

UNIVERSITI PUTRA MALAYSIA
***PREVALENCE OF UPPER LIMB DISORDERS AND ASSOCIATED
FACTORS AMONG WORKERS IN A MALAYSIAN PUBLIC
UNIVERSITY***

KARWAN MAHMOOD KHUDHIR

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**PREVALENCE OF UPPER LIMB DISORDERS AND ASSOCIATED
FACTORS AMONG WORKERS IN A MALAYSIAN PUBLIC
UNIVERSITY**

BY

KARWAN MAHMOOD KHUDHIR

**This thesis submitted to the School of Graduate Studies, Universiti Putra
Malaysia, in Partial Fulfillment of the Requirements for the
Degree of Master of Science**

February 2015

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DEDICATION

To the memory of my late father;

My loving mother;

My brothers, especially my elder brother, Juma;

and my sister

My supervisor, Dr. Ahmad Azuhairi Ariffin

My committee member, Dr. Hayati Binti Kadir

I dedicate this work with great love and appreciation for their kindness,

Encouragement and effort



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the Degree of Master of Science

PREVALENCE OF UPPER LIMB DISORDERS AND ASSOCIATED FACTORS AMONG WORKERS IN A MALAYSIAN PUBLIC UNIVERSITY

By

KARWAN MAHMOOD

July 2015

Chairman: Ahmad Azuhairi Ariffin, M.B.,B.S, M. Community Medicine
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Introduction: A cross-sectional study was conducted among workers in Universiti Putra Malaysia (UPM) from May to September 2014. The main objective of this study was to determine the prevalence and associated factors of upper limb disorders among Universiti Putra Malaysia workers. **Methodology:** Respondents were selected randomly and a total of 271 workers who met the inclusion criteria participated in this study. Data were collected by face-to-face interview and posture assessment method based on Standardized Nordic Questionnaire (SNQ), Job Content Questionnaire (JCQ), and Rapid Upper Limb Assessment (RULA) method. Statistical analysis of data was carried out by using SPSS version 21. **Result:** The overall prevalence of ULDs among UPM workers was 67.2% and the highest prevalence by body parts were neck 147 (54.2%). Chi square test shows that 10 factors were significantly associated with ULDs; age ($\chi^2=25.925$, $df=1$, $p<0.001$), smoking ($\chi^2=19.728$, $df=1$, $p<0.001$), BMI ($\chi^2=169.643$, $df=1$, $p<0.001$), physical activity ($\chi^2=124.662$, $df=1$, $p<0.001$), duration of employment, ($\chi^2=17.567$, $df=1$, $p<0.001$), awkward posture ($\chi^2=75.640$, $df=1$, $p<0.001$), control at work ($\chi^2=34.775$, $df=1$, $p<0.001$), psychological demand ($\chi^2=64.938$, $df=1$, $p<0.001$), social support ($\chi^2=37.736$, $df=1$, $p<0.001$), and job satisfaction ($\chi^2=95.817$, $df=1$, $p<0.001$). Multiple logistic regression test showed the significant risk factors for ULDs were obese (OR=19.472, 95%CI: 5.396-70.273), infrequent physical activity (OR=5.756, 95%CI: 1.504-22.028), medium and very high RULA risk level (OR=12.242, 95%CI: 3.617-41.435). **Conclusion:** Among UPM workers the overall prevalence of upper limb disorders was high and significantly associated with age, smoking, BMI, physical activity, duration of employment, awkward posture, control at work, psychological demand, social support, and job satisfaction. In order to reduce the risk of ULDs among UPM workers effective prevention strategies are required.

Keywords: *Upper Limb Disorders, Prevalence, Workers, Public University, Malaysia*

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan penganugerahan Ijazah Master Sains

**SEBARAN GANGGUAN ANGGOTA BADAN ATASAN DAN FAKTOR
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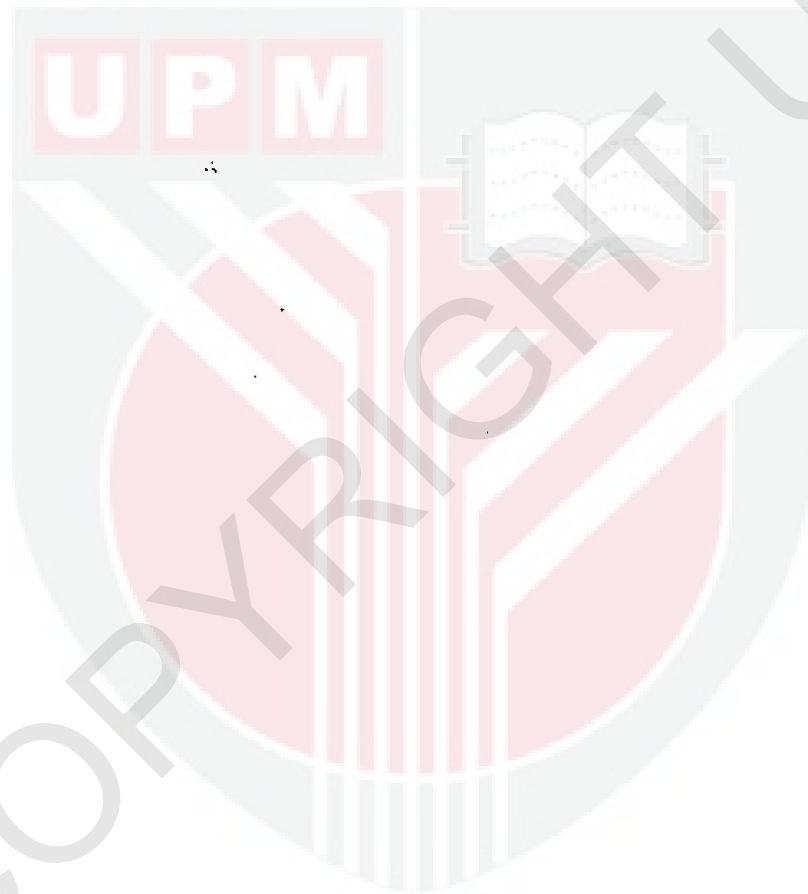
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Pengenalan: Satu kajian keratan-rentas telah dijalankan di kalangan pekerja-pekerja di Universiti Putra Malaysia (UPM) dari Mei hingga September 2014. Objektif utama kajian ini ialah untuk menentukan kelaziman dan faktor-faktor berkaitan penyakit-penyakit anggota badan bahagian atas di kalangan pekerja-pekerja Universiti Putra Malaysia. **Metodologi:** Responden telah dipilih secara rawak dan sejumlah 271 orang pekerja yang memenuhi kriteria kemasukan telah mengambil bahagian dalam kajian ini. Maklumat yang dikumpulkan adalah melalui temuramah dan kaedah taksiran postur dengan menggunakan borang soal selidik *Standardized Nordic Questionnaire (SNQ)*, *Job Content Questionnaire (JCQ)*, dan kaedah taksiran *Rapid Upper Limb Assessment (RULA)*. Analisis data berstatistik telah dijalankan menggunakan SPSS versi 21. **Keputusan:** Keseluruhannya, kelaziman ULDs atau penyakit bahagian atas anggota badan di kalangan pekerja-pekerja UPM ialah (67.2%). Gejala masalah otot rangka yang paling umum pada anggota badan adalah bahagian leher 147 (54.2%). Ujian Chi kuasa dua menunjukkan bahawa 10 faktor berkait rapat dengan ULDs secara signifikan; usia ($\chi^2=25.925$, $df=1$, $p<0.001$), merokok ($\chi^2=19.728$, $df=1$, $p<0.001$), BMI ($\chi^2=169.643$, $df=1$, $p<0.001$), aktiviti fizikal ($\chi^2=124.662$, $df=1$, $p<0.001$), tempoh masa pekerjaan ($\chi^2=17.567$, $df=1$, $p<0.001$), postur tubuh yang janggal ($\chi^2=75.640$, $df=1$, $p<0.001$), kawalan di tempat kerja ($\chi^2=34.775$, $df=1$, $p<0.001$), tuntutan psikologi ($\chi^2=64.938$, $df=1$, $p<0.001$), sokongan social ($\chi^2=37.736$, $df=1$, $p<0.001$), dan kepuasan kerja ($\chi^2=95.817$, $df=1$, $p<0.001$). Ujian regresi logistik pelbagai menunjukkan faktor-faktor risiko ULDs yang signifikan iaitu kegemukan (OR=19.472, 95%CI: 5.396-70.273), aktiviti fizikal jarang (OR=5.756, 95%CI: 1.504-22.028), aras risiko RULA yang sederhana atau tinggi (OR=12.242, 95%CI: 3.617-41.435). **Kesimpulan:** Di kalangan pekerja-pekerja UPM, keseluruhan kelaziman penyakit-penyakit anggota badan bahagian atas adalah tinggi dan berkait secara signifikan dengan usia, merokok, BMI, aktiviti

fizikal, tempoh bekerja, postur janggal, kawalan di tempat kerja, tuntutan psikologi, sokongan sosial dan kepuasan berkerja. Untuk mengurangkan risiko ULDs di kalangan pekerja-pekerja UPM, strategi-strategi pencegahan efektif amatlah diperlukan.

Kata Kunci: Gangguan Anggota Badan Atas, Prevalen, pekerja, Universiti awam Malaysia



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In The Name of Allah, the Most Beneficent, the Most Merciful

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I certify that a Thesis Examination Committee has met on 1 July 2015 to conduct the final examination of Karwan Mahmood Khudhir on his thesis entitled "Prevalence of Upper Limb Disorders and Associated Factors among Workers in a Malaysian Public University" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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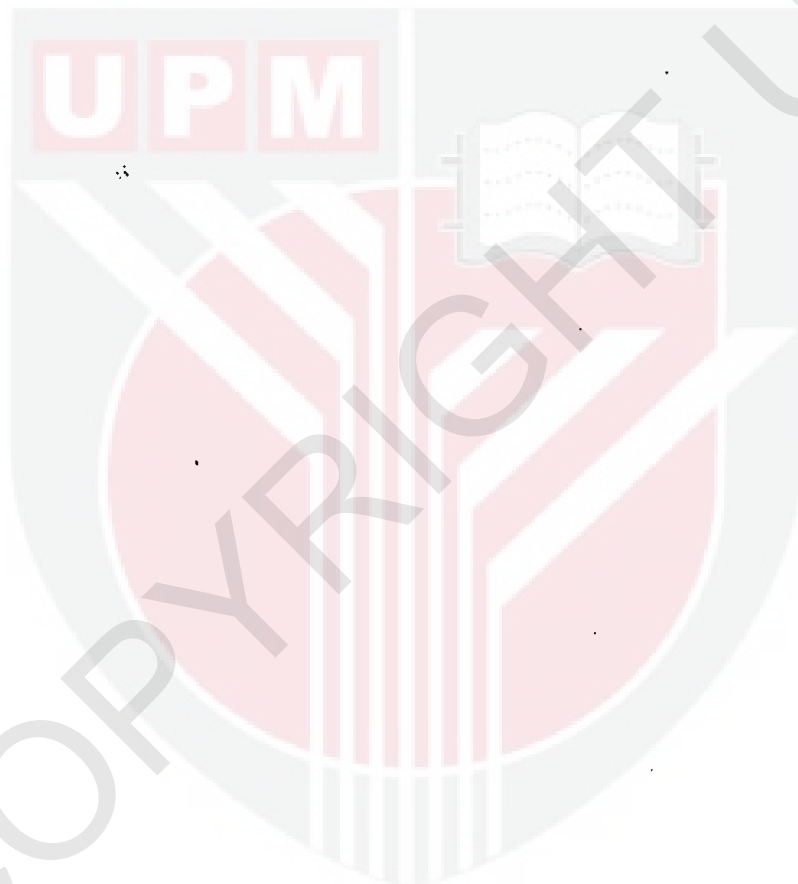
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LIST OF ABBREVIATIONS

x^2	Chi-Square Test
BMI	Body Mass Index
COPSOQ	Copenhagen Psychosocial Questionnaire
CTDs	Cumulative Trauma Disorders
DOL	U.S. Department of Labor
EG	Electronic Goniometry
EMG	Electromyography
et al,	And other
FIOSH	Finnish Institute for Occupational Safety and Health
JCQ	Job Content Questionnaire
QPS NORDIC	General Nordic Questionnaire
HARBO	Hands Relative to the Body
HSE	Health and Safety Executive
LMM	Lumbar Motion Monitor
LUBA	Loading on the Upper Body Assessment
MSD	Musculoskeletal Disorders
N	Sample size
NRC	National Research Council
NSP	Neck and/or Shoulder Pain
OSHA	Occupational Safety and Health Administration
OOS	Occupational Overuse Syndrome
PAQ	Position Analysis Questionnaire
PEO	Portable Ergonomic Observation
PPR	Prevalence proportion ratio
RM	Ringgit
RSI	Repetitive Strain Injury
RULA	Rapid Upper Limb Assessment
REBA	Rapid Entire Body Assessment
QEC	Quick Exposure Check
Sd	Standard deviation
SGH	Singapore General Hospital
SNQ	Standardize Nordic Questionnaire
SPSS	Statistical Package for Social Science
TRAC	Task Recording and Analysis on Computer
ULDs	Upper Limb Disorders
UPM	Universiti Putra Malaysia
USA	United States of America
VDU	Visual Display Unit
WHO	World Health Organization
WMSD	Work Related Musculoskeletal Disorders
WRULDs	Work Related Upper Disorders

CHAPTER 1

INTRODUCTION

1.1 Background of the study

1.1.1 Musculoskeletal Disorders (MSDs)

Till date, musculoskeletal disorders (MSDs) are increasing among employees worldwide as one of the most prevalent work-related health topics, incurring quite a lot of costs and significantly affecting quality of life. Musculoskeletal disorder (MSD) defined as an injury or disorder of the muscles, nerves, tendons, joints, cartilage and spinal discs (Bureau, 2006). A musculoskeletal disorder is not quite inevitable in an individual's life expectancy (Meleger & Krivickas, 2007; Damsgard et al., 2010). There has been a rapidly increasing number of people who are suffering from MSDs worldwide, especially in developed countries. It can increase due to bad work conditions and can lead to severe and debilitating symptoms such as pain, numbness, and tingling; decrease workers' ability to produce; lost time from work; temporary or constant inability; incapacity to implement job tasks; and an increase in workers' compensation costs. In the United States, Canada, Finland, Sweden, and England, musculoskeletal disorders cause more work absenteeism or disability than any other group of diseases (Punnett & Wegman, 2004).

Today, the cost of work-related musculoskeletal disorders (WRMSD) is one of the highest costs among health care issues affecting the community. For example, in the United States, National Occupational Research Agenda (NORA) declared that, the cost for work-related musculoskeletal disorders (WRMSD) is one of the main parts of the cost of occupational illness. The average cost related to WMSD annually is about US\$13- US\$54 billion (Marras, Cutlip, Burt , & Waters, 2009). Also, the awareness of MSDs in the UK has increased over recent years and in 2011/12 around half of the reported 439 000 cases out of a total of 1,073 000 for all work-related illnesses are associated with MSDs (HSE, 2013). Work-related musculoskeletal disorders (WRMSDs) is said to be responsible for about 12.3 million days of absence from work annually, their impact on the health of the workforce and the economy is clearly highly significant (Lock & Colford, 2005).

Work-related upper limb disorders are also called Cumulative Trauma Disorders (CTD's), Repetitive Motion Illnesses (RMI's), and Repetitive Strain Injuries (RSI's) (Silman & Newman, 1996). The World Health Organization (WHO) characterizes WRMDs as multi-factorial to indicate the inclusion of biomechanical, organizational, psychosocial, and sociological risk factors (Kulin & Reaston, 2011).

The economic loss due to WRMDs affects not only to the individual but also the organization and society as a whole (Kemmlert, 1994). Musculoskeletal disorders cause adverse effect such as working days lost, disability of workers (Tsauo, Liang, Jang, & Du, 2009) and wasting money (Neumann, 2004; Punnet & Wegman, 2004). It is the most prominent work-related health of modern industrialized nations

(Finneran & O'Sullivan, 2010). The major forms of musculoskeletal disorders that account for significant work-related morbidity include upper limb disorders and low back pain (Pearce et al., 2004). There is no doubt that musculoskeletal disorders of the low back and upper extremities are an important and costly national health problem. In 2001, the U. S. National Research Council Musculoskeletal disorders represented about 70 million hospital visits in the United States yearly, and an estimated 130 million aggregate health awareness experiences including outpatient, health facility, and emergency room visits (NRC, 2001).

WMSDs risk factors are identified to include work place activities such as heavy load lifting, repetitive tasks and static work posture, awkward posture (Haynes & Williams, 2008), while socio-demographic characteristics and psychosocial factors are also known to be important predictive variables (d'Errico et al., 2010). The main work activities attributed by workers as causing their musculoskeletal disorder, or making it worse, was manual handling, awkward or tiring positions and keyboard work (HSE, 2014).

Malaysia is one of the rapidly industrializing countries in the Asian region and it also faces challenges of the risk of MSDs. This is due to lack of attention being paid to safety awareness in the workplace (Lai, 2008). The major risk factors for MSDs are long period of service, awkward working postures, static posture, and psychosocial factors (CCOHs website, 2014). Since these factors contribute to the risk of MSDs, therefore this project was conducted to reduce the risk of musculoskeletal disorders by providing awareness to the UPM workers and giving them information about how to protect themselves from musculoskeletal disorders (MSDs).

1.1.2 Upper Limb Disorders (ULDs)

ULDs are very common and are a major cause of disability, sickness absence, decrease productivity and health care usage in both developed and developing countries (Picavet & Schouten, 2003). In England, a report by the Labor Force Survey shows upper limb disorder and neck conditions cause 3.8 million wasted working days yearly (Walker-Bone, Palmer, Reading & Cooper, 2003). According to HSE (2013), ULDs are conditions which affect the muscles, tendons, ligaments, nerves or other soft tissues and joints in the upper limbs such as the neck, shoulders, arms, wrists, hands and fingers. ULDs have various and interrelated risk factors, both occupational and non-occupational, for instance duration of employment, obesity, smoking, and psychosocial factors (Akrouf, Crawford, Al-Shatti, & Kamel, 2010; Bongers, Ijmker, Van den Heuvel & Blatter, 2006; Borle, Gunjal, Jadhao, Ughade & Humne, 2012; Moreira-Silva, Santos, Abreu, & Mota, 2013).

The upper limb disorders (ULDs) comprise a wide range of musculoskeletal issues and peripheral neural deficits (particularly neck shoulder pain (NSP) and Carpal Tunnel Syndrome (CTS) (Hutson, 1997; Silman & Newman 1996). These issues are quiet common globally as of now and will most presumably be much more common in the future for example, because of the increment in the utilization of computers and vibrating instruments (Mody & Woolf, 2003). There are a number of common terms which are also in use to describe the same conditions in different countries (Chatterjee, 1987) of which the most well known is Repetitive Strain Injuries (RSI),

in Canada and the UK, Occupational Overuse Syndrome in Australia, Cumulative trauma Disorders (CTD) in the USA (Yassi, 1997). ULD has become one of the main issues in the global health care sector. It represent more than 67% of all work-related injuries, and cost over US\$110 billion annually for medical expenses, lost wages, and productivity (Abelson & Abelson, 2003).

Review of priorities in occupational health research in Germany, UK, and USA all concluded that ULDs is a major problem among people in workplaces (Klussmann, Gebhardt, Liebers, & Rieger, 2008; HSE, 2014; Rosenstock., 1996). In USA every year about 500,000 people affected ULDs (Tanaka, Petersen, & Cameron, 2001). The most common MSDs which exist in Europe and in industrialized countries are those of the upper limb, as seen in the report given by Eurostat (2004), which states that 45% of work-related health problems are related to the upper limb. In Brazil there is a high increase in the demand for health care services among working-class individuals which has also led to an increase in health expenses, work absenteeism early retirements; in 2005 the aggregate cost of such ULDs had reached US\$ 170 million (Cunha, Blank & Boing, 2009). In Malaysia as well, a study was carried out among office workers by Rahman and Atiya (2009); they found that prevalence of ULDs was 33.0%. Due to the negative effects of upper limb disorders in both developed and industrially developing, review and study of ULDs is very important, in order to reduce and prevention of this problem in the work place (Chamani et al., 2012).

1.2 ULDs among univesrity workers

In university Putra Malaysia (UPM), the workforce comprises of employees with different job descriptions such as (lecturers, administrative staff, drivers and cleaners), their daily activities require a monotonous routine which involves highly repetitive work, static work posture and awkward posture which can affect the neck, shoulders, elbows and other body parts. The university workers carry out various daily activities according to individual areas of responsibility and job description. For instance, the academic staff does not only involve teaching students, but also prepare lessons, assessing students' coursework, setting and marking examinations, undertaking personal research projects and actively contributing to the institution's research profile, writing up research and preparing it for publication, supervising student's research activities, carrying out administrative tasks related to the department (such as student admissions, and also, at a senior level this may include the role of head of department). Furthermore, the administrative staff of UPM are exposed to prolong use of computer which eventually predisposes the workers to static and awkward body posture, prolong sitting and repetitive hand or finger movement especially while operating the keyboard and mouse; this is because, the Malaysian government has implemented the use of computer in most daily tasks especially among office workers (Mansor, Zakaria and Dawal, 2013).

Many activities related to daily life and occupation may result in episodes of neck pain or upper limb disorders; however, none is more consistently implicated than driving a motor vehicle for extended periods of time (Kelsey, 1975). Professional drivers can be defined as those workers whose main task is to operate a motor vehicle in traffic conditions. This includes chauffeurs and bus, truck, tram, trolley,

taxi, and ambulance drivers (Belkic, 2000). The UPM bus drivers total about 70 drivers, 69 males and 1 female. Every day, bus services start from 7:00 am until 11:30 pm; they drive coaster buses and work on rotation every 2 to 3 hours. UPM bus drivers must successfully balance the student's safety, UPM operating regulations and time schedule. Because of this, drivers are exposed to many risk factors such as prolonged sitting and motor vehicle driving, tight running schedules, reduced rest breaks, rotating shift patterns, traffic congestion, and the sedentary nature of job (Borle et al., 2012).

In addition, the work of cleaning has an important role in all institutions and public environments as it enhances worker/public feeling of health and well-being. Clean work areas also promotes productivity and quality of output. Unclean environments can lead to accidents, and without cleaning there is a greater risk of exposure to irritants which can lead to problems such as allergic reactions and respiratory ailments. The goal of cleaning can thus be described as contributing to the maintenance of hygienic work and public environments. UPM is a large university with a large population that consumes and disposes high volume of material resources during daily working activities, which can become a major source of environmental pollution. Most of the UPM cleaners are involved in full time work, and mostly performed alone but, sometimes they work in groups or teams, and also, many of them have low level of education. Their core task can be simply described as the removal of dirt, dust, marks, stains and other extraneous materials from surfaces; therefore, they are exposed to prolong static muscular activity, overuse of muscle capacity, repetitive movement, bending and twisting of their upper limbs.

Hence, exposure to these kinds of activities by UPM staff can pose as a threat to their health and well being as it increases their risk of developing upper limb disorders. This is because these kinds of activities require manual operations which could involve highly repetitive work, overexertion, forceful exertion and awkward posture which can affect the neck, shoulders, elbows, arms, and hands/wrists. Consequently, previous studies have also revealed that psychosocial factors are significantly associated with ULDs. For instance, study Malaysian office workers which reported significant association between ULDs in shoulders and decision latitude (Mahmud et al., 2014). Yet again, a study conducted among Malaysian bus drivers, indicated that psychosocial factors has influence on ULDs (Anjomshoae and Rani, 2013).

1.3 Measure of MSDs

The risk factors of MSDs in the work place were identified and evaluated by using ergonomic risk assessment method, most for assessment of the upper regions of the body such as the back, neck, shoulder, arms and the wrists. The methods have been categorized under three main headings as been commonly used by previous researchers which are; (1) simple checklist (self-reports from workers); (2) observational techniques; (3) direct measurements (using monitoring instruments) (David, 2005).

Simple checklist is a self-evaluation questionnaire which can be used to identify ULDs and its association with workplace exposure among workers. These methods have the apparent benefits of being straightforward to use, applicable to a wide range

of working situations and appropriate for surveying large numbers of subjects at comparatively inexpensive cost. Nonetheless, a major problem with these methods is that worker perceptions of exposure have been found to be inexact and erratic (Balogh et al., 2004). Furthermore, difficulties with self-reports may stem up from varying levels of worker literacy, comprehension or question interpretation (Spielholz et al., 2001).

Moreover, observational methods that may be further subdivided between (a) simpler techniques, is a method which is used to evaluate working postures by an observer such as Rappid Upper Limb Assessment (RULA), Rapid Entire Body Assessment (REBA), Quick Exposure Check (QEC), Loading on the Upper Body Assessment (LUBA); (b) advanced techniques such as Task Recording and Analysis on Computer (TRAC), Portable Ergonomic Observation method (PEO), Hands Relative to the Body (HARBO), every one of these methods record data either on videotape or by computer.

Direct measurement (instrumentation method) can offer large quantities of highly accurate data on a range of exposure variables such as Electronic goniometry, Lumbar Motion Monitor (LMM) and electromyography (EMG) which involves electricity to detect the health of the muscle. Though, direct measurement systems require considerable initial investment to procure the equipment, as well as the resources needed to cover the costs of maintenance and the employment of highly trained and skilled technical staff to confirm their effective operation (Li, & Buckle, 1999).

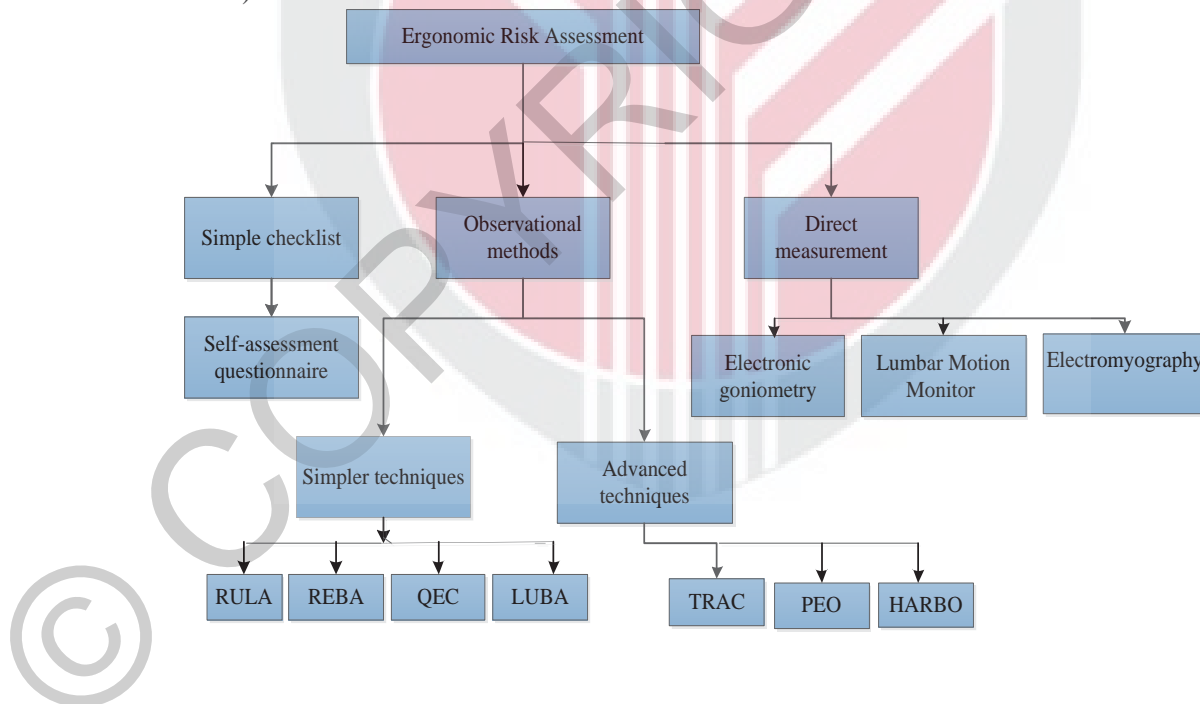


Figure 1.1 Types of MSD measurement

(Source: David, 2005).

1.4 Measure of psychosocial factors

Assessment of occupational psychosocial factors and their impact on the health and safety of workers is an immensely relevant and topical subject (Cox and Rial-González 2002; Wright and Cropanzano 2000), which has been officially recognised by various national governments (Delaunois et al. 2002; D’Hertefelt 2002). Psychosocial factors include exposures thought to impact on the well-being and health outcomes of workers (e.g. aspects of work content, work-group, supervision, organisational conditions). There are several methods used to assess psychosocial factors. The methods are divided into 3 categories such as self-reported questionnaires, observational approaches and biological measures (Figure 1.2). It has conventionally been used by earlier reviewers (Tabanelli et al., 2008).

Self-reported questionnaires usually contain questions regarding presence of risk factors in the work environment and are widely used since they are inexpensive and easy to analyze. An intrinsic limitation of self-reported questionnaires is that they provide “subjective” measures, representing the occupational stress perceptions of individual workers, such as Copenhagen Psychosocial Questionnaire (COPSOQ), General Nordic Questionnaire (QPS NORDIC) and Job Content Questionnaire (JCQ) (Tabanelli et al., 2008).

Objective assessments are based on observational approaches such as Position Analysis Questionnaire (PAQ) and Finnish Institute for Occupational Safety and Health (FIOSH) including archival data (e.g. sickness leave, performance measures, accidents), and biological measures (of adrenaline, cortisol values, etc). However, they are much more costly to administer (Frese and Zapf 1988; Leitner and Resch 2005; Kompier 2005).

Among these methods, Job Content Questionnaire (JCQ) will be used to assess psychosocial factors among UPM workers; since it is inexpensive and easy as to use as compared to observational instruments, observational instruments which are more expensive and time-consuming and generally require expert administration (Schaufeli and Kompier 2001).

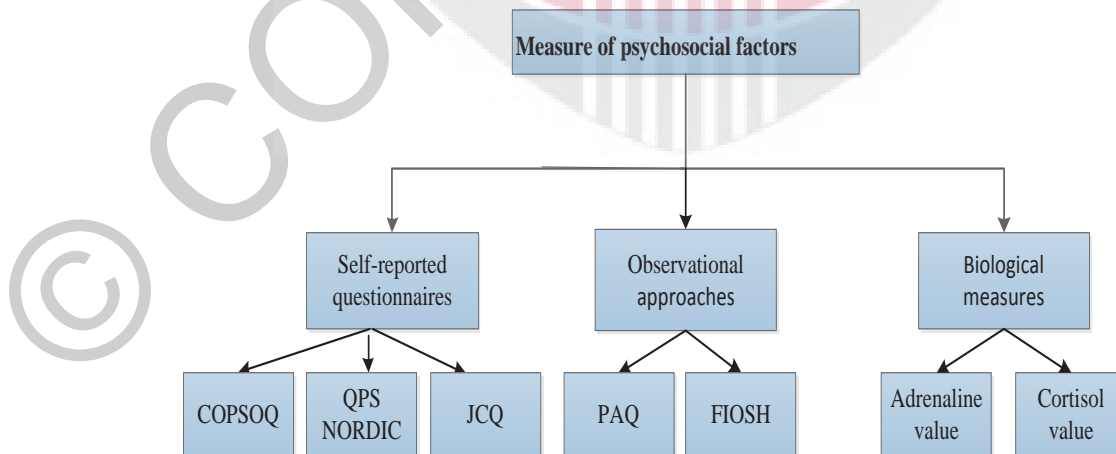


Figure 1.2 Types of psychosocial factors measurement

(Source: Tabanelli et al., 2008).

1.5 Problem Statement

Work-related upper limb disorders are among the most common causes of disability and represent a burden on society in both direct costs to the health care system and indirect costs through loss of work and productivity (Côté et al., 2009). In the current era, employment opportunities are on the increase and also high financial turnover is expected by developing nations due to global technological advancement and industrialization. Work-related upper limb disorder is a part of musculoskeletal disorders (MSD) that are related to ergonomic problems.

In a university, different job positions exist; academicians, administrators, cleaners, bus drivers, and secretaries as well as various levels of support staff. In the different positions, workers spend much time on their work which requires standing and sitting for a long time to teach, using computers, driving, lifting heavy loads and lots more. Due to these activities which the workers engage in, the prevalence of WURLDs is on the increase. Currently, many organizations only seek to increase their profit without considering the health condition of their workers because many have failed to understand that the comfort of their workers will lead to a high level of productivity on the part of the employees which will in turn result in increased profitability for the organization.

According to the United States Bureau of Labor statistics, in 2005 and 2011, there were 2.7 cases of injuries or illnesses involving employment in universities, colleges, and professional schools. Upper limb disorders (ULDs) were found that have considerable impact on the health of the workers. Based on the factsheet of the European Agency for safety and health at work, ULDs are the most common form of occupational disease in Europe, accounting for more than 45% of all occupational diseases (Eurostat, 2004). Based on a household survey done in 1995, an estimated 506 000 people were suffering from a musculoskeletal disorder which affected the upper limbs or neck in Great Britain. An estimated minimum 4.2 million working days were lost in Britain due to musculoskeletal disorders affecting the upper limbs or neck in 1995, with each affected employee taking, on average, 13 days off work (Hodgson, Clegg, & Elliott, 1998) Costs to employers of musculoskeletal disorders of the upper limbs or neck were estimated to be at least £200 million.

Computers are globally used in offices these days. Reports of unfavorable effects of computer use have received reasonable media attention (Freeman, 2002) and in cross sectional studies among working population in the European Union it was shown that about one out of three workers complained of constant or continuous pain around the wrist-hand or neck-shoulder area in the last 12 months (Andries, Smulders, & Dhondt, 2002). This problem calls for consideration not only because of individual suffering, but because addressing this problem is the key to increased organizational productivity, better quality of life and social conduct of workers. Therefore, this work-related problem should be taken serious so that prevention measures can be taken by organizations as these work-related ULDs can be prevented therefore it is important to identify intervention for reducing ULDs.

Numerous studies have been conducted to examine the relationship which exists between types of occupation and musculoskeletal problems. These studies were more focused on blue collar workers (Yazdani, 2009) and health care workers, especially

nurses and physicians (Amin, Nordin, Fatt, Noah & Oxley, 2014). Even though, some researches have documented the prevalence of MSDs among university workers (Siti, 2008; Wong, 2011), there is limited research regarding the university populations in Malaysia, especially association between psychosocial risk factors and ULDs among university workers. Thus, the present study was carried out among UPM workers to explore the prevalence of ULDs and to investigate the association between socio-demographic, individual, occupational and psychosocial risk factors and prevalence of ULDs among the UPM working population, in Malaysia. On the other hand, ULDs have adverse effects on the quality of life. In this sense, the present study was carried out to determine the prevalence of ULDs and its associated factors.

1.6 Significance of the Study

UPM as one of Malaysia's premier universities and a leading research university among the country's five research universities has a workforce that includes employees with different areas of specialization (lecturers, administrators, drivers, cleaners, and thousands of support staff) who may be exposed to a number of occupational, personal and psychosocial factors which could result in (ULDs). In Malaysia, studies about ULDs and risk factors among university workers are limited, especially in relation to psychosocial factors. The study on the prevalence of ULDs among UPM workers will help to identify the factors that contribute to the existence of this problem in this population. This study hopefully can provide baseline information to the management of various institutions and work places to develop intervention or preventive measures in relation to ULDs to safeguard the employees' safety, health and welfare in the workplace. This research is in line with the Malaysia governmental policy to promote the occupational safety and health according to the Occupational Safety and Health Act (OSHA, 1994). According to OSHA, it is the responsibility of both employers and employees to safeguard the safety, welfare and health of employees. The result of this study would highlight the nature of upper limb disorders among workers of Universiti Putra Malaysia and its work-related factors, which may play an important role in creating a more conducive working environment. From the perspective of public health, the information from this study could contribute to reducing the burden of ULDs among UPM workers. This will have important implications both for gaining a greater understanding about the aetiology of ULDs and for providing health care provision and management.

1.7 Objectives of the Study

1.7.1 General Objective

The aim of this study is to determine the prevalence of Upper Limb Disorders (ULDs) and associated factors among UPM workers.

1.7.2 Specific Objectives

- 1) To determine the socio-demographic factors (age, gender, ethnicity, level of education, type of job, income), individual factors (smoking, BMI, exercise), occupational factors (duration of employment, static work posture, awkward posture) and psychosocial factors (control at work, psychological demand, social support, job satisfaction) among UPM workers.
- 2) To determine the prevalence of Upper Limb Disorders (ULDs) among UPM workers.
- 3) To determine the association between Upper Limb Disorders (ULDs) and socio-demographic factors, individual factors, occupational factors and psychosocial factors.
- 4) To determine predictors of upper limb disorders (ULDs).

1.8 Hypotheses

H1: There is significant association between some selected socio-demographic (age, gender, ethnicity, education level and income) factors and ULDs among UPM workers.

H2: There is significant association between some selected individual factors (smoking, obesity, exercise) and ULDs among UPM workers.

H3: There is significant association between some selected occupational factors (duration of employment, static work posture, awkward posture) and ULDs among UPM workers.

H 4: There is significant association between some selected psychosocial factors (control at work, psychological demand, social support and job satisfaction) and ULDs among UPM workers.

1.9 Conceptual framework

Conceptual framework (Figure 1.3) shows the aspects associated to exposure of multi-factorial risk factor that is related with ULDs. In this study, it focused on the association among the socio-demographic, individual, occupational, and psychosocial factors that affects the upper limb of body parts among UPM workers.

1.9.1 Dependent variable

The dependent variable of this study is ULDs and it is categorized into neck, shoulders, elbows, arm, wrist/ hand. The Standardized Nordic Questionnaire (SNQ) was used to obtain prevalence of ULDs in any part of the body.

1.9.2 Independent variable

The independent variables are socio-demography (age, gender, ethnicity, level of education, type of work and income), individual factors (smoking, BMI and exercise) occupational factors (duration of employment, static work posture, awkward posture) and psychosocial risk factors (control at work or decision latitude, psychological demand, social support and job satisfaction). The association between ULDs and socio-demographic factors, individual factors occupational factors and psychosocial risk factors were studied in this study.

1.9.2.1 Socio-demographic factors

A number of previous reviews showed significant association between ULDs and some selected socio-demographic factors such as age (Nurrul, 2008; Rahman & Atiya, 2009), gender (Chiu et al., 2002; El Keshawi, 2008), ethnicity (Raanaas & Anderson, 2008), level of education (Mahmud, Kenny, Zein & Hassan, 2011), and income (Siti, 2012). At the same time, some studies showed that there was no association between the socio-demographic factors and ULDs (Attarchi, Raeisi, Namvar and Golabadi 2014; Darwish and Al-Zuhair, 2013). General questionnaire were used to obtain information about socio-demographic factors of UPM workers such as (age, gender, ethnicity, level of education and income).

1.9.2.2 Individual factors

Several studies showed significant association between ULDs and some selected individual factors such as smoking (Akrouf, Crawford, Al-Shatti and Kamel, 2010), BMI (Borle et al., 2012) and exercise (Kietrys, Galper and Verno, 2007). On the other hand, some studies reported that these factors were not related to ULDs (Mirmohammadi, 2012; Leroux et al., 2006).

1.9.2.3 Occupational factors

A lot of of previous studies found significant association between ULDs and various occupational factors such as; type of job (Ostergren et al., 2005), duration of employment (Chiu et al., 2002), static work posture ((El Keshawi, 2008; Yue et al., 2012) and awkward posture (Cangnie et al., 2007). However, some studies showed no association between occupational factors and ULDs (Raanaas and Andreson, 2008; El-Bestar, El-Mitwalli and Khashaba, 2011).

1.9.2.4 Psychosocial factors

Previous studies suggested significant association between ULDs and some selected psychosocial factors such as control at work or job decision latitude (Park and Jang, 2010), psychological demands (Alexopoulos et al., 2004), social support (Sim et al., 2006), and job satisfaction (Woods, 2005). Even though, a number of studies reported that these factors were unrelated to ULDs (El-Bestar et al., 2011; Kim et al.,

2013). The psychosocial factors were obtained using Job Content Questionnaire (JCQ).

The components of the conceptual framework includes;

- The independent variables (socio-demographic factors, individual factors, occupational factors and psychosocial factors) are presented in the long rectangles with each rectangle representing each independent variable. The boldly written factors in the long rectangles were the selected factors that were studied, whereas, the lightly written factors were not studied. Directly above the independent variables in short rectangles and linked by dotted lines, are the various questionnaires and methods to measure each independent variable.
- The dependent variable (ULDs) is presented in a square directly below the independent variables linked by bold full lines and an arrow (which also denotes associations between the independent variables and the dependent variable); also to its right side, linked by a dotted line, is the (SNQ) questionnaire to measure ULDs.
- The association between ULDs and socio-demographic factors, individual factors occupational factors and psychosocial risk factors were studied in this study.

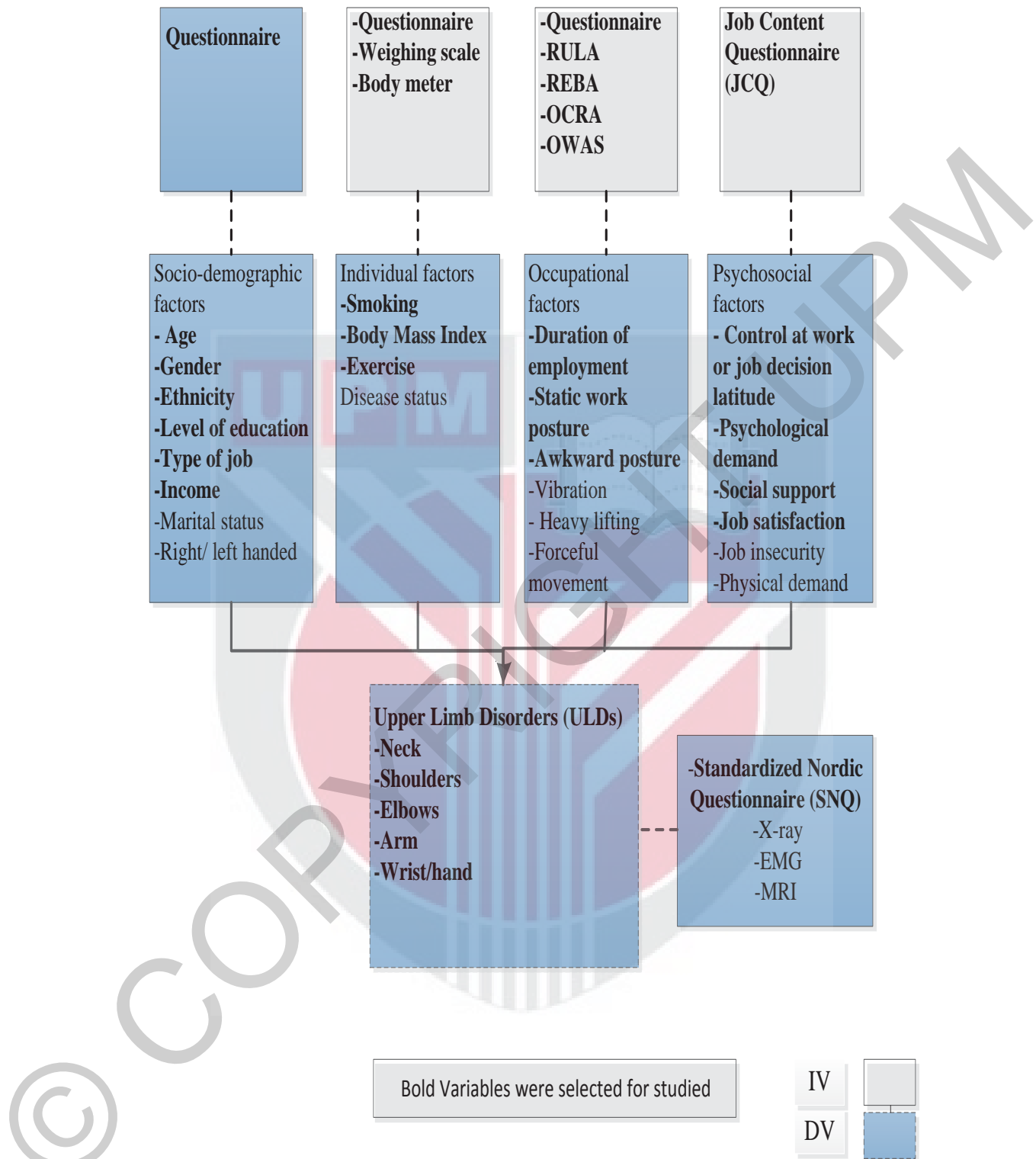


Figure 1.3 Conceptual Framework of upper limb disorders and associated factors among UPM workers

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