Among these, there are the total of 7,764 licenses issued in the state of Johor alone, where 2447 are rental taxi's, 5210 standard taxi's, 57 airport taxi's and 50 luxurious taxi's (see Figure 1.1). Based on these statistics, there are an estimated 10.5 % of taxi drivers in Johor.

Table 1.3: Driving license issued for taxi drivers in Malaysia

(Update till March 2011)

| STATE | RENTAL TAXI | PILOT CAR RENTAL | TAXI | AIRPORT TAXI | LUXURIOUS TAXI |
|---|---|---|---|---|---|
| **JOHOR** | 2447 | 0 | 5210 | 57 | 50 |
| **KEDAH** | 3074 | 0 | 0 | 1 | 18 |
| **KELANTAN** | 2213 | 0 | 0 | 41 | 5 |
| **MELAKA** | 1038 | 0 | 35 | 5 | 22 |
| **N. SEMBILAN** | 1113 | 0 | 187 | 35 | 7 |
| **PAHANG** | 1911 | 0 | 0 | 0 | 28 |
| **PERAK** | 2483 | 0 | 7 | 0 | 13 |
| **PERLIS** | 426 | 0 | 0 | 0 | 0 |
| **PULAU PINANG** | 558 | 0 | 1325 | 227 | 175 |
| **SABAH** | 1773 | 1559 | 2799 | 196 | 78 |
| **SARAWAK** | 690 | 607 | 1444 | 0 | 11 |
| **SELANGOR** | 1062 | 207 | 9241 | 467 | 258 |
| **TERENGGANU** | 974 | 0 | 5 | 1 | 13 |
| **W.P. KUALA LUMPUR** | 456 | 10246 | 16082 | 2011 | 824 |
| **W.P. PUTRAJAYA** | 2 | 0 | 172 | 0 | 4 |
| **TOTAL** | 20220 | 12619 | 36507 | 3041 | 1506 |

Source: Official website of Commercial Vehicle Licensing Board (LPKP) (2012) http://www.lpkp.gov.my

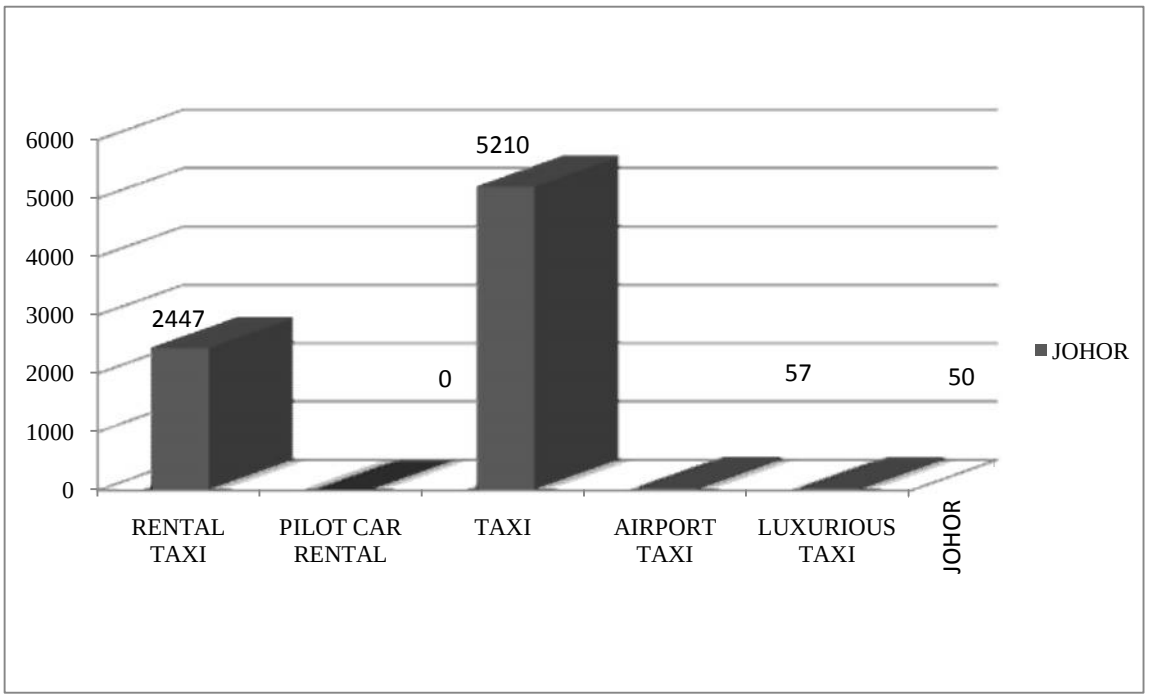


Figure 1.1 Number of taxi drivers in Johor

Source: Official website of Commercial Vehicle Licensing Board (LPKP) (2012) http://www.lpkp.gov.my

The taxi drivers are mainly from lower income and educational background, thus having limited awareness and exposure to occupational health related issues and existing legislations which have outlined their rights on occupational health hazards, such as the Occupational Safety and Health Act 1994.

This research focuses on the study of prevalence of low back pain among taxi drivers at Johor Bahru. In this study, the researcher looks into the details of the relationship of certain variable independents, namely socio demographic, physical workload, indirect work related factors and psychosocial workload with the dependent variable – prevalence of low back pain. In chapter one, background of study, research questions, research objectives, and the scope of the study had discussed.

## 1.2 Research Questions

There are few research questions that have been postulated based on the literature review conducted earlier by local and international researches. The questions raised are as below:

a) Are there any associations between socio demographic factors (types of taxi driven, ethnicity, marital status, underlying medical conditions, previous back injury, body mass index (BMI), smoker, age, number of cigarettes smoked in a day and years of smoking ) and low back pain among the taxi drivers in Johor Bahru?

b) Are there any associations between physical workload (frequent lifting, lifting while bending, lifting while twisting , lifting while bending and twisting, standing and walking, bending, prolonged bending, prolonged twisting and twisting) and low back pain among the taxi drivers in Johor Bahru?

c) Are there any associations between indirect work related factors (shift work, overtime, minutes of rest in a day, number of breaks in a day and duration of working hours in a week) and low back pain among the taxi drivers in Johor Bahru?

d) Are there any associations between psychosocial workload (duration of working, how to work, what to do at work, timetables and breaks, support at work and job satisfaction , work relationship, support at work and stress) and low back pain among the taxi drivers in Johor Bahru?

## 1.3 Research Objectives

### 1.3.1 General Objective

To determine the prevalence and factors associated with low back pain among taxi drivers in Johor Bahru.

### 1.3.2 Specific Objective

Below are some of the specific objectives which have been identified in regards to the study carried out.

a) To determine the association between socio demographic factors (types of taxi driven, ethnicity, marital status, underlying medical conditions, previous back injury, body mass index (BMI), smoker, age, number of cigarettes smoked in a day and years of smoking ) and low back pain among the taxi drivers in Johor Bahru.

b) To determine the association between physical workload (frequent lifting, lifting while bending, lifting while twisting , lifting while bending and twisting, standing and walking, bending, prolonged bending, prolonged twisting and twisting) and low back pain among the taxi drivers in Johor Bahru.

c) To determine the association between indirect work related factors (shift work, overtime, minutes of rest in a day, number of breaks in a day and duration of working hours in a week) and low back pain among the taxi drivers in Johor Bahru.

d) To determine the association between psychosocial workload (duration of working, how to work, what to do at work, timetables and breaks, support at work and job satisfaction) and low back pain among the taxi drivers in Johor Bahru.

## 1.4 The Scope of Study

The scope of this study has been determine by the prevalence of low back pain and associated factors among taxi drivers in Johor Bahru for the year 2012. The similar research had conducted by Chen et al. (2005) in Journal of Occupational factor associated with low back pain in urban taxi drivers and found the frequency of low back pain (LBP) among taxi driver was related with long driving time and frequent bending activities while driving. Chen et al. (2004), in their study about personal factors associated with acquired lumbar spondylolisthesis of urban taxi driver in the Journal of Occupational had identified that there are consistent relations between job scenarist and prevalence of acquired lumbar spondylolisthesis among taxi drivers. In this study, the prevalence of low back pain is among

taxi drivers who work in Johor Bahru. They were observed with self-report questionnaires (Appendix 1) for a few minutes at their place that they were working.

## 1.5 Summary

Lower back pain is basically multifactorial in origin, either occupational or non-occupationally caused. The possibility of low back pain due to prolonged driving has been studied both internationally thus locally. Studies had shown that the major postulated factors are whole body vibration (WBV) and prolonged sitting among humans. In Asian countries like Malaysia, there is still yet to be a standard system to evaluate the low back pain or other musculoskeletal disorders among drivers in the transportation sector. Apart from that, lack of proper education among drivers had caused them to have poor understanding about the problems. This study taken had been an attempt to research the prevalence of low back pain among taxi drivers and associated risk factors, with hope that the results will provide intent information to the relevant authorities to implement necessary interventions and control measures to reduce the occurrence of the problem as an occupational health hazard.

Next in chapter two, definitions of key terms, legislations regarding occupational safety and health, related theories and previous research studies were discussed. Chapter three is all about the research methodology which include research framework, research design, the sampling procedure, the pilot study and analysis of the data. The research had continued with chapter four which is research findings and final chapter with discussion, recommendations and conclusion.

# CHAPTER 2

# LITERATURE REVIEW

## 2.0 Introduction

This research focuses on the study of prevalence of low back pain among taxi drivers located in Johor Bahru. In this study, the researcher looks into the details of the relationship of certain variable independents, namely socio-demographic, physical workload, indirect work related factors and psychosocial workload with the dependent variable – low back pain. The severity of LBP will be assessed with the frequency of low back pain, sick absenteeism due to low back pain and visiting a doctor due to low back pain (getting treatment). In this chapter key terms of definition, elaborated legislation of low back pain and discussions of anatomy of spinal column are defined. Then, theories associated to low back pain had been studied and continued with research done by international and local researches. Next, this chapter had reviewed previous studies, which includes age, anthropometry, risk factors, heavy manual work, lifting, bending and twisting, sitting, body vibration, indirect factors, psychosocial factors and predisposing factors.

## 2.1 Definition of Key Terms

i. Low back pain (LBP) defines as pain, muscle tension or stiffness localized below the costal margin and above the inferior gluteal folds, with or without leg folds, which the pain persists for less than twelve weeks (McIntosh & Hall 2008). LBP is also the most common cause for patients to visit the orthopedic surgeons (Hulshof et al., 2007). While, according to World Health Organization (2003), LBP especially for recurrent bouts and chronic back pain lasts up to three months.

ii. Taxi drivers are individuals who take up driving of vehicles and for the purpose of this research, the taxi is an occupation and source of income.

iii. Demographic factors include age, sex, ethnicity, marital status and anthropometry.

iv. Sociological factors are smoking habits of respondents, history of previous back injury and underlying medical conditions (Lilia et al., 2008).

v. Body Mass Index (BMI) is a heuristic proxy for human body fat based on an individual's weight and height (Gallais., 2008). BMI is calculated as below:

$$\frac{\text{Weight (kg)}}{\text{Height (m}^2\text{)}}$$

Normal BMI : <23.9

Abnormal BMI : >23.9

vi. Physical Workload is defined as moving or bringing something from a lower level to a higher one. It encompasses stresses resulting from transferring objects from one level to another as well as the effects of varying techniques of patient handling and transferring (Anderson et al., 1997).

vii. Indirect Work Related Factors contributes with shift work, long working hours, and shift work is defined as a method of organization's working time in which workers succeed one another at the workplace so that the establishment can operate longer than the hours of work of individual workers at different daily and night hours. It can be a rotating shift around the clock with three shifts per day, namely morning, afternoon and night shifts (International Labour Organization 2004).

Long working hours are defined as working more than 48 hours in a week and or without a day off in a week (International Labour Organization 2007). For the purpose of this study, means of working hours in a week have been analyzed to identify its association with low back pain. A significant association is considered present if the means of working hours is higher in those with low back pain than in those without low back pain.

Break or rest is defined as break given during working hours or working week to preserve workers' safety, health and well-being. The recommended rest is 60 minutes if work exceeds eight hours and more than 24 hours of uninterrupted rest for every seven working days. It is also recommended to provide workers with 11 hours of rest between each shift if the shift is longer than six hours (International Labour Organization 2004). For the purpose of this study, the frequency of number of breaks and mean of minutes of break in a day had been analyzed to identify its association with low back pain. A significant association is considered present if the frequency of number of breaks and mean of minutes of break in a day is lower in those with low back pain than in those without low back pain.

viii. Psychosocial Workload is factor which influences the worker's ability to consciously or unconsciously adjust and relate the body to their work environment (Anderson et al., 1997). The same studies had defined job decision as job control or autonomy at work. Support at work is defined as positive work relation with co-workers or characteristics of working activities which include organizational culture, working climate, management style, help from co-workers, association, contribution and team working (Martino et al., 2003).

## 2.2 An Overview of Health and Safety Legislation

Occupational Safety and Health Act (OSHA) 1994, Section 15 and 17 predetermined that as far as it is reasonably practicable, a safe working environment, well maintained, safe equipments, and safe systems of work should be provided by employers, for the welfare of their immediate employees (health care workers), others (visitors or contractors) as well to the patients. As required under Section 16 of the same OSHA 1994, the safety and health policy statement should clarify the policy, standardize safety and provide supports for enforcement of safety and health within the company. The present and function of Safety and Health committee predetermined under Section 30 and 31 of OSHA 1994 together with the management commitment should undertake to play an active and proactive role so that there

is a continuity of action and all preventive and risk assessment measures taken are coordinated, documented, harmonized and implemented.

Section 24 of OSHA 1994, predetermined that all employees must comply and remain with the policies and protocols placed for their safety by their employers. They should protect their own health and safety by using personal protective equipments provided to them. The Occupational Safety and Health Administration (OSHA) of United States of America, as mentioned in the article by Menzel (2007) define ergonomics as science of fitting the physical environment and the job to the worker's capabilities and limitations as well as to the tasks performed. Work related low back pain occurs when there is a variance between environment, worker and the task. Section 20 and 21 of OSHA 1994, in general duty clause states that employers who are aware of the hazards at the workplace must make employees aware of these risks and work to eliminate them.

An ergonomically deficient workplace may not cause immediate pain as the human body has a great capacity for adapting to a poorly designed workplace or structured job. However, the compounding effect of the job and the workplace deficiencies in time will surpass the body's coping mechanisms, causing the inevitable physical symptoms, emotional stress, low productivity and poor quality of work (Jabbar, 2008). Transportation sector has lagged behind many other industries, such as warehousing and healthcare in instituting protections for their workforce. The reasons for transportation workers not receiving similar protections could be due to a singular focus on earning wages, lack of training on proper body mechanics and lack of occupational health and safety regulations in the transportation sector itself (Menzel, 2007).

Having said that currently there in no specific Act of law or Regulation on low back pain practice being enforced for taxi drivers nevertheless the respective Association can set up guidelines, practices or standard operative procedures (SOP) to make sure a proper way to reduce low back pain measures are undertaken and followed by the entire taxi drivers. To ensure its success there must be a continuous proactive action by the whole taxi drivers in terms of assessment, evaluation, training, supervision, awareness promotions and feedback.

## 2.3 Anatomy of the spinal column

The back, which extends from the skull to the tip of the coccyx, is defined as the posterior surface of the trunk. The scapulae and the muscles that connect the scapulae to the trunk are superimposed on the upper part of the posterior surface of the thorax (Snell, 1992). The vertebral column is the central bony pillar of the body. It supports the skull, pectoral girdle, upper limb and thoracic cage. By the way of the pelvic girdle, it transmits body weight to the lower limb. The vertebral cavity contains spinal cord, roots of spinal nerve and the covering meninges, to which the vertebral column gives protection (see Figure 2.2). The vertebral column is composed of 33 vertebrae as, 7 cervical vertebrae, 12 thoracic vertebrae, 5 lumbar vertebrae, 5 sacral vertebrae and 4 coccygeal vertebrae. See Figure 2.1 below;

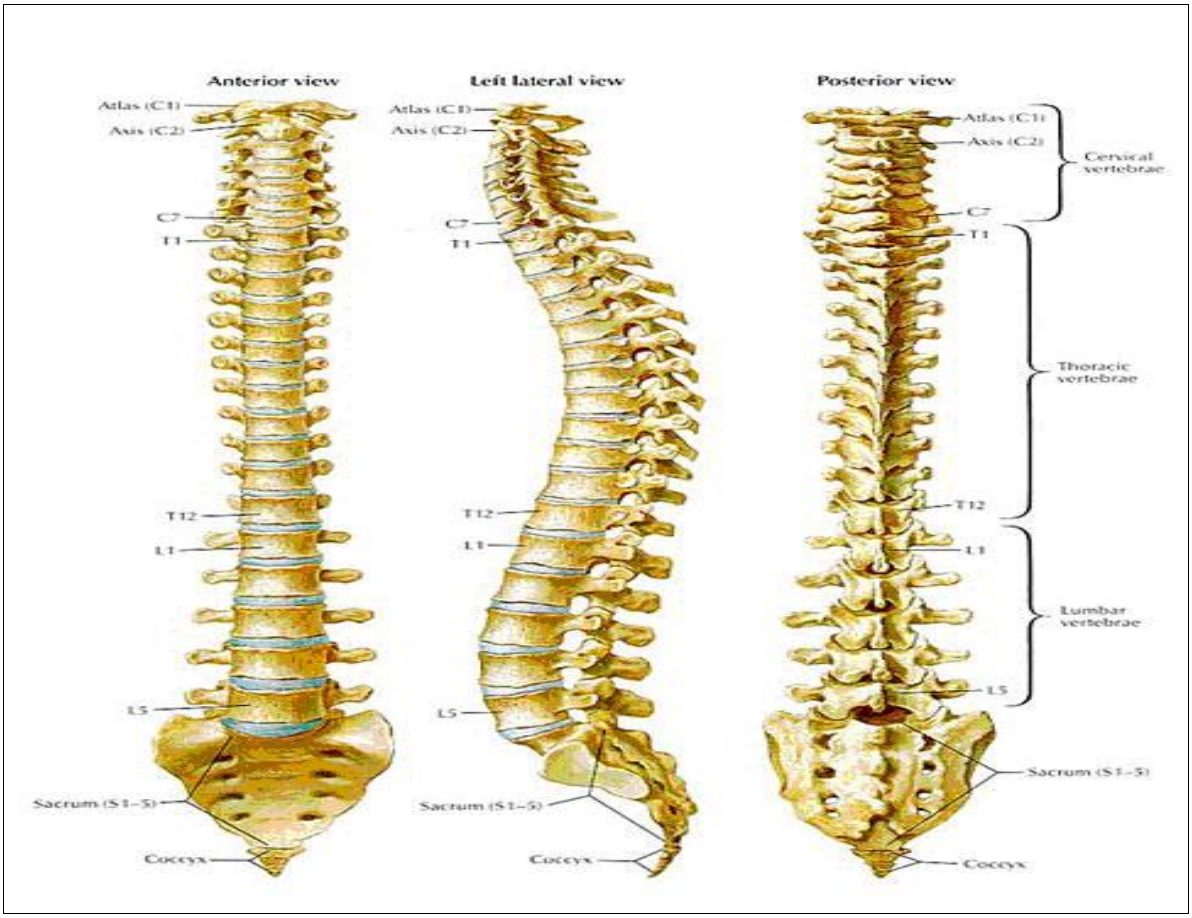


Figure 2.1: Anatomy of the spinal column

Source: adameducation.com (2012)

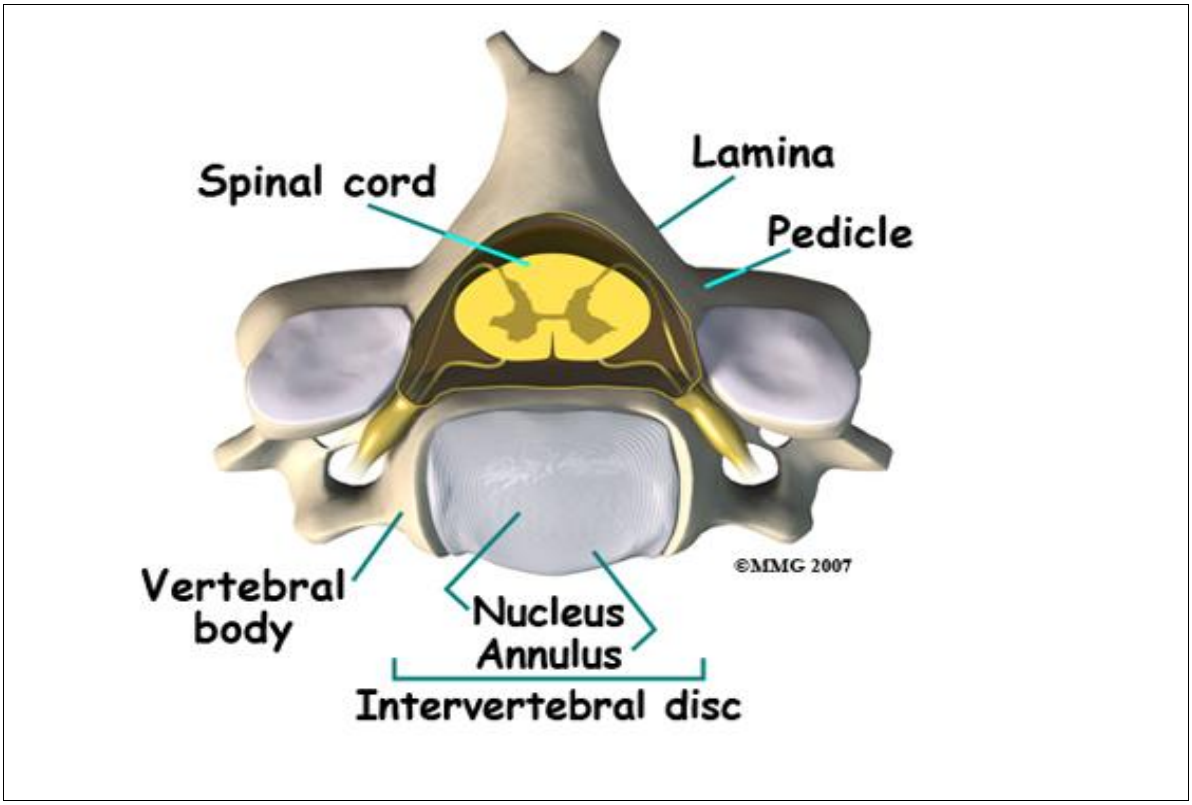


Figure 2.2: Anatomy of the vertebral body
Source: eorthopod.com (2012)

The spinal column (see Figure 2.1) functions to support the muscles, discs and nerves to control many functions of the trunk. All the vertebral bones are connected with each other to form a flexible curve. The spinal cord is protected by the spinal column. The intervertebral discs are responsible for one fourth of the length of the vertebral column. They are the thickest in the cervical and lumbar regions, where the movement of the vertebral columns is the greatest. Their physical characteristic permit them to serve as shock absorbers when the load on the vertebral column is suddenly increased, as when one is jumping from height. Each disc consists of a peripheral part, the annulus fibrosus and the central part, the nucleus pulposus (see Figure 2.3).

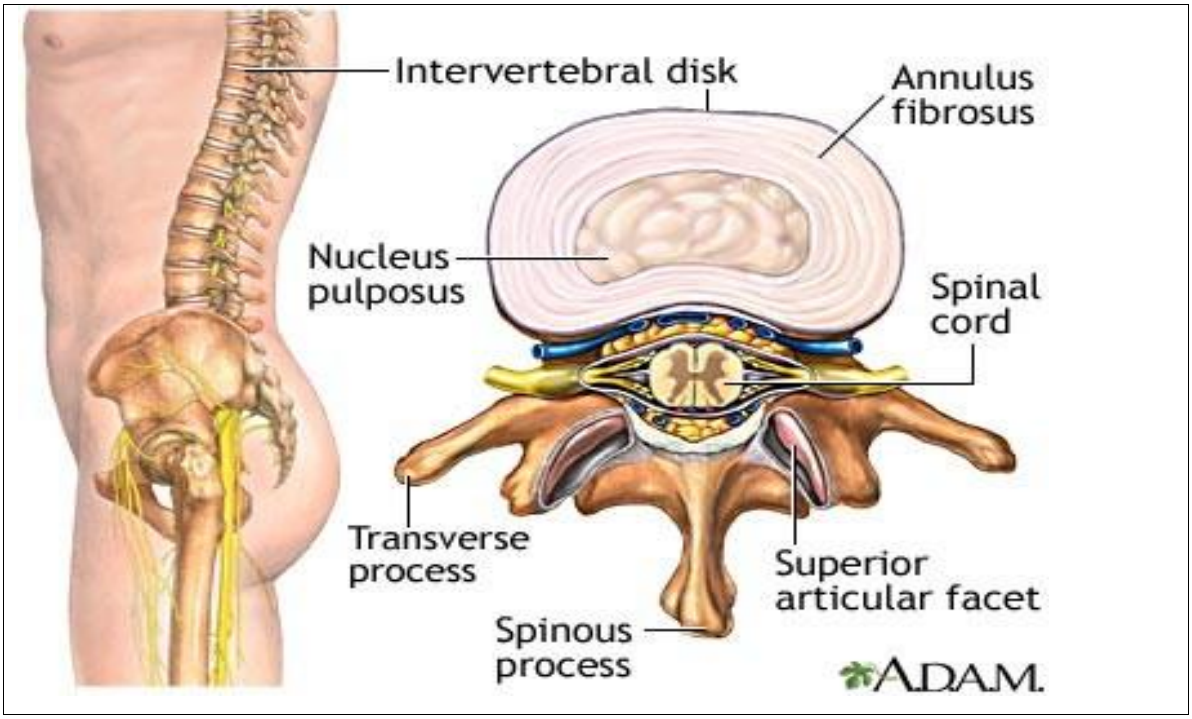

Figure 2.3: Anatomy of the intervertebral disc
Source: adameducation.com (2012)

The skin and the muscles of the back are supplied in a segmental manner by the posterior rami of the 31 pairs of the spinal nerves by the anterior or motor roots and the posterior or sensory roots. Each root (see Figure 2.4) is attached to the cord by a series of rootlets, which extend the whole length of the corresponding segment of the cord. After emergence from the intervertebral foramen, each spinal nerve immediately divides into a large anterior ramus and a smaller posterior ramus, which contains both motor and sensory fibers.

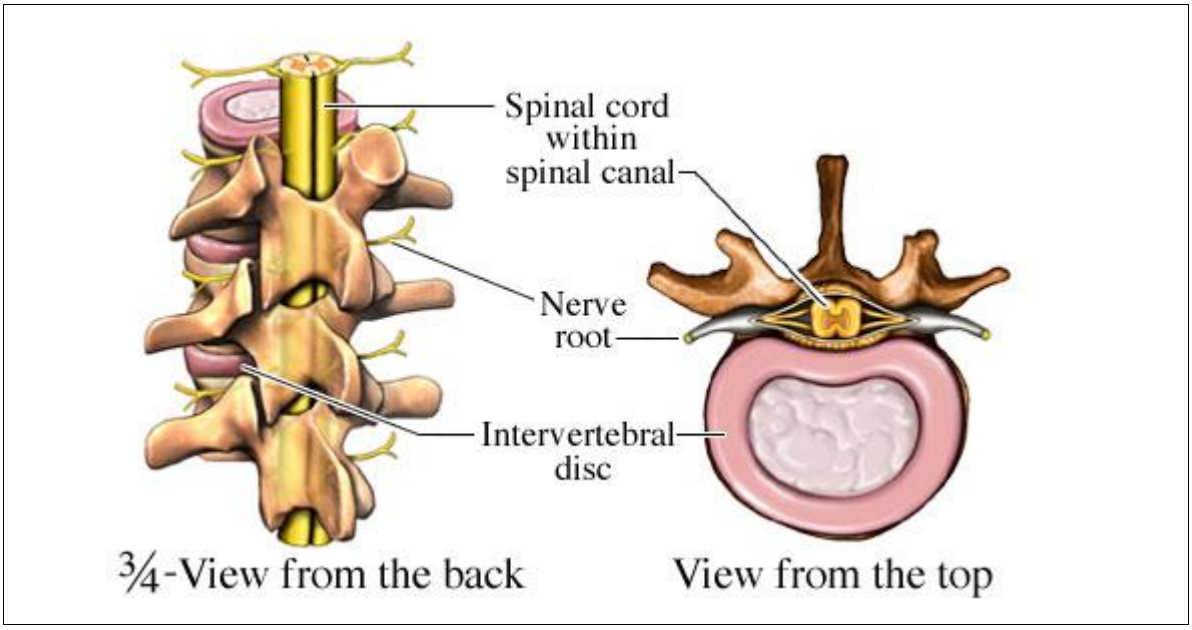

Figure 2.4: Anatomy of the spinal nerves in relation with the spinal cord
Source: edoctoronline.com (2012)

The vertebrae is held in position relative to one another and separated by strong ligaments that severely limit the degree of movement possible between adjacent vertebrae. The summation of all these movements gives the vertebral column as a whole remarkable degree of mobility. The spinal column is able to do the following movements:

a) Flexion – a forward movement
b) Extension – a backward movement
c) Lateral flexion – bending the body to one or the other side
d) Rotation – Twisting the vertebral column
e) Circumduction – a combination of all the above movements

## 2.4 Theories Associated to Low Back Pain

### 2.4.1 Theories of PREVICAP impact theory

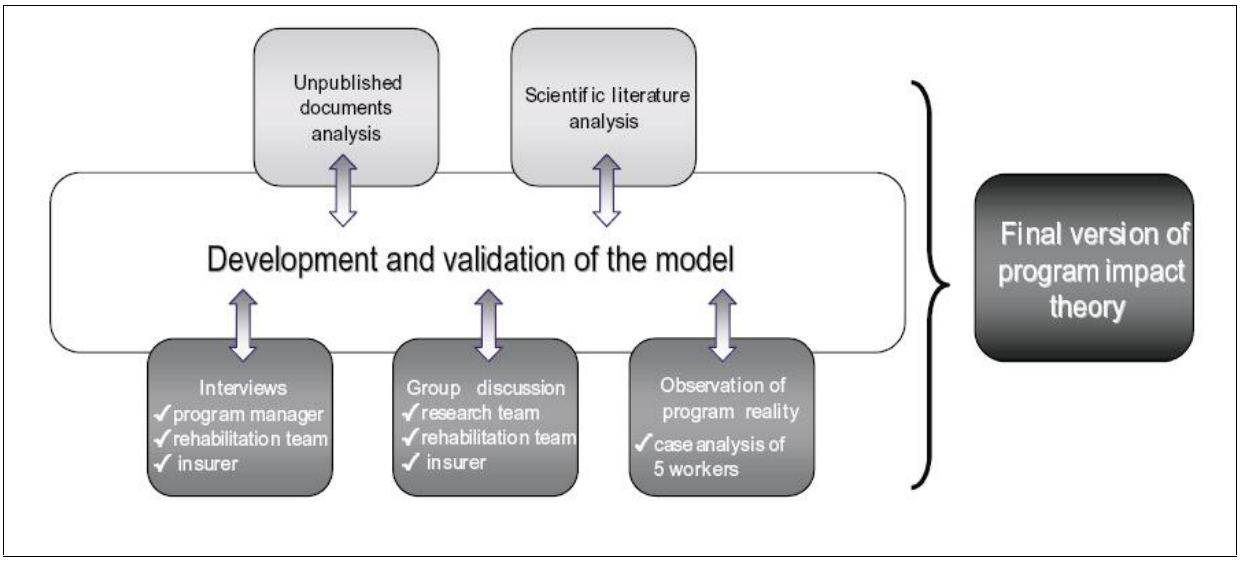


Figure 2.5 Model of Planned Behaviour
(Source: Duranda et al., 2003)

The theory of Prevention of Work Handicap (PREVICAP) program impact (see Figure 2.5) is a study on low back pain and has recently been implemented in four rehabilitation centers in Quebec. The PREVICAP program is designed to identify each worker's, physical, psycho-social, occupational and administrative factors which are responsible for the worker's work disability. It consists of a medical questionnaire, a physical examination for back pain, and a structured interview with the worker about work history, job difficulties, and life habits. Part of the evaluation is assessed by a work rehabilitation physician and the occupational part by an occupational therapist (OT). The program of PREVICAP usually ends when the worker has fully resumed his regular job (tasks and schedule) for at least one complete week. The PREVICAP program impact theory includes these three dimensions, the worker, the work environment and the interaction between the worker and his work environment.

### 2.4.2 Theories of PRECEDE-PROCEED

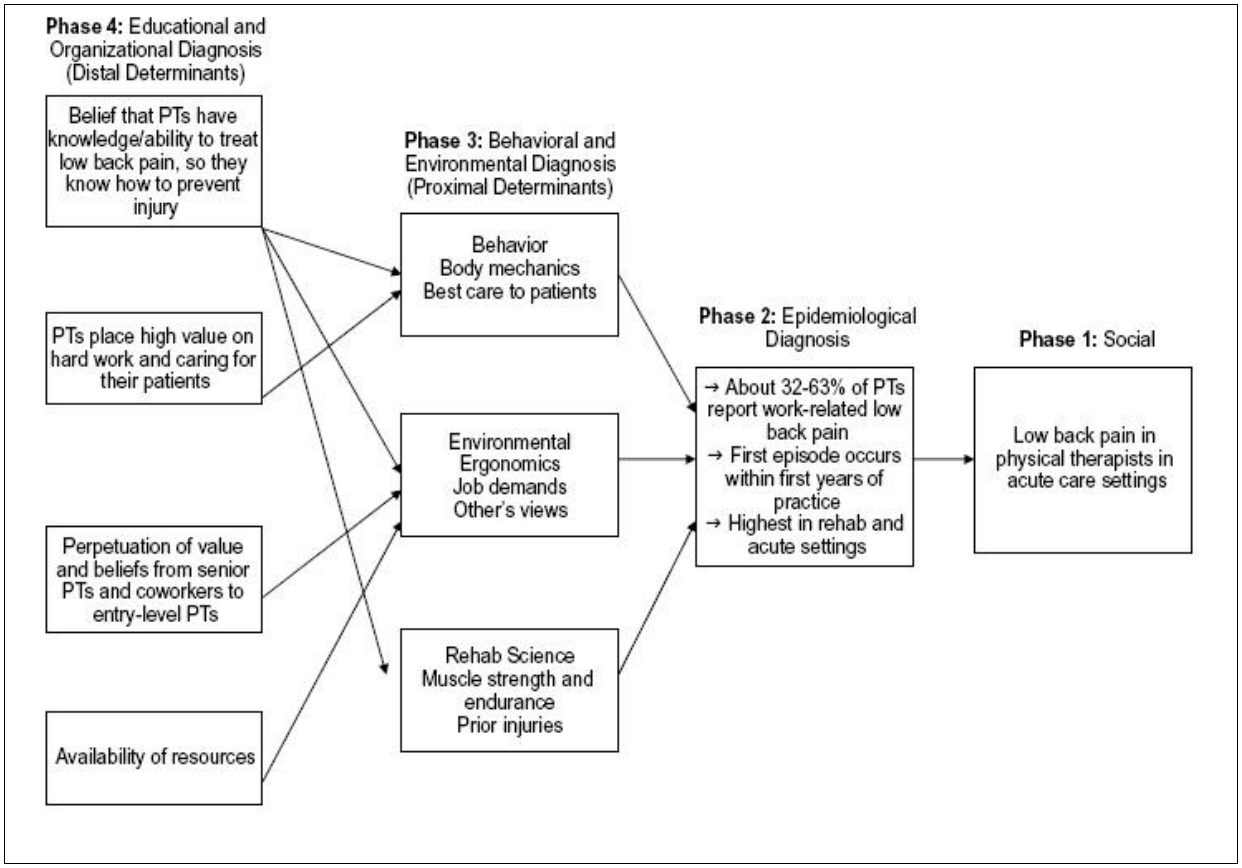


Figure 2.6 Model of PRECEDE-PROCEED Analysis
(Source: Hanson et al., 2007)

In this approach, PRECEDE refers to predisposing, reinforcing, and enabling constructs in educational/ecological diagnosis and evaluation. However, PROCEED is similar to policy, regulatory and organizational constructs in educational and environmental development. PRECEDE-PROCEED model (see Figure 2.6) propose an effective intervention to decrease low back pain among physical therapists (PT) needs to target the ethnicity of physical therapy. Physical therapists (PT) are a person who trains patients in body mechanics. Theoretical frameworks in health promotion are based on the notion that frameworks provide evidence for how to change those factors. PRECEDE-PROCEED model also identified that social action principles point out that the group of physical therapists needs to solve the health problem of low back pain to concentrate on their risk of low back injury. The major element of social action is to accomplish a cultural shift. The main elements of social action theory are empowerment, critical consciousness, community capacity, issue selection, and participation and relevance. Empowerment and participation includes enabling the individuals within the community to take control over their own lives and environment. The definition of participation involves the core health promotion concept

among community and participate them in the process of change. The behavioral and environmental stage identifies factors that are related to the health problem. Next, the stage of educational and ecological factors includes motivating, enabling, and reinforcing.

### 2.4.3 International researches on low back pain

A research which cross analyzed the Taxi Drivers' Health Study (TDHS) in Taipei City found that 51% reported LBP in the past 12 months, significantly (P , 0.001) higher than other professional drivers (33%) in Taiwan (Chen et al., 2005). In a research among professional truck drivers in Japan revealed that the prevalence of low back pain among truck drivers of a large chemical industry corporation was 50.3% (Miyamoto et al., 2000).

In another study conducted by Trinkoff et al. (2006) in United States of America, the annual prevalence of back injuries among nurses ranged between 30% and 60%. Nejenson et al. (2010) conducted a cross sectional study among professional bus drivers in Israel and found that 164 bus drivers (45.4%) reported experiencing LBP in the previous 12 months. Another study conducted among the physical therapists in Kuwait by Shehab et al. (2003), the lifetime prevalence of work related low back pain ranged between 61.8% among the males and 74.2% among the females. A study conducted among 47 registered nurses in Hong Kong revealed that the prevalence of back pain was 80.9%, with 38 of them complaining of upper back pain and the rest complaining of low back pain (French et al., 1997).

### 2.4.4 Local researches on low back pain

Developed countries had conduct more research on prevalence of low back pain among taxi drivers compared to the developing countries. As a result it is difficult to compare the prevalence of low back pain of our eastern taxi drivers who are small built with their western counterparts who are better built. A cross sectional study was conducted to determine the prevalence of low back pain and its risk factors among workers of Dunham Bush Industries Sdn. Bhd. Kajang Selangor by Jasbeer and Ismail (1998) and a total of 145 workers participated in the study by self administered questionnaires. It was found from this study that the prevalence of low back pain among workers was 42.1%.

Yeow (2003) determined that the prevalence of low back pain among nurses at the Tung Shin Hospital was 30.6% and low back pain was found to have a significant association with the activity of lifting patients. A local study of low back pain among oil palm plantation workers in Selangor by Nizam and Rampal (2001) showed that the prevalence of back pain that was related to work, experienced throughout their work in the plantation and in the last 12 months was 76.7% and 67.0% respectively. The research also revealed that high frequency of bending forward was the only suggestive predictor increasing the risk of back pain by five fold.

Normadiah (2005) conducted a survey among the doctors working in Hospital Kuala Lumpur and found that the prevalence of low back pain was 48% among the house officers, 70.5% during the last twelve months of working life among doctors and 72% among gynaecologists.

## 2.5 Review of Previous Research Study

### 2.5.1 Age

Prevalence of low back pain was studied to be increasing with age (Gallais., 2008). Ghaffari et al. (2006) did a study on low back pain among Iranian industrial workers and came to a conclusion that age and gender as well as certain work-related physical and psychosocial factors influenced the prevalence of low back pain but the differences between different categories of workers were small.

Bovenzi and Betta (1994) conducted a study among agricultural tractor drivers exposed to whole body vibration and found that there is a significant association between low back pain and age. The lifetime prevalence of low back pain increased with the increasing age for tractor drivers and also for the control subjects. In another study conducted by Bovenzi (1996), the prevalence of low back pain was found to increase with increasing age for professional drivers, such as bus drivers and tractor drivers as well for control subjects.

Bongers, et al. (1990) found in a study of low back pain among helicopter pilots that prevalence of low back pain was relatively high for a young group of subjects. The possible explanation given in this study was that individuals with back problems change profession

and do not get accounted for, creating a healthy worker effect. In the study of bus drivers conducted by Anderson et al. (1997), it was found that there is no significant association between age and occurrence of low back pain.

Hillman et al (1996) founds that the prevalence of low back pain starts to decline at the age of about 55 years. However, it was also shown that occupational low back pain is more common among younger individuals. The possible reason for this could be that younger individuals change their profession due to the symptoms and does not get accounted for. It was also found that there is a decreasing tendency of low back pain among the male at the age of 40 and female population had an increasing prevalence of low back pain with increasing age.

### 2.5.2 Anthropometry

The prevalence of low back pain was found to have a significant tendency to increase with increasing weight (Gallais., 2008). However, there was no significant association found between Body Mass Index (BMI) and low back pain. Gallais (2008) also mentioned in her study that taller people are at risk of low back pain compared to shorter people.

Heliovaara (1987) studied that the body height, obesity and the risk of herniated lumbar intervertebral disc found that Body Mass Index (BMI) is an independent risk factor in male population and that height and heavy body mass may be important contributors for disc herniation.

### 2.5.3 Risk Factors

The Occupational Safety and Health Association of United States of America, as mentioned in the review article by Menzel (2007) defines risk factor for musculoskeletal disorders as a characteristic of the work environment that research has shown to be associated with an elevated occurrence or severity of musculoskeletal disorders. Risk factors can involve purely external exposures such as shock or percussion that can act on the musculoskeletal system. They can also involve intrinsic response to a load or task, such as lifting, rapid and awkward movements. The effect of a risk factor may be modified by personal characteristics

such as anthropometry measures and physical conditions or by concurrent or previous non-work exposure.

### 2.5.4 Heavy manual work

A study conducted by Videman et al. (1984) found that low back pain caused problem for more employees in physically strenuous work, such as machine operators than those in sedentary work. Another study conducted by Liira et al. (1996) reported higher prevalence of low back pain among blue collar workers, such as those in service sector, primary occupations and industry workers and among those who were not working than among white collar workers (professional, clerical and sales employees).

The high prevalence of low back pain among people who were not working was explained again with healthy worker effect, when people suffering from low back pain are leaving the profession causing the problem.

### 2.5.5 Lifting

Lifting as a risk factor for low back pain is one of the most investigating working task, partly because almost all professions have to perform lifting at some point of the time. There are several studies which have researched the role of frequent and heavy lifting over a prolonged period of time on low back pain. There are reported studies on increased prevalence of low back pain in connection with the task of heavy and frequent lifting. Chaffin and Park (1973) found in their studies on the importance of postural stress which is induced by weight of lifting object and the method of lifting which can lead to low back pain. The high forces generated by low-back muscles while heavy lifting were identified as a possible cause of the compression on the lumbar intervertebral disc causing low back pain. Frequent lifting of heavy objects was found to be associated with increased prevalence of low back pain as well (Magora, 1974). Magnusson et al. (1996) conducted a study on low back pain, which showed the association between frequent lifting and low back pain among vehicle drivers. Kelsey et al. (1978) found that lifting objects more than twenty-five per day of loads greater than 11.3 kg (25 lbs) while twisting back is associated with increased risk of acute prolapsed lumbar intervertebral disc among vehicle drivers.

### 2.5.6 Bending and Twisting

Bending and twisting are both associated with lifting and to separate and analyze the impact of these non-neutral trunk movements on low back pain is complicated. Kumagai, et al. (1995) found that nursery teachers in the 0 - 1 (year) age class more often bend while, teachers in the 4 - 5 age class more frequently adopted high working postures, as standing. Therefore, person who frequently bends faces more low back pain compared to those less bending. Twisting or bending alone may not produce increased risk of low back pain. However, the risk of low back pain can increase in combination of twisting or bending with other manual handling work, particularly lifting, (Kelsey and Golden, 1978). The unlikely cause of low back pain, worsened by twisting or bending without any other motion was found in study of Boshuizen et al. (1992)

### 2.5.7 Sitting

When a person is seated, the pelvis rotates backward and the lumbar lordosis decreases (see Figure 2.7) and this is defined as a normal physiological response. The reduced lumbar lordosis, which increases the load movement and the disc deformation caused by the lumbar spine (see Figure 2.8) are contributing factor for the increased disc pressure in the spine which may lead to low back pain. The disc pressure can be influenced by the backrest inclination or by using the lumbar support (see Figure 2.9). Among, three posture of pelvis and spine (as in Figure 2.9) sitting with the backrest inclined to 110° with support for the lumbar spine is the best position [Figure (c)]. While, the worst are sitting with the backrest inclined to 90° [Figure (a)] and sitting with the backrest inclined to 110° [Figure (b)]. In 1974, Anderson et al. investigated a lumbar disc pressure and myeoelectric back muscle activity during sitting and their study strengthened the findings that the pressure in the lumbar intervertebral disc is higher in unsupported sitting than in standing or lying. Their study also supported the findings that sitting with forward inclination of backrest are resulting in the reduced disc pressure.

Increase of lumbar support and use of arm rest was also found to help to reduce the disc pressure. The activity of the back muscles is almost similar when considering standing and unsupported sitting with increasing activity when sitting and leaning forward. The muscle activity decreased with the increased backrest inclination. Prolonged sitting and lack

of motion means inactivity in the bone tissue which may disturb the nutrition supply to the intervertebral disc. Another explanation is that a lack of motion may lead to accumulation of metabolites, which can accelerate the degeneration of the disks.

In the study of Magora (1972), high prevalence of low back pain was reported in occupation which reported sitting for longer than four hours every working day when compared with occupation sitting for less than four hours. Kelsey (1975) in her study of the general population found that the increased risk of acute herniated lumbar intervertebral disc is higher among those individuals who reported five years of sedentary occupation and is increasing with each year in the work. A weak association between sitting for more than two hours per day and prolonged sitting was found in the study of Walsh et al. (1992) as well.

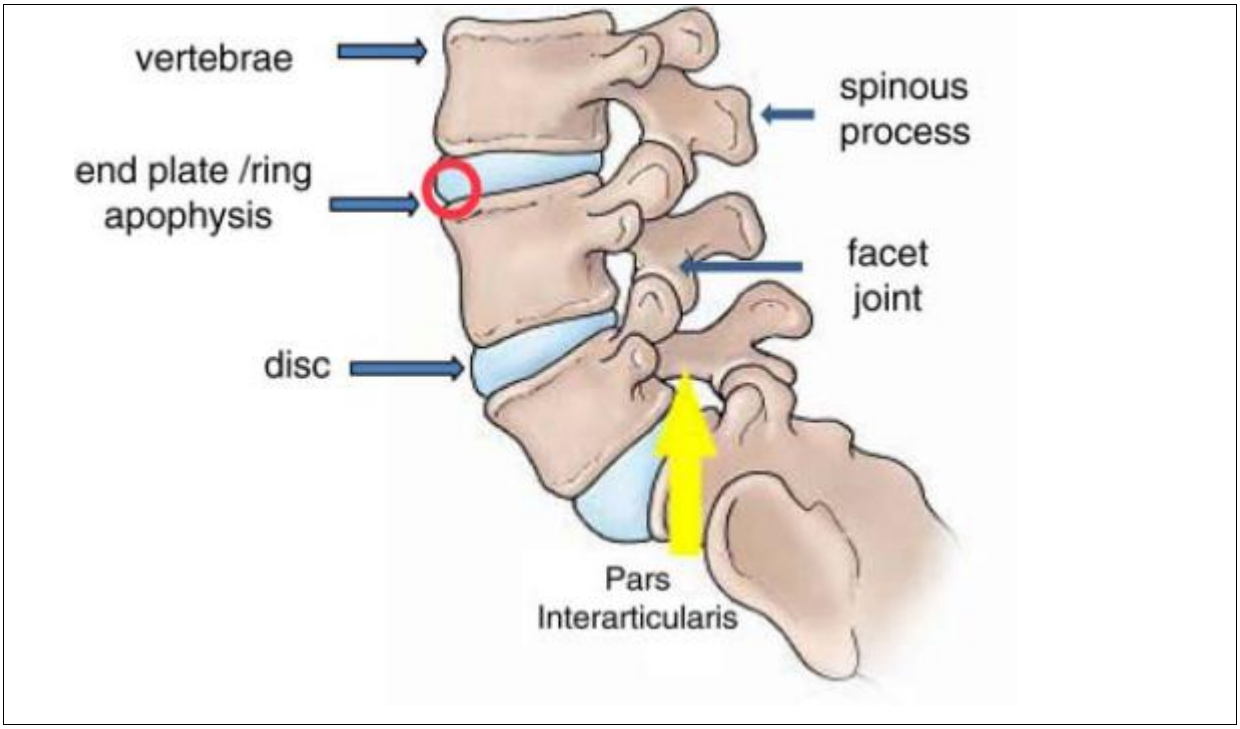


Figure 2.7: Posture of lumbar spine
Source: Purcell. L and Michel. L (2009)

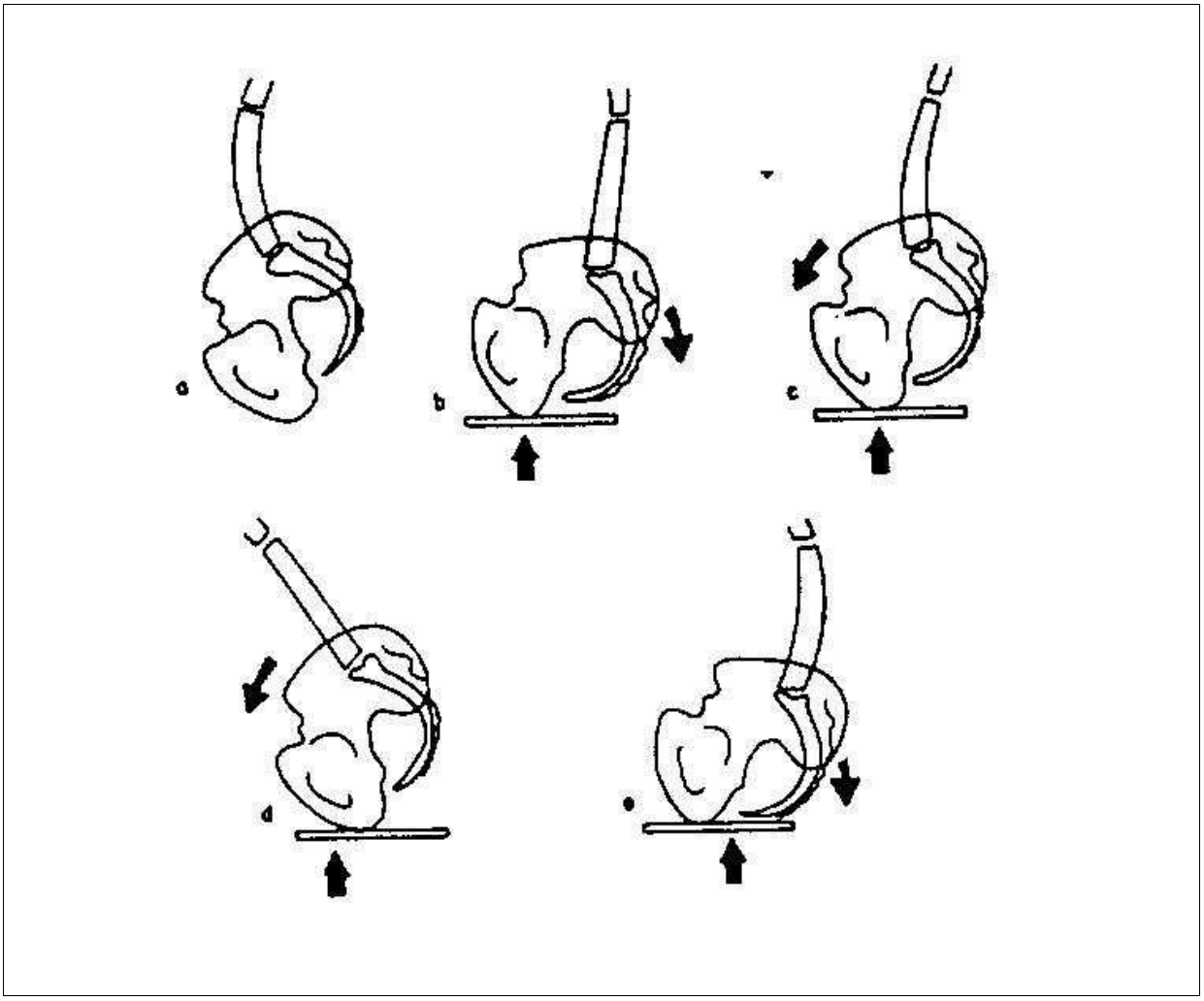

Figure 2.8: Posture of the pelvis and the lumbar spine when (a) standing, (b) sitting relaxed, (c) sitting erect, (d) anterior sitting and (e) posterior sitting

Source: Anderson et al. (1974)

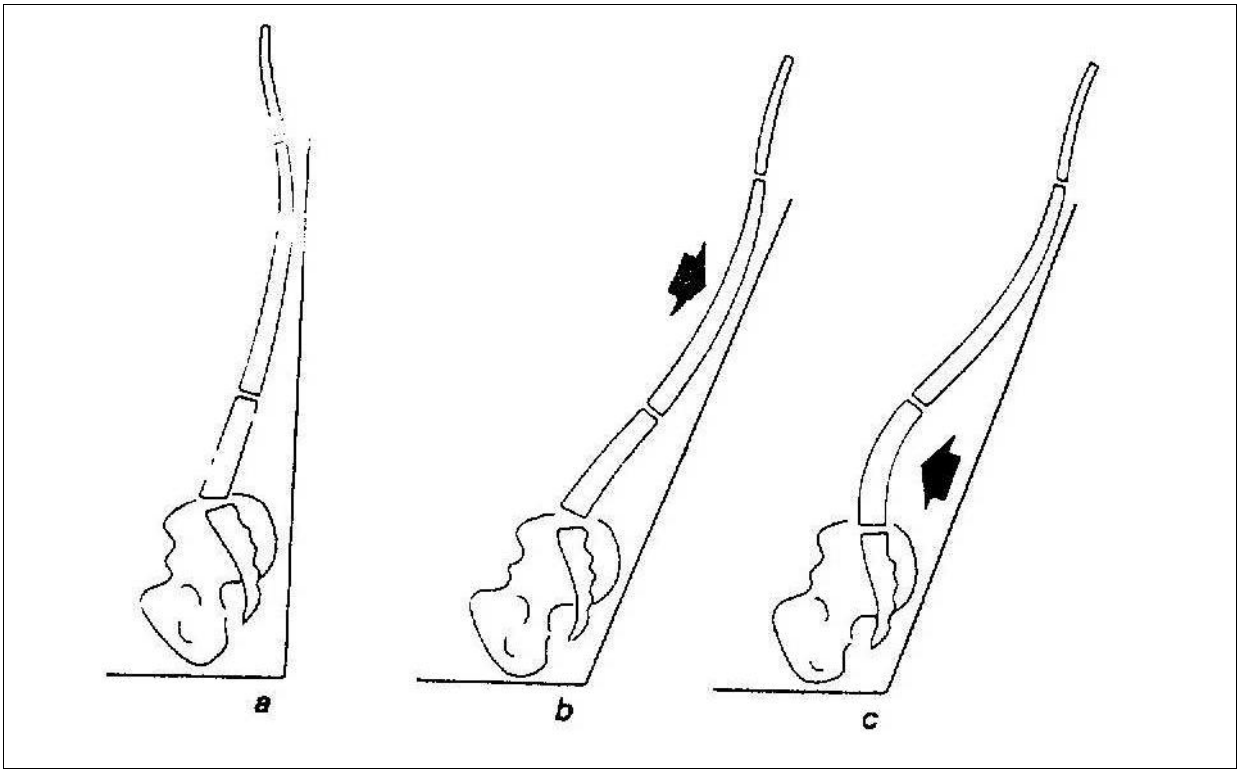


Figure 2.9: Posture of the pelvis and the spine when, (a) sitting with the backrest inclined to 90°, (b) sitting with the backrest inclined to 110° and (c) sitting with the backrest inclined to 110° and with support for the lumbar spine
Source: Anderson et al. (1974)

### 2.5.8 Whole body vibration and driving

The possibility that prolonged exposure to whole-body vibration may cause disorders of the spine has been studied such as Palmer et al. (2000), Kjellberg et al. (1994) and Bovenzi & Hulshof (1999). The exact mechanism of a negative effect of whole-body vibration is still unclear, although some hypotheses have been proposed by the earlier conducted studies. The first hypothesis is that the compressive loading of the intervertebral joint leads to fatigue which induces microfractures or fractures in the vertebra endplate which may cause reduction of blood flow and nutrition diffusion to the back. A second hypothesis is that increased loading may accelerate the muscular fatigue of the spinal muscles. Both hypotheses are also known as “tissue fatigue failure” (Hulshof et al., 2007).

### 2.5.9 Indirect work related factors

Menzel (2007) has stated in her review article that lack of staffs in a unit, shift work and frequent overtimes with long working hours, lack of rest and the unit layout itself which requires extensive walking with limited opportunities to sit contribute to the occurrence of low back pain..

Rest periods are particularly important in jobs which require a fast pace of work or a high degree of vigilance. When the workers are highly interdependent, explicit rules on the number, timing and duration of rest periods are advisable. Regular rest periods benefit both employer and the employee by preserving and improving worker's health and wellbeing. Breaks can also improve the hygiene and security of workers and increase their efficiency (International Labour Organization, 2004).

For the last five decades, there has been a global shift towards a total of 40-hours of working hours in a week limit. An estimated 22% of the global workforce, or 614.2 million workers, are working more than 48 hours per week. The International Labour Organization (2003) proposed that decent working time arrangements need to fulfill five interconnected criteria as below:

a) They should preserve health and safety.
b) Working hours must be 'family friendly'.
c) Working hours must be able to promote gender equality.
d) Working hours must be able to enhance productivity.
e) Facilitate worker's choice influence over working hours.

Working hours must be appropriate enough in preserving sufficient time to combine paid work with family and domestic obligations, such as childcare and elderly care as well (International Labour Organization, 2007).

### 2.5.10 Psychosocial Factors

There is increasing evidence that psychosocial factors related to the job and work environment play a role in the development of work-related musculoskeletal disorders of the

upper extremity and back. Perceptions of intensified workload, monotonous work, job ranking, limited job control, low job clarity, and low social support at work are associated with various work related musculoskeletal disorders (Anderson et al., 1997).

The National Institute for Safety and Health as mentioned in the review article by Menzel (2007) defines psychosocial factors as, factors associated with the job and environment, factors associated with the extra-work environment and characteristics of the individual workers.

It also points out that these factors interact with each other and affect health and job performance. Work related factors which are also known as psychosocial workload include job dissatisfaction, job ranking, job strain, lack of autonomy or job decision, time pressure, high mental pressure, poor work-related relationship with co-workers and poor support at work.

Job strain is stated as work conditions involving the greatest mental demand and lowest control over those conditions. Job satisfaction involves pay, work organization and workload, autonomy, stress and leadership issues (Karasek et al., 1990)

A host of psychosocial factors associated with the individual worker such as personality, psychological status and extra-work environment have been linked to back pain and disability. One possibility is that psychological distress is simply a consequence of chronic low back pain, with no etiologic role in the development of the disorder (Mark et al., 2009). While there are a number of studies of low back pain and individual physical factors, appear to be only a few prospective studies that incorporates individual and extra-work environment of psychosocial factors (Anderson et al., 1997).

The evidence on psychosocial risk factors as causative factors for low back pain is not so clear. The reason why it remains unclear is imprecision in psychosocial construct definition and measurement of psychosocial constructs. There are established definitions for physical force and shear and how to measure them but it is the opposite for constructs such as job strain or stress coping ability. There is also lack of knowledge on the biological plausibility of psychosocial factors as etiologic agents (Menzel, 2007). The four biological plausibility's are hypothesized as below:

a) Psychosocial factors result in muscle tension and increase spinal loading.
b) Psychosocial factors may influence body awareness and result in reporting of musculoskeletal pain or attribution of work force as the cause.
c) Psychosocial factors may influence that transition from the original acute injury to chronic low back pain, even after the original muscle damage heals.
d) Psychosocial demands may be associated with physical demands, making it seem that psychosocial factors are associated with the low back pain, when in fact they may be confounders.

There is evidence that psychosocial factors are important in determining length of disability, transition from acute to chronic pain and return to work (Menzel, 2007). Job strain and low social support at work were associated with low back pain related to sick leave incidence and length. For low back pain, there is strong empiric evidence from prospective studies that psychosocial factors are predominant risk for developing chronicity and disability. Pain is a psychological construct and when considered from this perspective, it is not surprising why psychosocial factors are important determinants of pain chronicity and related disability (Menzel, 2007).

Anderson et al. (1997) stated that there is an association between low back pain and intensified physical workload. Pain catastrophizing (excessive negative orientation towards pain) is associated with chronic low back pain and disability. When pain from an original injury is interpreted as threatening, it leads to movement avoidance, hyper vigilance and muscle reactivity which will subsequently lead to disability (Picovet et al., 2002).

The Karasek model (see Figure 2.10), on mental stress related to work is based on three variables as below:

a) Demands (psychological demands): The pressures put on an individual by the work environment which includes workload, pace of work, length of working hours, time schedules, tight deadlines and others.

b) Control (decision latitude): The individual's capacity to respond to work demands and pressures, including autonomy, responsibility, skill, training, experience and others.

c) Support (social support): The characteristics of the social environment in which working activities are performed including organizational culture, working climate, management style, help from co-workers, involvement, participation, team working, and others.

By combining the control and demand elements, four situations can be identified as below:

a) Passive – Low control/low demand

Passive situations where the employee has little control however demands are also low. This leads to stress in the form of monotony and boredom.

b) High strain – Low control/high demand

Situations where the employee has little control but demands are high. This leads to high stress.

c) Low strain – High control/low demand

Relaxed or low-strain situations where the employee has a lot of control and demands are low. This leads to little stress.

d) Active – High control/high demand

Situation where the employee has to respond to high demands, but at the same time can exercise high control. This leads to an active situation where most people feel they can somehow manage stress.

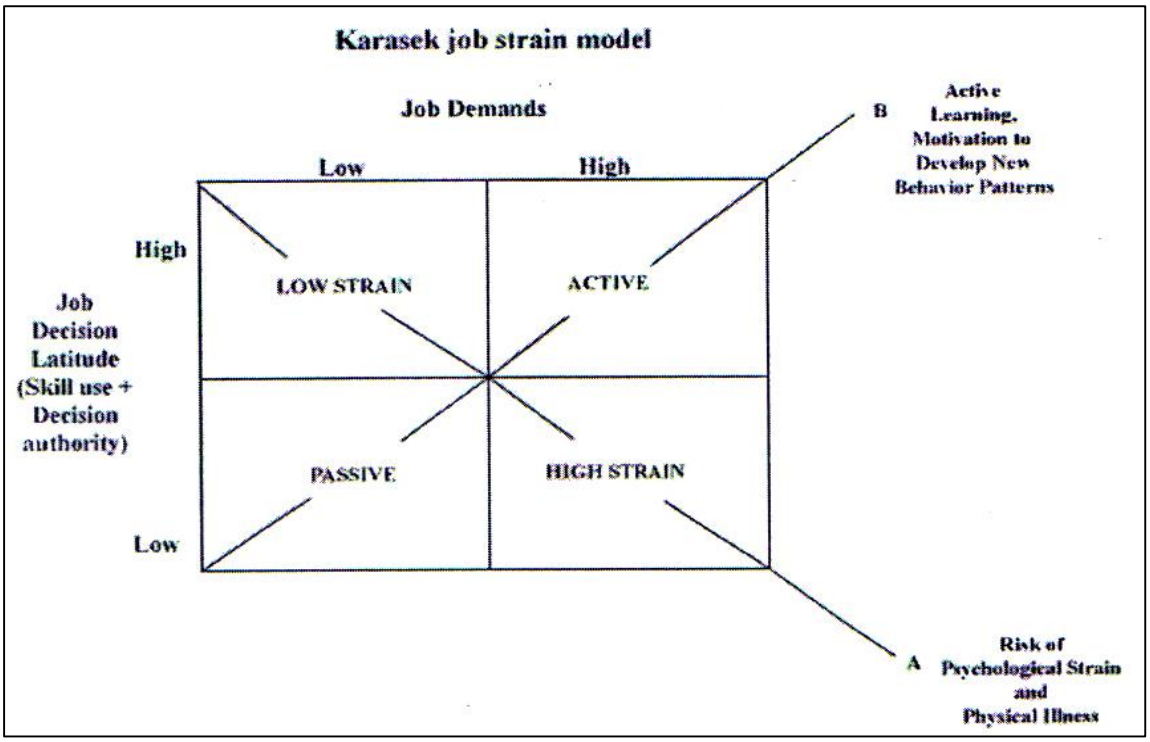

Figure 2.10: Job Strain Model, Karasek & Theorell, 1990
Source: Karasek et al., *T. Healthy Work.* New York: Basic Books, 1990.

According to the Karasek model, mental stress increases when control declines in combination with rising psychological demands or stressors. Mental stress decreases when control increases in combination with falling psychological demands or stressors and social support operates as a facilitator in reducing stress at work. Stress was shown to decrease when social support increases (Martino et al., 2003). Karasek and Theorell (1990) had stated that job demands are defined by questions such as "working very fast," "working very hard," and not "enough time to get the job done." Job decision latitude is defined as both the ability to use skills on the job and the decision-making authority available to the worker. This model provides a justification and a public health foundation for efforts to achieve greater worker autonomy as well as increased workplace democracy.

Coping skill is defined as constantly changing cognitive and behavioral efforts to manage specific external and internal demands that are appraised as exceeding the resources of the person (Susan et al., 1986). When a stressful situation is deemed as unchangeable, the worker uses emotion- focused coping to minimize emotional distress. If a situation is changeable, problem- focused coping is used to evaluate the situation and choosing the best solution. In meaning-focused coping, stressed workers modify the interpretation of a stressful situation and develop necessary values, goals and beliefs (Menzel, 2007). Workers with poor

coping skills will be psychologically maintaining their low back pain and disability and they are paramount in determining whether or not the affected individuals to take leave from work due to the pain.

Association of low back pain and psychosocial risk factors is a broad topic by itself and warrants an entirely different study altogether. This study focus more on the aspect of psychosocial workload which is also known as work related psychosocial factors.

### 2.5.11 Predisposing Factors

Frymoyer et al. (1983) found in their study that smoking was significantly associated with low back pain. Cigarette smoke was found to have a direct adverse physiological effect on the spine. Preliminary studies in their laboratory have shown that an amount of nicotine equivalent to that contained in one cigarette, when injected into dogs, may cause reduction in vertebral-body blood flow. Vertebral disc is dependent on diffusion of nutrients through the vertebral end plates and metabolic status of the intervertebral disc. Therefore, factors which cause alterations in vertebral blood flow could adversely affect discal metabolism and rendering it more susceptible to mechanical deformities. Another possible explanation could be that smoking may cause chronic cough which in turn puts more pressure on the intervertebral disc and influence disc prolapse and sciatica (Gallais, 2008).

Normadiah (2005) also studied that prevalence of low back pain among doctors who smoked was higher than those who did not smoke. Other predisposing factors which have been studied are age, obesity, sedentary lifestyle, previous back injury and pregnancy. Recreational activities appeared to have minimum relationship with low back pain. Association between low back pain and the frequency of regular exercise were not generally significant either (Videman et al., 1984).

## 2.6 Conclusion

This chapter has presented the literature review on low back pain and related empirical studies. The work related factors are anthropometrics, socio-demographics, physical workload, indirect work related factor, predisposing factors and psychosocial factors. This chapter also describes anthropometrics factors include height, weight and BMI while age, ethnicity and marital status categorized under socio-demographics. Physical workloads are heavy manual work, lifting, and prolonged sitting. Other than that, indirect factors as shift work, long working hours, overtime and lack of rest. Predisposing factors also one of important element in work related factor which consist smoking and sedentary lifestyle. The last is psychosocial factors which job satisfaction, job strain, job ranking, time pressure, high mental pressure, work relationship, support at work and stress.

# CHAPTER 3

# METHODOLOGY

## 3.0 Introduction

This section discussed on research methodology that covers research framework and the hypotheses of the study, research design, sampling procedure, development of survey instrument, data collection procedures, and sampling techniques and procedures used for the analysis of the data. The independent variables and dependable variable were operationally and conceptually defined in this chapter. Furthermore, these types of methodology and design are used to find the information in order to solve the problem.

## 3.1 The Research Framework and the Hypotheses of the Study

### 3.1.1 Variables

Below are the two variables used for the study. The first is Dependent Variable and followed by Independent Variable.

### 3.1.2 Dependent Variable

The dependent variable in this study was low back pain which define as pain, muscle tension or stiffness.

### 3.1.3 Independent Variables

An independent variable is the variables that have control over, which can be influence. It usually affects the dependent variable and in some cases, it may not be able to influence the independent variable.

a) Socio-demographic factors

Socio-demographic factors are types of taxi driven, ethnicity, marital status, underlying medical conditions, previous back injury, body mass index (BMI), smoker, age, number of cigarettes smoked in a day and years of smoking.

b) Physical workload

Physical workload is the activities that taxi drivers carry out in their job such as frequent lifting, lifting while bending, lifting while twisting , lifting while bending and twisting, standing and walking, bending, prolonged bending, prolonged twisting and twisting.

c) Indirect work related factors

Indirect work related factors consists of shift work, overtime, minutes of rest in a day, number of breaks in a day and duration of working hours in a week.

d) Psychosocial workload

Psychosocial workload are duration of working, how to work, what to do at work, timetables and breaks, support at work and job satisfaction.

### 3.1.4 Research Framework

The framework described below (see Figure 3.1) is developed based on the literature review and research problems. This model focuses on the factors that may have effect on compliance with low back pain. The framework of this study consisted of four independent variables to low back pain compliance which were socio-demographic (height types of taxi driven, ethnicity, marital status, underlying medical conditions, previous back injury, body mass index (BMI), smoker, age, number of cigarettes smoked in a day and years of smoking), physical workload (frequent lifting, lifting while bending, lifting while twisting , lifting while bending and twisting, standing and walking, bending, prolonged bending, prolonged twisting and twisting), indirect work related factors (shift work, overtime, minutes of rest in a day, number of breaks in a day and duration of working hours in a week) and psychosocial workload (duration of working, how to work, what to do at work, timetables and breaks, support at work and job satisfaction). The entire independent variables were then measured against the compliance towards low back pain as the determinant (dependent variable). Considering all factors of the independents and dependent variables, the model of the study is depicted as figure 3.1.

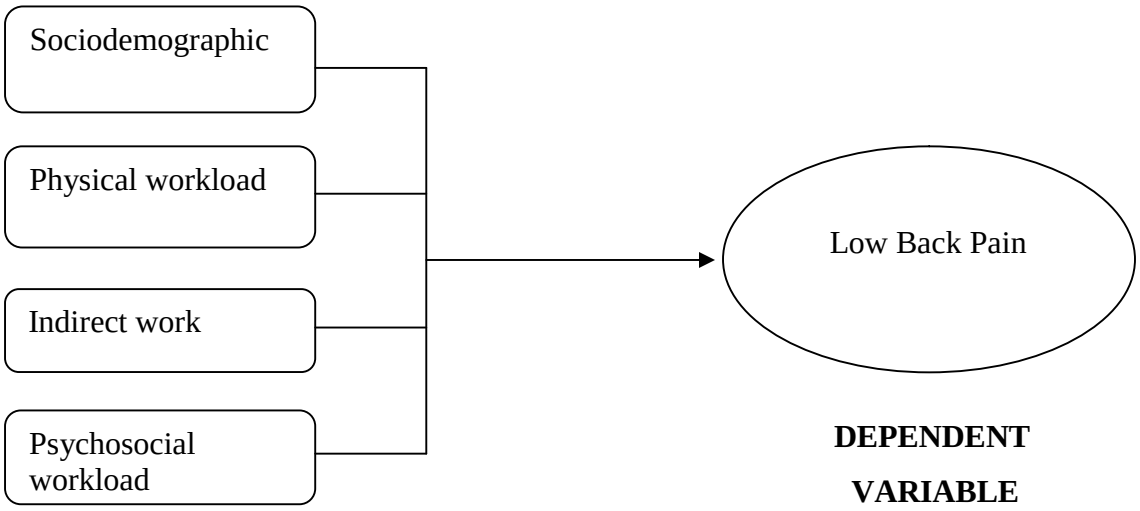


Figure 3.1 Frame Work of the Study

### 3.1.5 Hypotheses of the Study

Hypothesis testing would determine either to accept or reject the hypothesis. The important role of the hypothesis was to suggest variables to be included in the research design. This study consists of four hypotheses, they are;

HA1: There is significant association between socio-demographic (types of taxi driven, ethnicity, marital status, underlying medical conditions, previous back injury, body mass index (BMI), smoker, age, number of cigarettes smoked in a day and years of smoking ) and low back pain among taxi drivers in Johor Bahru.

HA2: There is significant association between physical workload (frequent lifting, lifting while bending, lifting while twisting , lifting while bending and twisting, standing and walking, bending, prolonged bending, prolonged twisting and twisting) and low back pain among taxi drivers in Johor Bahru.

HA3: There is significant association between indirect work factor (shift work, overtime, minutes of rest in a day, number of breaks in a day and duration ofworking hours in a week) and low back pain among taxi drivers in Johor Bahru.

HA4: There is significant association between psychosocial workload (duration of working, how to work, what to do at work, timetables and breaks, support at work and job satisfaction ) and low back pain among taxi drivers in Johor Bahru.

## 3.2 Research Design

The research design of this study is a cross sectional study. Olsen et al. (2004) defined cross sectional study as to gather represents of what is going on at only one point in a time. In this simple cross-sectional study, researcher might be attempting to determine whether there is a relationship between independent variable (Sociodemographic, Physical workload, Indirect work related factors and Psychosocial workload) and dependent variable (Low back pain).

This study was conducted in Johor Bahru over a period of three months, from March 2012 to May 2012 to ensure that a sufficient number of respondents participated in this study in the specific time period. The purpose of this study is to examine whether there are relationships or not between independent variables with compliance on low back pain among the taxi drivers.

## 3.3 The Sampling Procedure

### 3.3.1 The Population of the Study

This study was carried out with the purpose to identify whether there are relationships between independent variables with compliance on low back pain among taxi drivers at Johor Bahru. Thus, the population of this research is are licensed taxi drivers based in Johor Bahru as per registered under the National Vehicles Licensing Board. According to National Vehicles Licensing Board, there are five types of taxi drivers in Malaysia which is rental taxi, pilot car rental, standard taxi, airport taxi and luxurious taxi. Nonetheless, as the researcher is

focused on the type of standard taxi driverswho work in Johor Bahru, where the total population of this study is 5210 persons only.

### 3.3.2 Sampling Frame

Sampling frame would be taxi drivers who work at the middle town of Johor Bahru and along the road.

### 3.3.3 Sampling Unit

Sampling units are taxi drivers who only hold the job of driving taxi as their source of income.

### 3.3.4 Sampling Method

The sampling method employed for this study was done using convenience sampling, taking into concern the lack of proper base for taxi drivers in a particular workplace, independent taxi drivers and sufficient of time.

### 3.3.5 The Sample of the Study

The sample size is an important feature of empirical study in which the aim is to make inferences about a population from a sample. After replacing all the values into the equation, it generated 207 as minimum sample size. Based on the calculation as shown below, with 10% of non response the sample size was 228. This number is obtained using Sample Size Determination in Health Studies by Lwanga & Lemeshaw (1991). The sample size was estimated using a table provided by comparing the value of anticipated population proportion ($p$) and the specified absolute precision ($d$) at the confidence interval of 95%. By the international data found by Bovenzi et al. (1992), similarity of risk factors and local sampling population, the prevalence rate is estimated at 84 %, which contributes to $p$ value of 0.84. Since the value of absolute precision $d$ was specified at 0.05, therefore, from the table provided the sample required for this study was 228.

Alternatively, the following formula could be used to calculate sample size:

$$n = \frac{Z^2 . (p) . (q)}{d^2}$$

$$= \frac{(1.96)^2 . (0.84) . (1-0.84)}{(0.05)^2}$$

$$= 207$$

Where:

n = sample size

Z = standardized score according to given confidence level 95%

= 1.96

p = estimated proportion or prevalence

= 0.84

q = 1-p

d = precision or permissible error

= 0.05

Final sample size = 207 + 21

= 228

## 3.4 The Development of Survey Instruments

The research instrument used to conduct this study was assisted by questionnaire, taking into consideration factors such as time limitation, lower education level of taxi drivers and perceived low level of co-operation by them if the questionnaires were to be self answered one. The details of the questionnaire used are as below.

### 3.4.1 Selection of Survey Instruments

There are many methods of collecting primary data, for example, through questionnaires, observations and interviews. Within all the methods, questionnaire is a well accepted mean of collecting data because it can involve a large number of people or

organizations and it is much more cheap (De Vaeus, 2002: Zikmund, 2000). As such, questionnaire was used in this study as the main source of collecting data.

The questionnaire used in this research is adapted from the questionnaire constructed by Human Factors Research Unit, Medical Research Council of University of Southampton. The questionnaire was originally developed within the European project VINET (Vibration Injury Network). The questionnaire was enriched by a set of health questions selected from existing models used and validated in earlier Medical Research Council Surveys. This questionnaire compiles a total of 39 questions which were structured and had mainly dichotomous (yes / no) or multiple choice answers. In addition, the questionnaire has been modified accordingly as to ensure the study is suitable to be conducted among taxi drivers.

### 3.4.2 Reverse-scored Items and Back-translation

The languages of the questions were thoroughly checked for its suitability and grammar usage. This weaknesses and error are then acknowledged and being improved in actual questionnaire to avoid errors. The back-translation was adopted based on Brislin (1970) requirements. In this study, the back-translation process uses two bilingual translators who are well-known with the source and target languages. To initiate the process of back-translation, a group of translators makes a primary translation from the source version into the target version. Next, another group translates this material back into the questionnaire questions. These back-translators don't have access to the original source version before conducting the back-translation. The back translated version and the source version then is compared to check for equivalence of meaning. When the two versions are not identical, the back-translation process is repeated iteratively until no mistakes in meaning are found.

### 3.4.3 Questionnaire Design

The questionnaires are consists of five sections and it was required approximately 15 to 20 minutes to be completed for each respondent. The five sections are as below;

Section I : Personal information
Section II : Work information

Section III : Enquires on low back pain and was inspired by the widely used and validated Standardized Nordic Musculoskeletal Questionnaire

Section IV : Physical activities

Section V : Contain 8 questions with mixtures of open ended questions to get respondent's opinion

In the Section of IA, respondents are asked about personal information which includes questions on socio-demographic details such as age, gender, smoking habits, anthropometric details, previous medical history and back injury. Present and ex-smokers are both considered as smokers.

While in the Section of IB (see Table 3.1), respondents are asked about work information such as duration of working as a taxi driver and concerning psychosocial workload. Respondents were asked about support and satisfaction at work. The set of questions also asks about the possibility of decision on how to perform a variety of working tasks. The questions were based on the Karasek demand-control support model that predicts the mental strain resulting from the relations of job demands and job decision latitude. In this model, work related psychosocial risk factors are measured on a 4 point scale. For additional analysis, subjects were classified into two groups according to their responses. The answers to these questions were treated as below:

Table 3.1 Question Scale in Section IB

| **Job decision and support** | |
|---|---|
| **Often, sometimes** | (YES) |
| **Seldom, never / almost never** | (NO) |
| **Job satisfaction** | |
| **Very satisfied, satisfied** | (YES) |
| **Dissatisfied, very dissatisfied** | (NO) |

Next, in Section II, the questionnaire enquires on low back pain and was inspired by the widely used and validated Standardized Nordic Musculoskeletal Questionnaire for the analysis of musculoskeletal symptoms. Low back pain was defined as pain in the area shown in the Figure 3.2, which lasted more than one day during the past 12 months.

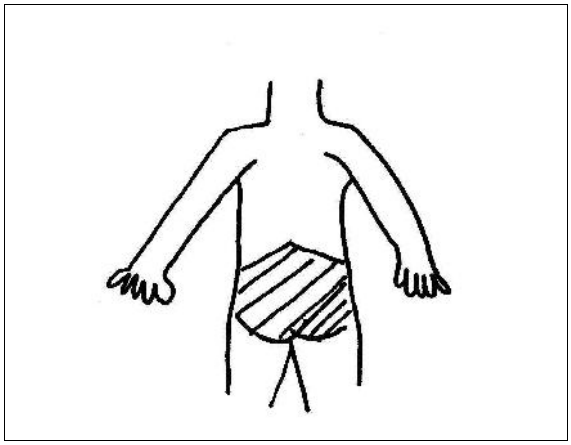

Figure 3.2 Area of low back pain
Source: Crawford (2007)

All respondents facing low back pain in the past 12 months were required to answer additional questions about the low back pain symptoms to find out the frequency of symptoms and absenteeism due to the severity of low back pain. Additional questions were on:

a) The duration of low back pain episodes,
b) The number of visits to doctor due to low back pain,
c) Days off from work due to the low back pain.

In the Section of III (see Table 3.2), the questions are more narrow on physical activities related to the current job as a taxi driver. The work activities assessed in this section are such as lifting, bending, twisting, walking or standing. Work activities were assessed by using frequency or duration of the working activities per one working day. For further analysis, the working activities were classified as categorical variables. Answers to these questions were treated as Table 3.2.

Table 3.2 Question Scale in Section III

| **Lifting/ bending/ twisting** | |
|---|---|
| 1-10 times, more than 10 times per day | (YES) |
| Not at all | (NO) |
| **Prolonged walking or standing** | |
| 1-3 hours, more than 3 hours | (YES) |
| None, less than one hour | (NO) |
| **Frequent bending** | |
| 5-20 times, more than 20 times | (YES) |
| Less than 5 times | (NO) |
| **Frequent twisting** | |
| 5-20 times, more than 20 times | (YES) |
| Less than 5 times | (NO) |
| **Prolonged bending** | |
| Bending more than 1 hour | (YES) |
| Bending less than 1 hour | (NO) |
| **Prolonged twisting** | |
| Twisting more than 1 hour | (YES) |
| Twisting less than 1 hour | (NO) |

The questions continue with Section IV enquires on indirect work related factors such as shift work, overtime and rest while at work. The answers to these questions are as dichotomous answers (yes / no).

In the last section, which is Section V is organized to get respondent's view on the problem of low back pain itself and their understanding of the problem. The Likert scale is used for Sections V. The Likert scale is usually used in survey research and it was originally developed by Rensis Likert, a sociologist at the University of Michigan from 1946 to 1970 (Uebersax, 2006). It is frequently used to measure respondents' attitudes by asking the level to which they agree or disagree with a specific question or statement. In this research, the answers are rated on a scale of 1 to 6 (likert scale) in which '1' signifies completely disagree

and ‘6’ signifies completely agree. The summary of the questionnaire design is shown in table 3.3 below:-

Table 3.3 Questionnaire Design

| Variable | No of Item | Item | Source & Year |
|---|---|---|---|
| ***Section IA : Personal Information*** | | | |
| Sociodemographics | 1-7 | Section IA, Item 1-7 | Crawford (2007) |
| Underlying medical conditions | 8 | Section IA, Item 8 | Crawford (2007) |
| Previous back injury | 9 | Section IA, Item 9 | Crawford (2007) |
| Smoking | 10-12 | Section IA, Item 10-12 | Crawford (2007) |
| ***Section IB : Work Information*** | | | |
| Duration of working | 1 | Section IB, Item 1 | Crawford (2007) |
| Job decision | 2 | Section IB, Item 2 | Crawford (2007) |
| Support at work | 3 | Section IB, Item 3 | Crawford (2007) |
| Job satisfaction | 4 | Section IB, Item 4 | Crawford (2007) |
| ***Section II : Low back pain*** | | | |
| Presence of low back pain in past 12 months | 1 | Section II, Item 1 | Crawford (2007) |
| Duration | 2 | Section II, Item 2 | Crawford (2007) |
| Frequency of absenteeism due to low back pain | 3 | Section II, Item 3 | Crawford (2007) |
| Visiting doctor | 4 | Section II, Item 4 | Crawford (2007) |
| Pain while working | 5 | Section II, Item 5 | Crawford (2007) |
| Pain after work | 6 | Section II, Item 6 | Crawford (2007) |
| ***Section III : Physical workload*** | | | |
| Lifting | 1-4 | Section III, Item 1-4 | Crawford (2007) |
| Posture ( standing, walking, bending, and twisting) | 5-11 | Section III, Item 5-11 | Crawford (2007) |

| | | | |
|---|---|---|---|
| ***Section IV : Indirect work related factors*** | | | |
| Shift work | 1 | Section IV, Item 1 | Crawford (2007) |
| Overtime | 2 | Section IV, Item 2 | Crawford (2007) |
| Duration of work in a week | 3 | Section IV, Item 3 | Crawford (2007) |
| Number of breaks in a day | 4 | Section IV, Item 4 | Crawford (2007) |
| Duration of break in a day | 5 | Section IV, Item 5 | Crawford (2007) |
| ***Section V : Indirect work related factors*** | | | |
| Respondent's view | 1 | Section V, Item 1 | Crawford (2007) |

## 3.5 The Pilot Study

The reliability of the questionnaire is 0.855 as reported by Mesquita et al. (2010). Before the questionnaire was dispersed to the targeted respondents, this questionnaire was pre-tested as to ascertain its face validity. The questionnaire was pre-tested on twenty taxi drivers based in Johor Bahru who participated in this research to ensure the correct phrases. However, there were no amendments required.

### 3.5.1 Inclusion Criteria

Inclusion criteria are used to determine the taxi drivers who can participate in this study. The inclusion criteria of the sample of this study were:

a) Taxi drivers who are working on full time basis.
b) Taxi drivers who do manual handling activities apart from driving while at work.
c) Taxi drivers who have been more than three months in the profession.

### 3.5.2 Exclusion Criteria

Exclusion criteria are used to exclude the taxi drivers who can't participate in this study. The following are the exclusion criteria of the sample of the study:

a) Taxi drivers who are not willing to participate in the research.
b) Taxi drivers who have not completed three months of service in the profession.

### 3.5.3 Research Ethics

This research was done based on the outlined research ethics. This research was conducted on a voluntary basis and respondents were provided with required information regarding the purpose of this research. They were also required to sign a written permission form to participate in this research. Respondents were honoured with token of appreciation as a goodwill gesture for participating in this research.

## 3.6 The Administrative of the Survey Instruments

### 3.6.1 The Data Collection Procedure

The data were collected for three months while taxi drivers waiting along the road. Researcher in person administered the questionnaire and was readily accessible to participants for its return. This was to ensure a high respondent rate and timely retrieval of data. The observational study was carried out by the researcher himself to avoid biasness in the reporting of the compliance rate. The results of the data were reported in a collected manner with no reference to specific individual. Thus, the data from each individual will be confidential. The names of the participants were not disclosed to anyone.

## 3.7 Analysis of the Data

To conduct a research, certain measures are required to be followed before achieving a final result of the study. After the information of the questionnaires collected, the data preparation must be obtained such as checking the accuracy of data, keying in the data into the computer, and transforming and coding the data, developing and documenting a database structure. The questions were coded to facilitate for analysis using Statistical Packages for the Social Science (SPSS) to measure the relationship and differences between variables. In this study, the data was analyzed using the IBM SPSS Statistics Version 20.0 software.

### 3.7.1 Data Screening

The typo error will be cleared during the screening process so that the data received were accomplished for the use in the analysis. The data which demonstrate a skewed pattern would also changed through a normality test. Data would be scrutinized to keep away from any misplaced data.

### 3.7.2 The Reliability of the Instrument

The reliability indicates the extent to which the instruments used was without bias and hence ensures reliability and stability of the measurements. Besides, the validity measures the particular concept which was intended to be measured. The instrument used in this research was adopted from the research by Crawford (2007).

### 3.7.3 Descriptive Statistics

The descriptive statistics were used to look at the frequencies, categorical variables and the standard deviation, which give descriptive information. This statistical tool was used mainly to describe the socio-demographic, occupational information and the distribution of variables in the research.

### 3.7.4 Hypothesis Testing

This analysis was done using the chi square to determine the determinacy of low back pain among taxi drivers.

## 3.8 Summary

This section discussed the research method proposed for this study. This is a cross sectional study conducted on 224 taxi drivers based in Johor Bahru from the period of March 2012 to May 2012. The study was conducted using assisted questionnaires modeled after the Nordic Musculoskeletal Questionnaires. Pilot testing were conducted to ensure reliability of the questionnaire. Taxi drivers who do not fulfill the set criteria are excluded from the study to reduce confounding factors which could twist the way of this research. The data was

analyzed using IBM SPSS Statistics Version 20.0 software. The analysis of the result is presented in the next chapter.

# CHAPTER 4

# RESULT AND DISCUSSION

## 4.0 Introduction

This cross sectional study was conducted among taxi drivers in Johor Bahru and the data were obtained through assisted questionnaires. The data were analyzed using SPSS IBM SPSS Statistics Version 20.0 software. This chapter presents the obtained data with explanation and tables.

## 4.1 Summary of Data Collection

### 4.1.1 Respondents participation in the study

Data collection was conducted from March to May 2012. The calculated sample size was 228 taxi drivers from across Johor Bahru. Convenience sampling method was used to obtain the data. Not all the taxi drivers approached agreed to participate in the study and written consents were obtained from the respondents who agreed to participate. All the respondents have served as taxi drivers for more than three months in service. Only a total of 224 respondents were obtained at the end of data collection period, which provides with a response rate of 98.2%.

### 4.1.2 Data screening

After all the data being keyed in SPSS software, the data screening process has been conducted to see whether any taboo error of the data. This process is essential to ensure the data entry is correct. During cleaning the data of the questionnaires were collected, some typo errors have been found. Thus, the relevant data have been corrected accordingly.

## 4.2 The Demographic of Respondents

All taxi drivers working in Johor Bahru was considered based on the inclusive criteria. There were 224 taxi drivers respectively.

### 4.2.1 The socio-demographic factor analysis

Majority of the respondents drove Iswara taxis (50.9%) and , 63 of them (28.1%) drove Wira taxis and 47 drove Perdana taxis (21.0%) (see Figure 4.1). There were no gender variation as all the taxi drivers were male. Most of the respondents (84.4%) were Malay, followed by 23 Indian respondents (10.3%) and 10 Chinese respondents (4.5%) (see Figure 4.2). The least number of respondents were from other ethnicities (0.9%). Majority of the respondents were married (65.2%) and (34.8%) were single (see Figure 4.3).

Only about 26 respondents (11.6%) had underlying medical conditions such as Diabetes Mellitus, hypertension and bronchial asthma (see Figure 4.4). A history of previous back injury was given by 21 respondents (9.4%) (see Figure 4.5). Majority of the respondents were also non smokers (90.2%) (see Figure 4.6). The detailed data is presented in figure below.

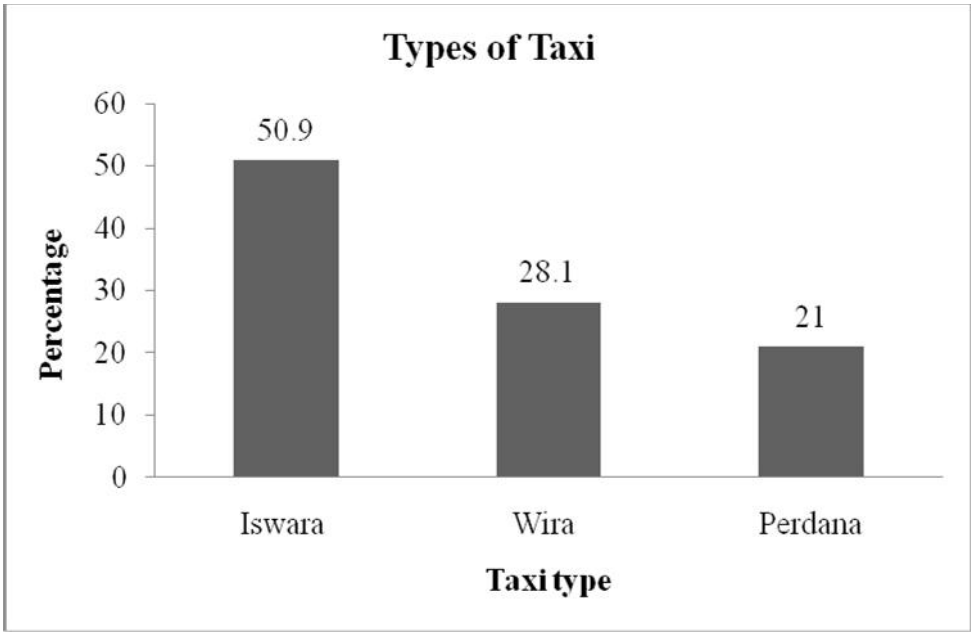


Figure 4.1: Taxi drivers by the types of taxi driven

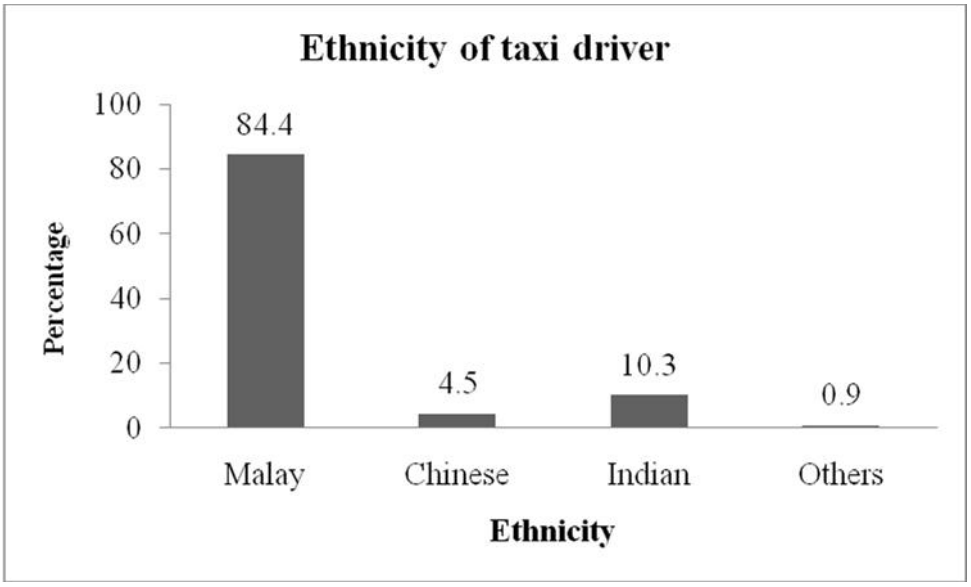


Figure 4.2: Ethnicity of taxi drivers

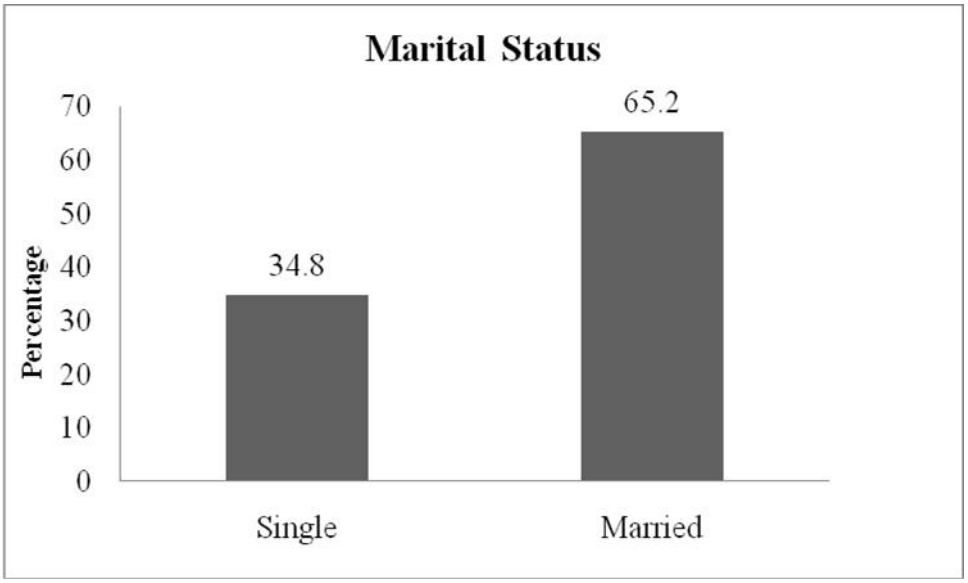


Figure 4.3 Marital status of taxi drivers

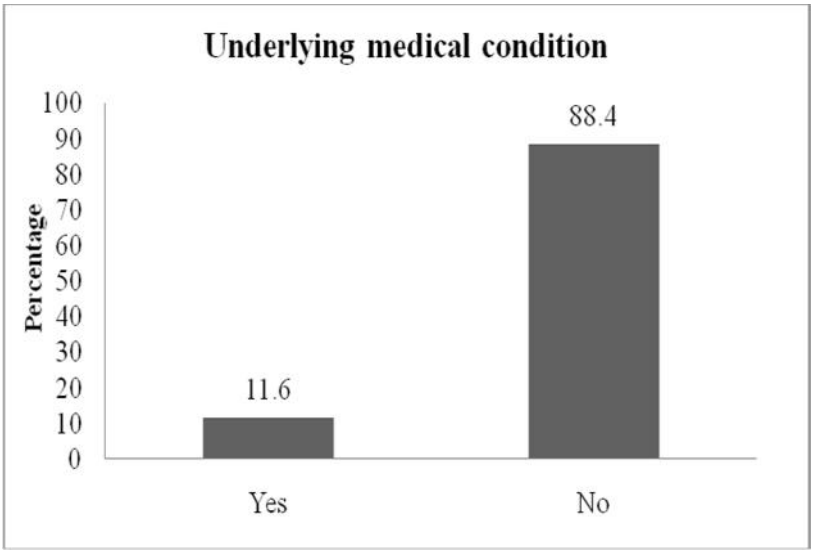


Figure 4.4 Percentage of existence of underlying medical condition among taxi drivers

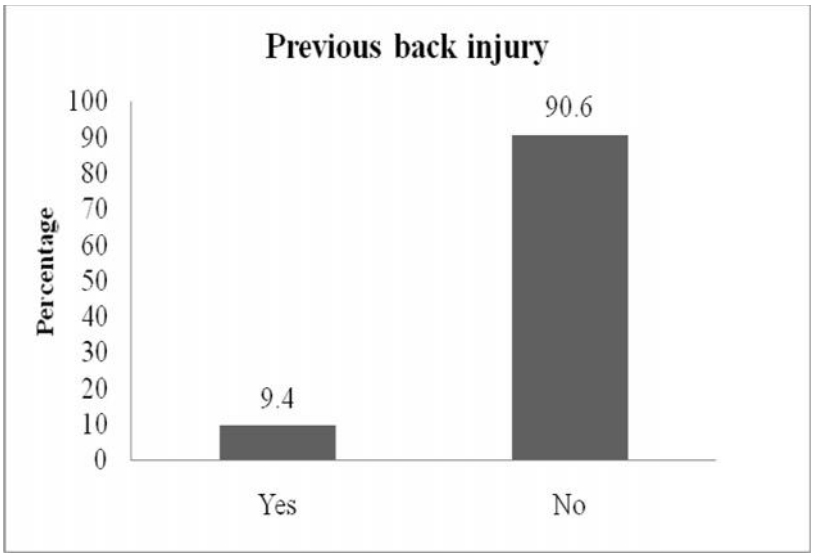


Figure 4.5: Existence of previous back injury among taxi drivers

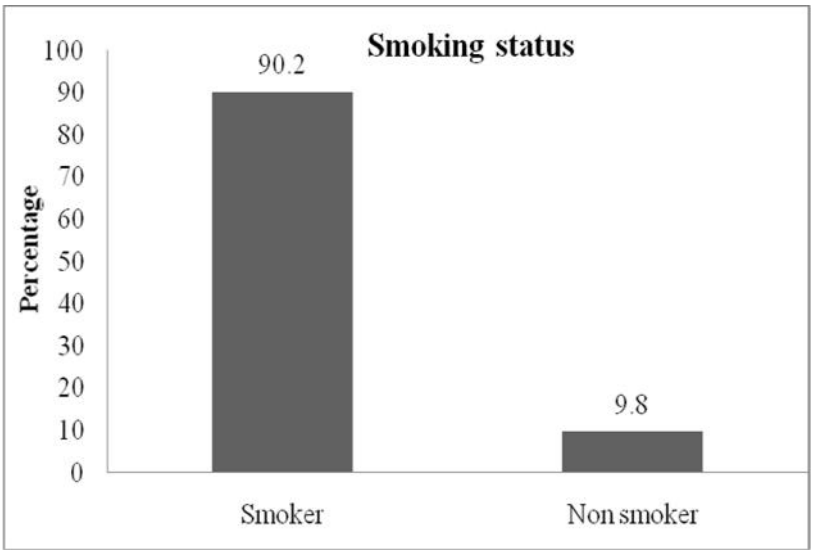


Figure 4.6: Smoking status of taxi drivers

Table 4.1 Sociodemographic work related factors description

| Descriptions | N | Percentage (%) |
|---|---|---|
| **Types of taxi driven** | | |
| Iswara | 114 | 50.9 |
| Wira | 63 | 28.1 |
| Perdana | 47 | 21.0 |
| **Ethnicity of taxi drivers** | | |
| Malay | 189 | 84.4 |
| Chinese | 10 | 4.5 |
| Indian | 23 | 10.3 |
| Others | 2 | 0.9 |
| **Marital status of taxi drivers** | | |
| Single | 78 | 35.0 |
| Married | 146 | 65.0 |
| **Underlying medical condition among taxi drivers** | | |
| Yes | 27 | 12.0 |
| No | 197 | 88.0 |
| **Previous back injury among taxi drivers** | | |
| Yes | 20 | 9.0 |
| No | 204 | 91.0 |
| **Smoking status of taxi drivers** | | |
| Smoker | 22 | 10.0 |
| Non smoker | 202 | 90.0 |
| **Age** | | |
| 29 years and less | 131 | 58.0 |
| More than 29 years | 93 | 42.0 |
| **Number of cigarettes smoked in a day** | | |
| 8 and less | 213 | 95.0 |
| More than 8 | 11 | 5.0 |

| | | |
|---|---|---|
| **Years of smoking** | | |
| 5 years and less | 214 | 96.0 |
| More than 5 years | 10 | 4.0 |

### 4.2.2 Physical workload factor analysis

Majority of the respondents (61.6%) claimed that their work involves frequent lifting and 113 respondents (81.3%) stated that they frequently lift loads whilst their back is in bent position and 104 respondents (75.9%) lift loads whilst their back is in twisted position while 96 of them (69.6%) lift loads whilst their back is in bent and twisted position.

Majority of the respondents (80.4%) also claimed to stand or walk for more than an hour while working. 116 respondents (51.8%) stated that their job involves bending and 108 respondents (48.2%) stated that their job does not involve bending. Of the 116 respondents who bend other than while lifting loads during work, 51 of them (44.0%) bend for more than five times other than while lifting loads in a working day and 56.0% of the respondents stated that their work does not involve bending for less than five times in a working day.

Majority of the respondents (62.5%) stated that their work does not involve twisting their lower back. Of the 84 respondents who claimed that their work involved twisting their lower back, 42 of them twisted their lower back less than an hour in a working day and 42 respondents (50.0%) stated that they twist their lower back for a total of more than an hour in a working day. The detailed analysis is presented in Table 4.2.

Table 4.2 Physical workload description

| Description | N | Percentage (%) |
|---|---|---|
| **Frequent Lifting** | | |
| Yes | 138 | 61.1 |
| No | 86 | 38.4 |
| **Lifting while bending** | | |
| Yes | 113 | 81.3 |
| No | 26 | 18.7 |
| **Lifting while twisting** | | |
| Yes | 104 | 75.9 |
| No | 33 | 24.1 |
| **Lifting while bending and twisting** | | |
| Yes | 96 | 69.6 |
| No | 42 | 30.4 |
| **Standing and walking** | | |
| Yes | 180 | 80.4 |
| No | 44 | 19.6 |
| **Bending** | | |
| Yes | 116 | 51.8 |
| No | 108 | 48.2 |
| **Prolonged bending** | | |
| Yes | 51 | 44.0 |
| No | 65 | 56.0 |
| **Twisting** | | |
| Yes | 84 | 37.5 |
| No | 140 | 62.5 |
| **Prolonged twisting** | | |
| Yes | 42 | 50.0 |
| No | 42 | 50.0 |

### 4.2.3 Indirect work related factors analysis

Majority of the respondents 197 (88.0%) taxi drivers worked in shift and 98 (44.0%) taxi drivers did overtime on regular basis. Most of the taxi drivers 161 (75.0%) took minimum 30 minutes of rest and less. Majority of respondents 171 (81.0%) also took 2 breaks and less, except 39 respondents took more than 2 breaks. In duration of one week 125 (56%) respondents worked 42 hours and less, while 99 (44.0%) worked more than 42 hours. The detailed data is presented in Table 4.5 as below.

Table 4.3 Indirect work related factors description

| Descriptions | N | Percentage (%) |
|---|---|---|
| **Shift work** | | |
| Yes | 197 | 88.0 |
| No | 27 | 12.0 |
| **Overtime** | | |
| Yes | 98 | 44.0 |
| No | 126 | 56.0 |
| **Minutes of rest in a day** | | |
| 30 min and less | 161 | 75.0 |
| More than 30 min | 55 | 25.0 |
| **Number of breaks** | | |
| 2 breaks and less | 171 | 81.0 |
| More than 2 breaks | 39 | 19.0 |
| **Duration of working hours in a week** | | |
| 42 hours and less | 125 | 56.0 |
| More than 42 hours | 99 | 44.0 |

### 4.2.4 Prevalence of low back pain

As discussed earlier, low back pain was defined as pain, muscle tension, or stiffness, in the past 12 months based on the Standardized Nordic Musculoskeletal Questionnaires for the purpose of this study. Majority of the respondents 114 (50.9%) taxi drivers claimed that they didn't have low back pain in the past 12 months while 110 (49.1%) taxi drivers had low back pain. From the respondents with low back pain, 58 taxi drivers (50.4%) had episodes of low back pain lasting for a period of one to two days while only one respondent (0.01%) claimed to have low back pain from one week to one month duration. No respondents stated that they suffered from low back pain for more than three months.

Majority of taxi drivers (79.7%) have never undergone medical treatment for the low back pain. Only twenty eight respondent with low back pain had taken leave for the problem which is 22 (15.9%) taxi drivers took leave from one to six days, 1 (0.7%) taxi drivers took leave from seven to fourteen days, 4 (2.9%) taxi drivers took leave from fifteen to thirty days and another one (0.7%) taxi driver from one to three months. Most the 108 respondents (71.1%) taxi drivers claimed to have had episodes of low back pain while driving and only 34 respondents (24.5%) had visited doctor due to low back pain. The detailed data are presented in Table 4.4.

Table 4.4 Prevalence of low back pain analysis

| Description | N | Percentage (%) |
|---|---|---|
| **Low back pain in past 12 months** | | |
| Yes | 110 | 49.1 |
| No | 114 | 50.9 |
| **Duration of low back pain in the past 12 months** | | |
| 1-2 days | 58 | 50.4 |
| 3-6 days | 43 | 37.4 |
| 1-3 months | 13 | 11.3 |
| 7-30 days | 1 | 0.01 |
| More than 3 months | 0 | 0 |
| **Sick leave due to low back pain** | | |
| None | 110 | 79.7 |
| 1-6 days | 22 | 15.9 |
| 7-14 days | 1 | 0.7 |
| 15-30 days | 4 | 2.9 |
| 1-3 months | 1 | 0.7 |
| More than 3 months | 0 | 0 |
| **Visit to doctor due to low back pain** | | |
| Yes | 34 | 24.5 |
| No | 105 | 75.5 |
| **Low back pain while working** | | |
| Yes | 108 | 71.1 |
| No | 44 | 28.9 |

### 4.2.5 Psychosocial workload factor analysis

The taxi drivers that worked for 24 years and less are 113 (51%) and 111 (49.0%) worked more than 24 years. Most of the respondents (81.3%) stated that they are allowed to make decision on how to do their work and 177 of them (79.0%) also stated that they were allowed to decide on what they do at work. Majority of the respondents (71.4%) also claimed to have the freedom to decide their work timetable and breaks during a working day. Except

for 13 respondents, the rest (94.2%) claimed that they sometimes or often receive support from colleagues or their immediate manager in doing their work.

Majority of the respondents, totaling 203 taxi drivers (90.6%) claimed that they are satisfied or very satisfied with their work while the rest were not. The data is as presented in Table 4.5.

Table 4.5 Psychosocial workload description

| Description | N | Percentage (%) |
|---|---|---|
| **Duration of working** | | |
| 24 years and less | 113 | 51.0 |
| More than 24 years | 111 | 49.0 |
| | | |
| **Job decision** | | |
| How to work | | |
| Yes | 182 | 81.3 |
| No | 42 | 18.7 |
| What to do at work | | |
| Yes | 177 | 79.0 |
| No | 47 | 21.0 |
| Timetables and breaks | | |
| Yes | 160 | 71.4 |
| No | 64 | 28.6 |
| | | |
| **Support at work** | | |
| Yes | 211 | 94.2 |
| No | 13 | 5.8 |
| | | |
| **Job satisfaction** | | |
| Yes | 203 | 90.6 |
| No | 21 | 9.4 |

### 4.2.6 Respondents' opinion on low back pain

All the participating taxi drivers were requested to provide their opinion on low back pain irrespective of them having or not having the problem. Their level of agreement was measured using Likert Scale ranging from one to six. The least score depicts disagreement of the respondents with provided statements while as the score gets higher, it depicts a higher level of agreement.

The feedback reveals that most of the respondents (71.6%) neither slightly agree nor disagree or moderate agree on the statement that physical activity worsens back pain. Majority of the respondents (45.7%) also agree moderately that to reduce the risk of worsening the pain, physical activity must be avoided. Most of the respondents also agree moderately that an increase in pain is an indication to stop what one was doing and rest is needed to get better.

Majority of the respondents (40.5%) also slightly agree that normal work should not be resumed until the pain is treated. Many (87 respondents) also agree moderately that it is important to see a doctor straight away at the first sign of trouble with low back pain. Only 51 (23.0%) respondents completely disagree with the statement that back pain normally gets better by itself. The detailed analysis is presented in Table 4.6.

Table 4.6 Respondent's Opinion

| Description | N | Percentage (%) |
|---|---|---|
| Physical activity worsens back pain | | |
| 1. Completely disagree | 2 | 0.9 |
| 2. Moderate disagree | 13 | 5.9 |
| 3. Slightly disagree | 81 | 36.5 |
| 4. Slightly agree | 78 | 35.1 |
| 5. Moderately agree | 36 | 16.2 |
| 6. Completely agree | 12 | 5.4 |
| Physical activity should be avoided if they make the pain worse | | |
| 1. Completely disagree | 6 | 2.7 |
| 2. Moderate disagree | 7 | 3.2 |
| 3. Slightly disagree | 44 | 19.9 |
| 4. Slightly agree | 101 | 45.7 |
| 5. Moderately agree | 53 | 24.0 |
| 6. Completely agree | 10 | 4.5 |
| An increase in pain is an indication to stop what one is doing | | |
| 1. Completely disagree | 0 | 0 |
| 2. Moderate disagree | 4 | 1.8 |
| 3. Slightly disagree | 61 | 27.7 |
| 4. Slightly agree | 98 | 44.5 |
| 5. Moderately agree | 46 | 20.9 |
| 6. Completely agree | 11 | 5.0 |
| Rest is needed to get better | | |
| 1. Completely disagree | 1 | 0.5 |
| 2. Moderate disagree | 1 | 0.5 |
| 3. Slightly disagree | 25 | 11.4 |
| 4. Slightly agree | 85 | 38.6 |
| 5. Moderately agree | 92 | 41.8 |
| 6. Completely agree | 16 | 7.3 |

| | | |
|---|---|---|
| Normal work should be avoided until the pain is treated | | |
| 1. Completely disagree | 2 | 0.9 |
| 2. Moderate disagree | 21 | 9.5 |
| 3. Slightly disagree | 61 | 27.7 |
| 4. Slightly agree | 89 | 40.5 |
| 5. Moderately agree | 32 | 14.5 |
| 6. Completely agree | 15 | 6.8 |
| It is important to see a doctor straight away at the first sign of trouble | | |
| 1. Completely disagree | 0 | 0 |
| 2. Moderate disagree | 6 | 2.7 |
| 3. Slightly disagree | 71 | 32.0 |
| 4. Slightly agree | 87 | 39.2 |
| 5. Moderately agree | 46 | 20.7 |
| 6. Completely agree | 12 | 5.4 |
| Neglecting problems of this kind can cause permanent health problems | | |
| 1. Completely disagree | 2 | 0.9 |
| 2. Moderate disagree | 5 | 2.3 |
| 3. Slightly disagree | 34 | 15.3 |
| 4. Slightly agree | 112 | 50.5 |
| 5. Moderately agree | 59 | 26.6 |
| 6. Completely agree | 10 | 4.5 |
| Back pain normally gets better by itself | | |
| 1. Completely disagree | 51 | 23.0 |
| 2. Moderate disagree | 32 | 14.4 |
| 3. Slightly disagree | 83 | 37.4 |
| 4. Slightly agree | 46 | 20.7 |
| 5. Moderately agree | 10 | 4.5 |
| 6. Completely agree | 0 | 0 |

## 4.3 Hypothesis Testing

The hypothesis was tested with the Chi-square Test with *p* value less than 0.05 considered significant value statistically.

### 4.3.1 Association between socio-demographic factors and low back pain

The study revealed that the prevalence of low back pain was higher among taxi drivers who drive Wira taxi (55.5%) and the association was not significant as *p* value was 0.19 ($p>0.05$). Majority of the respondents were Malay but it was found that the prevalence of low back pain was higher among Indian and other ethnicities (56.0%). The Chi-square test did not reveal any significant association between low back pain and ethnicity ($p >0.05$).

The prevalence of low back pain was higher among respondents who are married or have been married before (58.9%) and there was a significant association between low back pain and marital status ($p<0.05$). Majority of the respondents with low back pain had underlying medical condition (65.4%) but there were no significant association between underlying medical condition and presence of low back pain ($p>0.05$).

The study also revealed a significant association between low back pain and previous back injury in which the *p* value was 0.03 ($p<0.05$). However, majority of respondents with low back pain was found to have abnormal Body Mass Index (BMI) which the *p* value was 0.88 ($p>0.05$). Although most of the respondents with low back pain were smokers (45.5%), there was no significant association between low back pain and smoking status which the *p* value was 0.72 ($p>0.05$). The prevalence of low back pain was higher among respondents who are more than 29 years old (53.7%) and there was no significant association between low back pain and age which the *p* value was 0.24 ($p>0.05$). The number of cigarettes smoked by respondents with 8 cigarette and less are 49.3% and there was no significant association between low back pain and number of cigarette smoked 0.80 ($p>0.05$). While, respondents who smoke more than 5 years (60%) has no significant association between low back pain and years of smoking 0.48 ($p>0.05$). The detailed analysis is presented in Table 4.7.

Table 4.7 Association between socio-demographic factors and low back pain

| Factors | Low back pain | | | |
|---|---|---|---|---|
| | Yes (N %) | No (N %) | $X^2$ | p value |
| **Drivers by Taxi Types** | | | | |
| Iswara | 57 (50.0%) | 57 (50.0%) | 3.28 | 0.19 |
| Wira | 35 (55.5%) | 28 (44.5%) | | |
| Perdana | 18 (38.3%) | 29 (61.7%) | | |
| **Ethnicity** | | | | |
| Malay | 91 (48.1%) | 98 (51.9%) | 2.23 | 0.53 |
| Chinese | 5 (50.0%) | 5 (50.0%) | | |
| Indian & Others | 14 (56.0%) | 11 (44.0%) | | |
| **Marital Status** | | | | |
| Single | 24 (30.8%) | 54 (69.2%) | 16.10 | <0.001 |
| Married & Divorced/ widowed | 86 (58.9%) | 60 (41.1%) | | |
| **Underlying medical conditions** | | | | |
| Yes | 17 (65.4%) | 9 (34.6%) | 3.12 | 0.07 |
| No | 93 (47.0%) | 105 (53.0%) | | |
| **Previous back injury** | | | | |
| Yes | 15 (71.4%) | 6 (28.6%) | 4.62 | 0.03 |
| No | 95 (46.8%) | 108 (53.2%) | | |
| **Body Mass Index (BMI)** | | | | |
| Normal BMI | 27 (50.0%) | 27 (50.0%) | 0.02 | 0.88 |
| Abnormal BMI | 83 (48.8%) | 87 (51.2%) | | |

| | | | | |
|---|---|---|---|---|
| **Smoker** | | | | |
| Yes | 10 (45.5%) | 12 (54.5%) | 0.13 | 0.72 |
| No | 100 (49.5%) | 102 (50.5%) | | |
| **Age** | | | | |
| 29 years and less | 60 (45.8%) | 71 (54.2%) | 1.38 | 0.24 |
| More than 29 years | 50 (53.7%) | 43 (46.3%) | | |
| **Number of cigarettes smoked in a day** | | | | |
| 8 and less | 105 (49.3%) | 108 (50.7%) | 0.06 | 0.80 |
| More than 8 | 5 (45.5%) | 6 (54.5%) | | |
| **Years of smoking** | | | | |
| 5 years and less | 104 (49.0%) | 110 (51.0%) | 0.49 | 0.48 |
| More than 5 years | 6 (60.0%) | 4 (40.0%) | | |

$X^2$ ; Chi Square Test with $p < 0.05$ showing a significant association

### 4.3.2 Association between physical workload and low back pain

The prevalence of low back pain was higher among those who frequently lifts loads greater than 15 kilogrammes (55.8%) and the association was significant as *p* value was 0.011 ($p<0.05$). There was also a significant association between low back pain and work which involves lifting loads in a bent position as shown in the questionnaire ($p<0.05$). Majority of the respondents with low back pain also lift loads whilst the back is in twisted position (57.7%) and the association was found no significant ($p>0.05$). The prevalence of low back pain was also higher (61.5%) among respondents who lift loads with the back both in a bent and twisted position as drawn in the diagram and the chi-square test revealed significant association as the *p* value was 0.043 ($p< 0.05$).

The prevalence of low back pain was higher among respondents whose work involves prolonged standing and walking but the association was not significant as the chi-square test gave a *p* value= 0.380 ($p>0.05$). The study revealed respondents with low back pain (34.3%) also stated that their work involves bending other than while lifting loads and the association was significant ($p< 0.05$).

The prevalence of low back pain was also higher among those who frequently bend while working (67.6%) and the association was not significant as well ($p>0.05$). There was no significant association between low back pain and prolonged period of bending while working, which is defined as a cumulative period of more than an hour ($p>0.05$).

The study also revealed that the prevalence of low back pain was higher among respondents whose work involves twisting their lower back other than while lifting loads and the association was significant ($p< 0.05$). Majority of the respondents with low back pain also stated that their work involves frequent (67.5%) twisting and the association was not significant as well ($p>0.05$) while prolonged (78.6%) twisting and the association of these factors with low back pain was significant ($p< 0.05$). The detailed analysis is as presented in Table 4.8 as shown.

Table 4.8 Association between physical workload and low back pain

| **Factors** | **Low back pain** | | **$X^2$** | **p value** |
|---|---|---|---|---|
| | **Yes (N%)** | **No (N%)** | | |
| **Frequent lifting** | | | | |
| Yes | 77 (55.8%) | 61 (44.2%) | 6.43 | 0.011 |
| No | 33 (38.4%) | 53 (61.6%) | | |
| **Lifting while bending** | | | | |
| Yes | 68 (60.2%) | 45 (39.8%) | 4.04 | 0.044 |
| No | 10 (38.5%) | 16 (61.5%) | | |
| **Lifting while twisting** | | | | |
| Yes | 60 (57.7%) | 44 (42.3%) | 0.86 | 0.354 |
| No | 16 (48.5%) | 17 (51.5%) | | |
| **Lifting while bending and twisting** | | | | |
| Yes | 59 (61.5%) | 37 (38.5%) | 4.09 | 0.043 |
| No | 18 (42.9%) | 24(57.1%) | | |
| **Standing and walking** | | | | |
| Yes | 91 (50.5%) | 89 (49.5%) | 0.769 | 0.380 |
| No | 19 (43.2%) | 25 (56.8%) | | |
| **Bending** | | | | |
| Yes | 37 (34.3%) | 71 (65.7%) | 18.397 | <0.001 |
| No | 73 (63.0%) | 43 (37.0%) | | |
| **Frequent bending** | | | | |
| Yes | 48 (67.6%) | 23 (32.4%) | 1.714 | 0.190 |
| No | 25 (56.0%) | 20 (44.4%) | | |

| | | | | |
|---|---|---|---|---|
| **Prolonged bending** | | | | |
| Yes | 34 (66.6%) | 17 (33.4%) | 0.544 | 0.461 |
| No | 39 (60.0%) | 26 (40.0%) | | |
| **Twisting** | | | | |
| Yes | 55 (39.3%) | 85 (60.7%) | 14.409 | <0.001 |
| No | 55 (65.5%) | 29 (34.5%) | | |
| **Frequent twisting** | | | | |
| Yes | 27 (67.5%) | 13 (32.5%) | 0.138 | 0.710 |
| No | 28 (63.6%) | 16 (36.4%) | | |
| **Prolonged twisting** | | | | |
| Yes | 33 (78.6% ) | 9 (21.4%) | 6.372 | 0.012 |
| No | 22 (52.4% ) | 20 (47.6%) | | |

$X^2$ ; Chi Square Test with $p < 0.05$ showing a significant association

### 4.3.3 Association between indirect work related factors and low back pain

Majority of the respondents who work in shift did not have low back pain (52.3%) and the study did not reveal any significant association between low back pain and shift work. However, the prevalence of low back pain was higher among respondents who does overtime (54.1%) but the association was not significant as *p* value 0.189 ($p>0.05$). The study also did not reveal any significant association between low back pain and total minutes of rest in a day, number of breaks taken in a day and total number of hours working in a week ($p >0.05$) as shown in detail in Table 4.9.

Table 4.9 Association between indirect works related factors and low back pain

| Factors | Low back pain | | $X^2$ | p value |
|---|---|---|---|---|
| | Yes (N %) | No (N %) | | |
| **Shift work** | | | | |
| Yes | 94 (47.7%) | 103 (52.3%) | 1.266 | 0.261 |
| No | 16 (59.3%) | 11 (40.7%) | | |
| **Overtime or on call** | | | | |
| Yes | 53 (54.1%) | 45 (45.9%) | 1.725 | 0.189 |
| No | 57 (45.2%) | 69 (54.8% | | |
| **Minutes of rest in a day** | | | | |
| 30 min and less | 80 (49.6%) | 81 (50.4%) | 0.09 | 0.75 |
| More than 30 min | 26 (47.3%) | 29 (52.7%) | | |
| **Number of breaks** | | | | |
| 2 breaks and less | 84 (49.1%) | 87 (50.9%) | 0.11 | 0.74 |
| More than 2 breaks | 18 (46.2%) | 21 (43.8%) | | |
| **Duration of working hours in a week** | | | | |
| 42 hours and less | 55 (44.0%) | 70 (56.0%) | 2.95 | 0.08 |
| More than 42 hours | 55 (56.0%) | 44 (44.0%) | | |

$X^2$ ; Chi Square Test with $p < 0.05$ showing a significant association

### 4.3.4 Association between psychosocial workload and low back pain

For the purpose of this study, psychosocial workload is covered on four aspects, which are duration of working, job decision, and support at work and job satisfaction. The prevalence of low back pain was lower among respondents who are less than 29 years old (53.1%) and there was no significant association between low back pain and duration of working which the *p* value was 0.50 ($p>0.05$). There was no significant association between low back pain and job decision factor ($p>0.05$) which covers ability of respondents to decide on how to work, what to do at work and deciding on their work timetable and breaks.

The prevalence of low back pain was higher among respondents who did not have support at work (53.8%) but the association was not significant as chi-square test gave a *p* value 0.725 (p>0.05). Majority of respondents with low back pain were also not satisfied with their work (66.7%) but the association was not significant as chi-square test gave a *p* value 0.091 (p>0.05). The detailed data is as presented in Table 4.10.

Table 4.10 Association between psychosocial workload and low back pain

| **Factors** | **Low back pain** | | **$X^2$** | **p value** |
|---|---|---|---|---|
| | **Yes (N %)** | **No (N %)** | | |
| **Duration of working** | | | | |
| 24 years and less | 53 (46.9%) | 60 (53.1%) | 0.44 | 0.50 |
| More than 24 years | 57 (51.4%) | 54 (48.6%) | | |
| **Job decision** | | | | |
| ***How to work*** | | | | |
| Yes | 89 (48.9%) | 93 (51.1%) | 0.016 | 0.898 |
| No | 21 (50.0%) | 21 (50.0%) | | |
| ***What to do at work*** | | | | |
| Yes | 84 (47.5%) | 93 (52.5%) | 0.918 | 0.338 |
| No | 26 (55.3%) | 21 (44.7%) | | |
| ***Timetables and breaks*** | | | | |
| Yes | 77 (48.0%) | 83 (52.0%) | 0.216 | 0.642 |
| No | 33 (51.6%) | 31 (48.4%) | | |
| **Support at work** | | | | |
| Yes | 103 (48.8%) | 108 (51.2%) | 0.124 | 0.725 |
| No | 7 (53.8%) | 6 (46.2%) | | |
| **Job satisfaction** | | | | |
| Yes | 96 (47.3%) | 107 (42.7%) | 2.859 | 0.091 |
| No | 14 (66.7%) | 7 (33.3%) | | |

$X^{2;}$ Chi Square Test with $p < 0.05$ showing a significant association

## 4.4 Conclusion

The study revealed that majority of the respondents were Malay (84.4%), don't have previous back injury (90.6%) and non smokers (90.2%). The prevalence of low back pain in the past 12 months were 49.1%. There was a significant association between marital status and low back pain, in which respondents who are married or have been married before have higher prevalence of low back pain compared to those who are not married. Being married or have been married before is also a significant risk factor for low back pain in this study. There was no significant association between Body Mass Index (BMI) level and low back pain, and also between low back pain and smoking status.

The study revealed significant association between low back pain and physical workloads which involves manual handling, such as lifting loads, lifting loads in bent, bending, twisting and prolonged twisting in which $p$ value $<0.05$. Lifting loads while bending and twisting the lower back increases the risk of low back pain by three folds. There was no significant association between low back pain and prolonged standing or walking.

The study also did not reveal any significant association between low back pain and shift work. It was also found that there was no significant association between low back pain and psychosocial workload factors which include job decision, support at work and job satisfaction.

# CHAPTER 5

# CONCLUSION AND RECOMMENDATION

## 5.0 Introduction

Low back pain has been a well-studied problem worldwide and the focus on transportation sector, including taxi drivers, bus drivers and lorry drivers has been given importance in many local studies as well. This research focused on taxi drivers within Johor Bahru who handle taxis of different sizes. The idea to focus on taxi drivers was to study the significance of low back pain with many risk factors, especially on manual handling works done by these drivers apart from driving taxi with prolonged hours of sitting.

## 5.1 Hypotheses Testing Result

### 5.1.1 Association between Socio-demographic and the Prevalence of Low Back Pain among Taxi Driver

The study discovered that there was no significant association between types of taxi and prevalence of low back pain. The finding fails to reject the null hypothesis. The finding is consistent with the study by Miyamoto et al. (2000) who reported that prevalence of low back pain is related to the types of vehicle drove. This situation may be due to safety devices and equipments that are installed in vehicles.

The result gathered in this study demonstrated that there were no significant association between the ethnicity group and prevalence of low back pain. Thus, the finding obtained failed to reject the null hypothesis of the research. This finding is consistent with Normazura (2009) on prevalence of low back pain among medical assistants found that the problem was more prevalent among Indians as well (78.3%), which is consistent with findings of this study. It seems potential that these results are due to people from different ethnicities who have different cultures which lead them to behave in different manner.

In relation to previous back injury, this study revealed that there were significant association between the previous back injury and prevalence of low back pain. The result obtained rejects the null hypothesis of the research. The phenomenon observed in this research is inconsistent with findings by Videman et al. (1984). Previous back injury would have resulted in the respondents suffering from some amount of chronic pain and could play a major role in aggravating respondent's low back pain in the past twelve months. Therefore, previous back injury can be regarded as a confounding factor which could change the direction of association between risk factors and low back pain.

The result from the research showed that there were no significant association between BMI and prevalence of low back pain. The finding fails to reject null hypothesis. The finding is in line with Heliovaara (1987) that found BMI is an independent risk factor in male population and that height and heavy body mass may be important contributors for low back pain. This situation may be due to awareness of taxi drivers about their health lifestyle.

The result from the research showed that there were no significant association between age and the prevalence of low back pain. The result fails to reject the null hypothesis of the research. This finding supports the previous research conducted by Bovenzi and Betta (1994) that showed a significant association with age. This situation may due to increasing trend of low back pain with increasing age.

The study also discovered that there were no significant association between numbers of cigarettes smoked in a day and years of smoking with low back pain. The result fails to reject the null hypothesis of the research. Many studies have proven a significant association between smoking and low back pain such as the one conducted by Frymoyer et al. (1983) and Normadiah Jabar (2005). This study revealed that the prevalent of low back pain was lower among smokers (54.5%) and the association was not significant.

### 5.1.2 Association between Physical Workload and the Prevalence of Low Back Pain among Taxi Driver.

The study revealed that there were no significant association between low back pain with works that involves lifting while twisting, standing and walking, frequent bending, prolonged bending and frequent twisting. The result fails to reject the null hypothesis of the

research. This finding is consistent with the study conducted by Gallais (2008) which stated that the prevalence of low back pain can increase in combination of twisting and bending with other motions, especially lifting. It is almost undeniable that apart from driving taxis, taxi drivers are also involved in loading and unloading goods from the taxi.

The result from the research showed that there were significant association between the prevalence of low back pain with works that involves frequent lifting, lifting while bending, lifting while bending and twisting, bending, twisting and prolonged twisting. The result rejects the null hypothesis of the research. The result is inconsistent with Magnusson et al. (1996) and Magora (1974). Bending and twisting are common postures assumed by the taxi drivers while doing manual handling jobs such as loading or unloading goods. Bending is also often assumed if the taxi drivers have to do manual inspection to ascertain that their taxi is in good condition prior to driving, especially for long distance.

Kumar (1990) in his study on cumulative load as a risk factor for low back pain has mentioned that cumulative load over a work day and throughout lifetime predisposes the spine to pain and injury. The findings of this study was consistent with the study conducted by Nizam and Rampal (2001) on oil palm plantation workers in which the result revealed prevalence of back pain was significantly higher among workers who did manual handling jobs. The findings were also consistent with the study conducted by Department of Occupational Safety and Health (2008) among nurses in Malaysia, which indicated ergonomic factors such as awkward posturing and repetitive movements as significant risk factors for low back pain. Jabbar (2008) has also mentioned in his study among dentist that awkward body posturing, bending and twisting of lower back were significant risk factors for low back pain.

Many studies conducted among drivers have indicated that manual handling tasks, which involve lifting loads, were significant risk factors for low back pain. Lack of training on manual handling of heavy objects was found to be a contributory factor to low back pain (Anderson et al., 1997). This study did not directly enquire on prolonged sitting while driving as it is assumed that prolonged working hours are equivalent to prolonged driving. Gallais (2008), in her study among car drivers found that sitting for a cumulative period of between two to four hours in a working day was associated with higher prevalence of low back pain. Prolonged sitting was known to be a risk factor for low back pain as when one is

seated, there will be increased pressure on the lower back and lack of motion or mobility while seating will also inactivity in the bone tissue, disrupting nutrition supply to the intervertebral disc through accumulation of metabolites.

### 5.1.3 Association between Indirect Work and the Prevalence of Low Back Pain among Taxi Driver.

The result of this study indicates that there is no significance association between shift work, overtime, minutes of rest in a day and duration of working hours in week with the prevalence of low back pain. Thus, the findings fail to reject the null hypothesis of the current research. Previous research has showed that taxi drivers who work for long hours have higher prevalence of low back pain compared to those who do not work for long hours. The International Labour Organization (2007) in its policy on working hours has emphasized and proposed for a total of 40-hours of working in a week to promote healthy living and enhance productivity.

Taxi drivers who work for longer hours experience increased cumulative workload in a working day and results in a higher pressure loading on the lower back. Prolonged working hours also leaves them with minimal time for rest and recovers from any strain on the lower back before resuming work on the next day, thus causing cumulative trauma on the lower back. Besides that, prolonged working hours with intensified workload could also contribute to increased stress levels among the taxi drivers and this was known to be associated with various musculoskeletal disorders, including low back pain (Anderson et al., 1997).

The International Labour Organization (2004) has proposed for standard rules to be imposed on number, timing and duration of rest periods for highly interdependent work with fast pace or work which requires high degree of vigilance such as in critical care units to ensure workplace safety and health. Regular breaks were also found to increase productivity and reduce work related health problems. Adequate rests and breaks in a working day is needed to ensure that the taxi drivers do not maintain static posture for prolonged periods and to allow recovery of minor traumas on the low back pain due to static loading and pressure. Regular walkabouts and change of posture during rest periods will also enhance circulation to the lower back muscles and increase its nutritional supply to ensure normal function.

### 5.1.4 Association between Psychosocial Workload and the Prevalence of Low Back Pain among Taxi Driver.

In term of psychosocial, there was no significant association between duration of working, job decision, support at work and job satisfaction with the prevalence of low back pain. The results obtained fail to reject the null hypothesis of the research. Anderson et al. (1997) stated in his study that job ranking and low job control are associated with various musculoskeletal disorders. He also stated that psychosocial workload could result in muscle tension and increase in spinal loading. Besides that, those who are affected by psychosocial workload will have a higher tendency to complain on physical symptoms and maintain the pain symptoms as it is a psychological construct (Menzel, 2007).

Hartvigsen et al. (2004) reviewed forty papers on association between low back pain and psychosocial work factors and stated that moderate evidence were found for no association between low back pain and perception of work, organizational aspects of work, and social support at work. Kermit and Catherine (2000) studied on relationship between psychosocial work characteristics and low back pain and found that employee's reactions to psychosocial work characteristics such as job dissatisfaction and job stress are more consistently related to lower back pain. This result may be explained by the fact that psychosocial workload will be perceived by taxi drivers who have poor coping skills and thus, there is a possibility that they will be maintaining the physical symptoms of low back pain to minimize emotional distress. Psychosocial aspect itself is a very broad topic to be covered and warrants a different study by itself.

## 5.2 Research Contribution

The prevalence of low back pain among taxi drivers in this study was relatively high although it had diminished the taxi drivers satisfaction to the practice. This created a significant challenge to the management to overcome the issue in terms of providing health services and equipments. The findings of this study will allow to increase the awareness of the low back pain so that prevention could be designed to reduce the back pain and to provide a safe environment for all taxi drivers.

This study allowed us to realize that the low back pain is not a minor task to overcome this issue but instead needed a proven and systematic approach to tackle it. A sound measurement system to determine the true behavioral aspect of the health care workers can be considered as area of interest for possible improvement for the overall prevalence rate. Behavioral theories and secondary interventions have known to primarily target individual workers and this practice might be responsible to sustain change. Interventions aimed at improving low back pain prevalence must account for different levels of behavior interaction thus, the interdependence of individual factors, environmental constraints, and the institutional climate must be taken into account in the strategic planning and development of low back pain campaigns.

Various factors involved in sustaining low back pain which includes, perceived social norm, perceived behavioral control, perceived role model, and motivation can be considered in future research to find the possible link to the prevalence rate.

## 5.3 Limitations and Future Research Directions

### 5.3.1 Limitations

These are among the few limitations predicted that would be encountered during the conduct of the study:

a) Identification of low back pain in this study was not based by a physician or orthopedic surgeon's diagnosis but it depends on the respondent's answers on the questionnaire. The outcome might be bias.

b) Respondents with previous low back pains may be more likely to remember any episodes of past injuries than those without any injuries, leading to a recall bias.

c) Respondents who are dissatisfied with their work or those who are proactive are more likely to complain about the pain which might lead to an over estimation to the problem.

d) This study was conducted on a convenience sampling basis and the results might not be representative of all taxi drivers in Malaysia but only focus on taxi drivers in Johor Bahru.

e) There is no temporal relationship between low back pain and associated factors as this is a cross sectional study.

f) Taxi drivers with chronic back pain may not be fit enough to work and might have left the occupation. Respondents who participate in this research most likely will be those who are fit to work, creating the healthy worker effect. This will reduce the apparent prevalence of low back among the taxi drivers in Malaysia.

g) Confounding factors such as previous back injury and underlying medical conditions can change the direction between the risk factors and low back pain.

### 5.3.2 Suggestions for the Future Research

This study conducted association between socio-demographic, physical workload, indirect work related factors and psychosocial workload with the low back pain. It is suggested that future researcher will try to identify the others factors that influence the low back pain. Next, as this research is mainly focused on the study of low back pain among the standard taxi driver at Johor Bahru, a future study can be conducted into other types of taxi such as rental taxi, pilot car rental, airport taxi and luxurious taxi to see whether or not any difference is found on the low back pain among these groups.

Additionally, it is also recommended in the future research that it would be better if there were more or different variables involved rather than four variables as been done in this study. The future researchers can expand the context or environment by implementing at other fields of organization or public sector.

## 5.4 Recommendations

### 5.4.1 Suggestions for Implementation

There is a need for everyone to realize that work is only one contributor to back pain but that back pain whatever its cause can, if poorly managed, can produce a devastating effect on an individual's ability to work. Based on the objectives and findings of this research, a few practicable recommendations can be made to reduce the prevalence of low back pain among taxi drivers. Their management team and administration could implement an interventional

program for its taxi drivers to reduce the prevalence of low back pain as being practiced in many developed countries. The intervention may contain of few aspects as administrative support, exercise programme, education and skills, research and development and change in behavior. In order for the above key parameters to be successful, it is important that each and every taxi drivers know the importance of lower back muscles.

### 5.4.2 An Overall Action Plan to Implement

#### 5.4.2.1 Assessments of their working condition

The assessment of working condition such as technical condition of the taxi, ergonomical seats in the context of this study is the responsibility of the management team or administrators. This is because the administrators, management team involved and safety representatives are better versed on the potential risk factors and working mechanisms of the drivers than anyone else. Most situations or assessments may just require just a few minutes of observation to identify ways to make the activity easier and less risky or less physically demanding. Advice and input from outside experts may be helpful in difficult or unusual cases, or to get the interventional programme started. To ascertain on the risk level involved with manual handling, it is recommended to engage a competent person to conduct HIRARC (Hazard Identification, Risk Assessment and Risk Control) to prioritize aspects that need to be tackled in view of financial and manpower limitations. Besides this, the management should also ensure that each driver is working for a stipulated time period in a week with adequate rests and breaks as recommended by the International Labour Organization (ILO). There should also be adequate medical benefits, permission to take leave and incentives available to avoid unnecessary psychosocial stressors for them.

#### 5.4.2.2 Physical exercise

The taxi drivers can be suggested to practice simple exercise techniques to strengthen their lower back muscles and it should be practiced continuously to enhance is effect. It is suggested that each exercise session should last for at least 30 to 45 minutes each session and recommended to be done twice weekly.

#### 5.4.2.3 Training on proper manual handling techniques

Education and training programmes on practicing correct manual handling techniques is necessary to reduce the prevalence of low back pain. A well designed training programme, implemented or conducted by qualified person should be organized in the transportation sector setting to provide continual education and training about ergonomic hazards and controls to all taxi drivers. Training should be updated and presented to them as changes occur frequently in their work settings, and be at a level of understanding that is appropriate for those individuals being trained. Taxi drivers should be trained on the available lifting guidelines as well.

#### 5.4.2.4 Mechanical aids in manual handling

Mechanical aids in assisting manual handling are advised to be provided if it is reasonably practicable to do so and the risks identified in risk assessment conducted earlier can be reduced or eliminated by this means. Mechanical aids can also be considered in other situations as well as they can improve productivity by producing efficient work as well as safety of the taxi drivers.

Many of the mechanical aids that are available in the market are simple, common sense modifications to equipment or procedures that do not require substantial time or resources to implement. When deciding on the mechanical aids to be obtained, a few factors need to be taken into consideration as below:

a) Availability of technical service such as repairs and service of the equipment
b) Availability of parts which warrants change or repair due to damage
c) Storage facility for the equipment within the unit, taking into consideration its size
d) Inclusion of charging unit and back up batteries
e) Remote activation capabilities of the device or equipment
f) Versatility of the equipment
g) Speed and noise level of the equipment

#### 5.4.2.5 Safe manual handling policy

Safe manual handling policy, which is also referred to as no-lift, zero-lift, minimal lift, no-manual lift, or lift-free in various countries is one part of a comprehensive approach to preventing musculoskeletal injuries to taxi drivers. A well written safe manual handling policy should be able to serve the functions below:

a) Provide a clear understanding of the elements of a safe manual handling and movement program
b) Define the roles and responsibilities for all affected taxi drivers
c) Provide a reference for review when questions arise.

Methods to be applied for transferring goods should be based on the size, amount and capacity available. This assessment is made to be more difficult in a critical setting, where the driver is doing manual handling without any assistance. Prior to enforcing a safe manual handling policy, the administrators must ensure that the proper mechanical or manual handling aids are made available to suit the taxi driven. A safe manual handling policy must be able to establish that the drivers will use the safest techniques to accomplish high-risk manual handling tasks, and that administrators will provide equipment and resources to support the driver's efforts. An effective safe manual handling policy is suggested to include the following elements:

a) Programme goals for reducing low back pain or other musculoskeletal pain or injuries among the taxi drivers
b) Improving manual handling quality
c) Review of low back pain or injuries to taxi drivers associated with manual handling.
d) Assessment of the driving or travelling environment to determine equipment requirements and potential workplace modifications.
e) Roles and responsibilities of the taxi drivers who perform manual lifting activities.
f) Manual handling and movement algorithms to classify goods based on transferring needs, and the type of equipment required to safely move and transfer the goods.

g) Definitions of content-specific training and education requirements for drivers affected with low back pain or other musculoskeletal injuries secondary to manual handling.
h) Resources available for lifting equipment, batteries, repositioning aids, and other supportive equipment that will be required to establish a safe manual handling and movement programme.
i) Specific maintenance and inspection schedules for lifting equipment and accessories, and tag out procedures for damaged equipment.

A well written safe manual handling policy will also assist in improving taxi drivers' morale, increase efficiency for the administrators, yield cost savings for healthcare facilities, and most importantly, provide better care and a safer working environment for the taxi drivers.

**5.4.2.6 Psychosocial Intervention**

Psychosocial workload is a form of stressor and known to increase the risk of low back pain based on the studies mentioned earlier. Findings of this study supports that the prevalence of low back pain is higher among those who are not satisfied with their work and have poor support at work and based on these findings, problems regarding psychosocial workload can be intervened if the administration implements a few measures as below:

a) Institution of stress management programs
b) Regular meetings and discussions to communicate feelings, gain support, and share innovative ideas
c) Flexibility and innovation by supervisors to create alternative job arrangements if the drivers found to be debilitated with musculoskeletal injuries.
d) Adequate staffing
e) Reasonable shift schedules for the drivers with reduction in prolonged time for driving to allow adequate time for sleep each day
f) Organized and efficient work functions and environment
g) Individual approaches such as relaxation exercises and biofeedback to relieve symptoms of stress until the sources are identified and evaluated
h) More flexibility and worker participation in scheduling
i) Scheduled rotation of driving to alternate short and long distance if applicable

## 5.5 Conclusion

The response rate for this study was 98.2% and the prevalence of low back pain among respondents was 49.1%. There was higher prevalence rate of low back pain among drivers who drive Wira taxi (55.5%) and those from Indian and other ethnicity groups (56.0%) but the association was not significant ($p>0.05$). The study also revealed no significant association between low back pain and underlying medical condition ($p>0.05$). The findings of this study supports the hypotheses that there are no significant difference in prevalence of low back pain among taxi drivers who does manual handling work which involves lifting while twisting, standing and walking, frequent bending, prolonged bending and frequent twisting ($p>0.05$). The findings of this study also supports the hypotheses that taxi drivers who work for long hours have higher prevalence of low back pain compared to those who do not work for long hours.

The study supports the hypotheses that taxi drivers who are not satisfied with their job have higher prevalence of low back pain compared to those who are satisfied with their job. The study also supports the hypotheses that taxi drivers who lack support at work have higher prevalence of low back pain compared to those who have support at work. The study revealed a high level of awareness among the taxi drivers on occupational low back pain.

Low back pain among taxi drivers is an important issue that needs to be given adequate attention to ensure that they serve productively within the transportation sector. Working as a taxi driver is physically demanding and frequently in need for manual handling of goods could aggravate and accelerate the problem of low back pain among this group of workers compared to those who are working in sedentary environment. Further studies are needed to compare the difference in prevalence of low back pain among taxi drivers and other group of drivers as well. To enhance the findings of this study, assessment of whole body vibration (WBV), which is a well-known risk factor for low back pain among drivers, need to be conducted as well.

As the study has revealed that taxi drivers are highly aware of low back pain problem, it would be easier for the management to implement any preventive and rehabilitative control measures to tackle the problem early and to expect a higher level of compliance to interventions among them. Adequate training, refresher courses and mechanical aids are important aspects that can be focused by the management to reduce the prevalence of low

back pain among the taxi drivers and any mode of training conducted need to be tailored to suit the driver's level of education to ensure it reaches the target.

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