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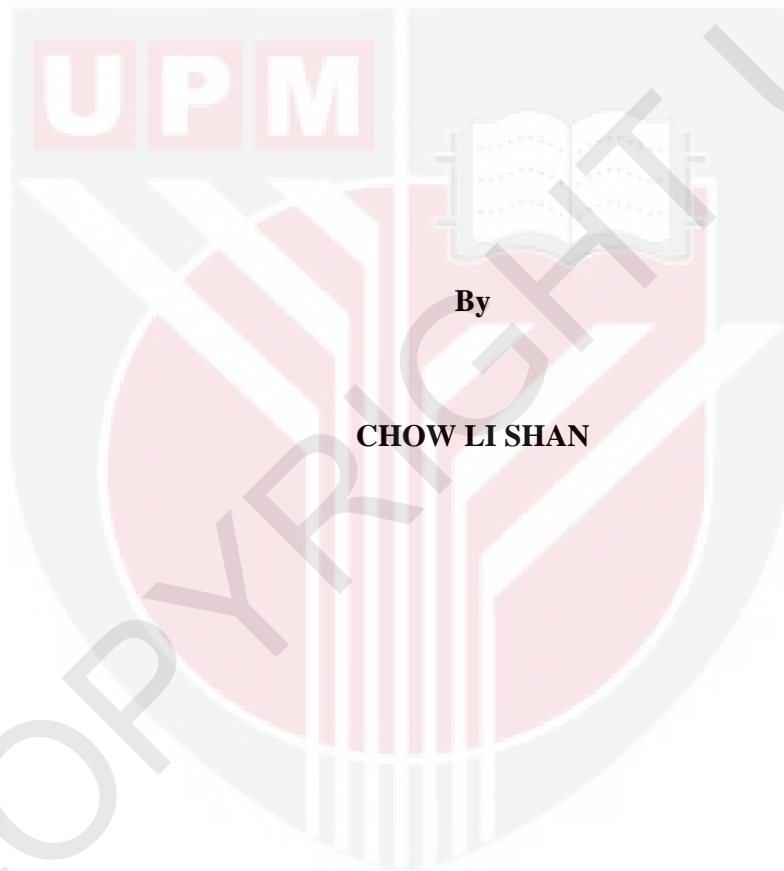
***FACTORS ASSOCIATED WITH WORK-RELATED NECK, SHOULDER  
AND LOW BACK PAIN AMONG RUBBER TAPPERS AT FELDA  
SETTLEMENT IN JEMPOL, NEGERI SEMBILAN, MALAYSIA***

**CHOW LI SHAN**

**FPSK(m) 2011 66**



**FACTORS ASSOCIATED WITH WORK-RELATED NECK, SHOULDER AND  
LOW BACK PAIN AMONG RUBBER TAPPERS AT FELDA SETTLEMENT  
IN JEMPOL, NEGERI SEMBILAN, MALAYSIA**



By

**CHOW LI SHAN**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,  
in Fulfillment of the Requirements for the Degree of Master of Science**

**December 2010**

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

**FACTORS ASSOCIATED WITH WORK-RELATED NECK, SHOULDER,  
LOW BACK PAIN AMONG RUBBER TAPPERS AT FELDA SETTLEMENT  
IN JEMPOL, NEGERI SEMBILAN, MALAYSIA**

By

**CHOW LI SHAN**

**December 2010**

**Chairman: Associate Prof. Mohd Yusoff Bin Adon, PhD**

**Faculty: Medicine and Health Sciences**

A cross-sectional study among rubber tappers was conducted to determine the association between risk factors namely personal characteristics, ergonomic and psychosocial factors with work-related musculoskeletal symptoms (WMSS). Simple random sampling method was adopted and total of 419 rubber workers in each FELDA's scheme at Jempol, Negeri Sembilan participated in this study. Data was collected through face to face interview using Standardized Nordic Questionnaire (SNQ) and Job Content Questionnaire (JCQ). The results revealed prevalence of WMSS according to anatomical body region was the highest for neck pain (59.9%) followed by low back pain (56.3%) and shoulders pain (54.9%). Risk factors of

occupational stress revealed that these workers had low level of social support (71.4%), psychological demand (65.6%), job dissatisfaction (64.2%), decision latitudes (56.3%), depression (53.7%) and job insecurity (52.5%). There were 13 risk factors found to be significantly related to WMSS, age, working hours per day, job insecurity, depression, repetitive motion, heavy lifting, twisting and bending, manual handling materials, static posture, awkward posture, harmful standing, neck flexion or rotation and vibration with  $p < 0.05$  revealed significant association with WMSS. Multivariate analyses were focused on neck, shoulder and low back pain. Multivariate logistic analysis showed risk factors for neck pain (NP) were decreased with age (OR= 3.92, 95% CI 1.61 – 9.58), increase in neck flexion or rotation (OR= 9.52, 95% CI 5.55 – 16.32), awkward postures (OR=2.23, 95% CI 1.29 – 3.86) and static postures (OR=1.86, 95% CI 1.10 – 3.14). Low back pain (LBP) was associated with number of trees tapped per day with less than 100 trees (OR= 4.45, 95% CI 1.38 – 14.39) and 100 to 300 trees (OR= 3.55, 95% CI 1.19 – 10.59), heavy lifting (OR= 2.27, 95% CI 1.37 – 3.77), twisting and bending (OR= 3.32, 95% CI 2.03 - 5.45) and vibration (OR= 2.02, 95% CI 1.21 – 3.37). Age in 49 to 58 years old (OR=2.12, 95% CI 1.03 – 4.37), ethnic (OR= 0.23, 95% CI 0.06 – 0.90), manual handling materials (OR= 3.21, 95% CI 1.93 – 5.35), awkward postures (OR= 2.77, 95% CI 1.60 – 4.93), neck flexion or rotation (OR= 2.11, 95% CI 1.23 – 3.62), repetitive motion (OR= 1.80, 95% CI 1.02 – 3.19) and heavy lifting (OR= 1.83, 95% CI 1.07 – 3.11) were also significant factors in shoulder pain (SP). The high prevalence of WMSS is a significant problem among rubber tappers and it's associated with various occupational risk factors. This

finding showed that management should instituted health promotion and awareness program to curb this problem.

Key words: Work-related Musculoskeletal Symptom; Rubber Tappers; FELDA; Neck Pain; Low Back Pain; Shoulder Pain



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

**FAKTOR-FAKTOR YANG BERKAITAN DENGAN SAKIT LEHER, BAHU,  
PINGGANG DI KALANGAN PENEROKA-PENEROKA GETAH DI  
RANCANGAN FELDA DI JEMPOL, NEGERI SEMBILAN, MALAYSIA**

By

**CHOW LI SHAN**

**Disember 2010**

**Pengerusi: Prof. Madya Mohd Yusoff Bin Adon, PhD**

**Fakulti: Perubatan dan Sains Kesihatan**

Kajian irisan lintangan di antara peneroka-peneroka getah telah dijalankan untuk mengenalpasti hubungan faktor-faktor risiko iaitu ciri-ciri peribadi, faktor ergonomic dan psikososial dengan gejala musculoskeletal berkaitan kerja. Kaedah persamplan secara rawak digunakan dan sejumlah 419 peneroka getah di setiap skim FELDA Jempol, Negeri Sembilan telah menyertai dalam kajian ini. Data adalah dikumpul melalui wawan cara tatap muka dengan menggunakan Standardized Nordic Questionnaire (SNQ) dan Job Content Questionnaire (JCQ). Keputusan kajian menunjukkan bahawa prevalen WMSS mengikut setiap anatomi tubuh badan yang tertinggi merupakan sakit leher (59.9%) diikuti dengan sakit pinggang (56.3%) dan sakit bahu (54.9%). Faktor risiko untuk stress kerja menunjukkan bahawa para peneroka mempunyai peringkat yang rendah dalam sokongan sosial (71.4%),

keperluan psikologi (65.6%), ketidakpuasan tentang pekerjaan (64.2%), keputusan lintang (56.3%), depresi (53.7%) dan pekerjaan yang tidak aman (52.5%). Terdapat 13 faktor risiko yang ditemui secara signifikan dengan WMSS iaitu umur, jam kerja sehari, pekerjaan yang tidak aman, depresi, gerakan berulang, angkat berat, berputar dan membongkok, pengendalian barang secara manual, postur statik, postur kekok, berdiri berbahaya, fleksi leher atau putaran dan getaran dengan nilai  $p < 0.05$ . Multivariat analisis difokuskan pada leher, bahu dan sakit pinggang. Multivariat logistik analisis telah mengenalpasti bahawa faktor risiko untuk sakit leher (SL) menunjukkan penurunan dengan umur (OR= 3.92, 95% CI 1.61 – 9.58), peningkatan dalam fleksi leher atau putaran (OR= 9.52, 95% CI 5.55 – 16.32), postur kekok (OR=2.23, 95% CI 1.29 – 3.86) dan postur static (OR=1.86, 95% CI 1.10 – 3.14). Sakit pinggang (SP) dikaitkan dengan jumlah pokok yang ditoreh sehari dengan kurang daripada 100 pokok (OR= 4.45, 95% CI 1.38 – 14.39) dan 100 hingga 300 pokok sehari (OR= 3.55, 95% CI 1.19 – 10.59), angkat berat (OR= 2.27, 95% CI 1.37 – 3.77), berputar dan membongkok (OR= 3.32, 95% CI 2.03 - 5.45) dan getaran (OR= 2.02, 95% CI 1.21 – 3.37). Umur dalam lingkungan 49 hingga 58 (OR=2.12, 95% CI 1.03 – 4.37), bangsa (OR= 0.23, 95% CI 0.06 – 0.90), pengendalian barang secara manual (OR= 3.21, 95% CI 1.93 – 5.35), postur kekok (OR= 2.77, 95% CI 1.60 – 4.93), fleksi leher atau putaran (OR= 2.11, 95% CI 1.23 – 3.62), gerakan berulang (OR= 1.80, 95% CI 1.02 – 3.19) dan angkat berat (OR= 1.83, 95% CI 1.07 – 3.11) juga merupakan faktor yang signifikan bagi sakit bahu (SB). Prevalen WMSS yang tinggi merupakan masalah yang signifikan di antara peneroka getah dania berkaitan dengan pelbagai faktor risiko kerja. Penemuan ini menunjukkan bahawa pengurusan harus dilembagakan dengan

promosi kesihatan dan program kesedaran untuk mengurangkan masalah gejala muskuloskeletal.

Kata kunci: Gejala Muskuloskeletal Berkaitan Kerja; Peneroka Getah; FELDA, Sakit Leher; Sakit Pinggang; Sakit Bahu





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I certify that an Examination Committee has met on **20 December 2010** to conduct the final examination of **Chow Li Shan** on his (on her) degree thesis entitled “**Factors Associated With Work-related Neck, Shoulder and Low Back Pain Among Rubber Tappers at FELDA Settlement Jempol, Negeri Sembilan, Malaysia**” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the student be awarded the Master Science of Occupational Safety and Health.

Members of the Examination Committee were as follows:

**Dr. Lye Munn Sann, PhD**

Professor  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Chairman)

**Dr. Hejar Abdul Rahman, M.D**

Associate Professor  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Internal Examiner)

**Dr. Shamsul Bahri Mohd Tamrin, PhD**

Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Internal Examiner)

**Dr. Noor Hassim Ismail, PhD**

Professor  
(External Examiner)

---

**Dr. Noritah Omar, PhD**

Associate Professor and Deputy Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date: 30 April 2011

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

**Mohd Yusoff Bin Adon, M.D**

Associate Professor  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Chairman)

**Anita Binti Abdul Rahman, M.D**

Associate Professor  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Member)

**Syed Tajuddin Bin Syed Hassan, PhD**

Professor  
Faculty of Medicine and Health Sciences  
Universiti Putra Malaysia  
(Member)

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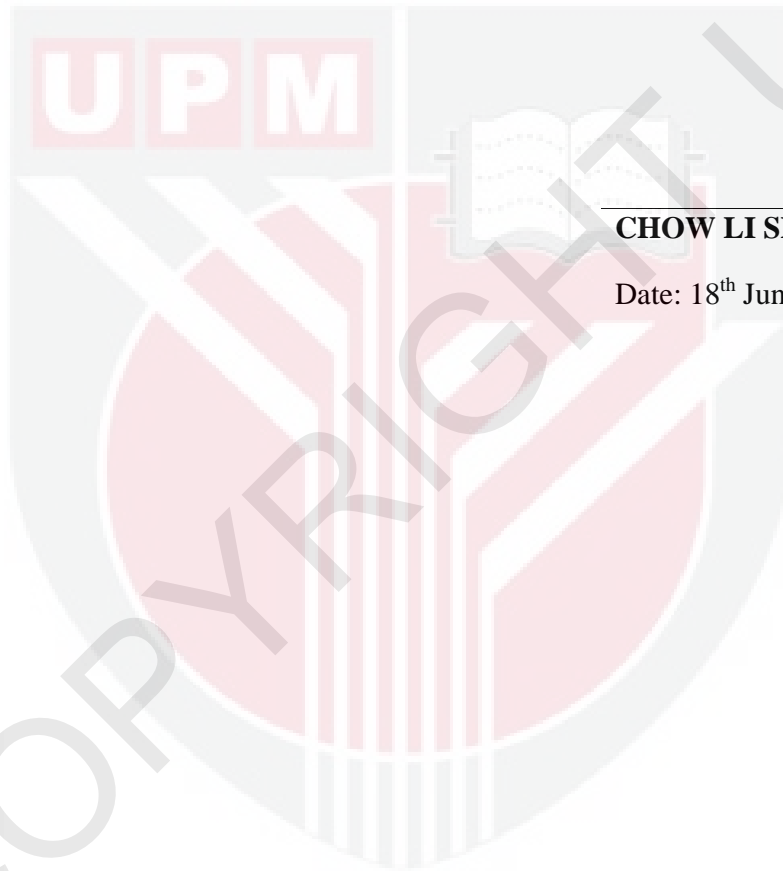
**HASANAH MOHD. GHAZALI, PhD**

Professor and Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date: 14 July 2011

## DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.



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**CHOW LI SHAN**

Date: 18<sup>th</sup> June 2010

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## LIST OF ABBREVIATIONS

BMI	Body Mass Index
CI	Confident Interval
df	Degree of freedom
FELDA	Federal Land Development Authority
HAWS	Hand arm vibration syndrome
IQR	Inter quarter range
JCQ	Job Content Questionnaire
JKKR	Skim Development Committee
LBP	Low back pain
MOA	Ministry of Agriculture
MPIC	Ministry of Plantation Industries and Commodities
MSDs	Musculoskeletal Disorders
NIOSH	National Institute of Safety and Health
NP	Neck pain
OA	Osteoarthritis
OR	Odd ratio
OWAS	Ovako Working Posture Assessment System
PMG	Pusat Mengumpul Getah
PMR	Penilaian Menengah Rendah
REBA	Rapid Entire Body Assessment
RULA	Rapid Upper Limb Assessment
SD	Standard Deviation
SNQ	Standardized Nordic Questionnaire

SP	Shoulder pain
SPM	Sijil Pendidikan Malaysia
SPSS	Statistical Package for Social Science
STPM	Sijil Tinggi Pendidikan Malaysia
WBV	Whole Body Vibration
WHO	World Health Organization
WMSS	Work –related Musculoskeletal Sytoms



## CHAPTER 1

### INTRODUCTION

#### 1.1 Rubber Industries and Health Problems among Rubber Tappers

Agriculture appear to be the most important industries as an engine of economic growth, modernization as well as poverty reduction and promoted as 'New Agriculture' in Malaysia's latest 5-year development plan-the Ninth Malaysia Plan (Wong, 2007). The specific occupational health problems faced among agricultural workers in Malaysia include infectious diseases, agricultural accidents, pesticide poisonings, physical hazards, keratitis nummularis, musculoskeletal symptoms and snake-bites as the major product in agriculture sectors is oil palm, rubber, rice and timber (Lim, 1983 and Asyraf *et al.*, 2007).

Rubber industries include rubber plantation, rubber processing and products as well as rubber manufacturing. Rubber tapping processes, chemicals and pesticides used in rubber field posed potential risk of various health problems among rubber tappers. It range from simple skin, upper respiratory tract and musculoskeletal aches to more serious and complicated multi organ impairment and failure as well as structured damage to bone, muscles, tendons and nerves of musculoskeletal system are linked directly to the arduous demands of farm labor. In Malaysia, the common Work-related Musculoskeletal Symptoms (WMSS) faced among rubber tappers are low back pain,

neck pain, shoulder pain, wrist pain, knee pain and upper back pain (Abu Hassan and Hasbullah, 2003; Asyraf *et al.*, 2007). A cross-sectional study among 116 rubber tappers in FELDA, Pahang reported high prevalence of low back pain 60.3% with odd ratio of 6.24 ( $p < 0.05$ ) which gave some insight about the magnitude of this problem (Abu Hassan and Hasbullah, 2003). Workers in the rubber field are exposed to numerous health problems which can be caused by physical, ergonomic, psychosocial, chemical and biological hazards (MTUC, 1989).

## **1.2 Work-related Musculoskeletal Symptoms (WMSS) and Risk Factors**

### **1.2.1 Definition of WMSS**

Work-related musculoskeletal symptoms (WMSS) by definition are overuse and misuse in musculoskeletal systems such as muscle, nerves, tendons, ligaments, joints, cartilage and blood vessels (Fung *et al.*, 2008). It occurs when mechanical workload is higher than physical capacity of human body (Fung *et al.*, 2008). However, acute conditions attributable to accidents or instantaneous events are normally not included in the term (Holmberg, 2004).

### **1.2.2 Risk Factors of Work-related Musculoskeletal among Rubber Tappers**

Overall tasks of rubber tapping are expected to expose rubber tappers to ergonomics risk factors such as repetitiveness, awkward postures, static muscle loading and forceful

exertion (Asyraf *et al.*, 2007). This hazard was neglect as the main cause of musculoskeletal disorders (MSDs) among rubber tappers. Among the ergonomic factors present in rubber tapping process include age of the trees, height of tapping areas, number of area being tapped and technique of performing the tapping. These will cause several MSDs such as low back pain, neck pain, shoulder pain, wrist pain and etc.

In addition, geographical factors such as slope terrains and uneven ground pose potential risk of developing MSDs. In order to obtain and improve the yield, rubber tapping process must be conducted early in the morning or before dawn for long duration working time. Working in the dark will cause eye strain due to the fact that the rubber tappers need more concentration and focus of the particular work or rubber tapping process in the field. In addition, rubber tap knife if not handle in a safe and proper way may cause injuries or even death.

Psychosocial hazards such as low job dissatisfaction, supervisor rating, psychological demands, decision latitudes and social support were the factors to cause sick leaves or disability due to MSDs (Hartman *et al.*, 2006). Other studied found that increased stress could directly increase muscle tension on the structures of spine or increase loading through trunk motion concurrently reduce blood flow due to depletion of oxygen supply to spinal tissues in resulting muscle pain (Davis and Heaney, 2000).

Rubber tapping process exposed workers to pesticides such as herbicide sodium arsenite for weed control in field and chemical such as ammonium hydroxide fixative or formic



acid to coagulate the milky latex on rubber plantations. The WHO estimate that at global level, three million severe pesticide poisoning episodes occur annually and, of these, a minimum of 300,000 died with 99% of the cases being from low and middle incomes countries (Gunnell and Eddleston, 2003). Allergic proteins have been identified in natural rubber sap, which has been associated with latex sensation (Tang *et al.*, 2005). Moreover, rubber tappers are also exposed to agents such as virus infections, snake and insect bite, and vector-borne diseases such as dengue, malaria, chikugunyah and etc.

### **1.3 Problem Statement**

Rubber workers are categorized as a susceptible group in developing WMSS because of it exposure to physical workloads, psychosocial exposure, working in a steep and uneven ground as it is the most important problem ergonomists encounter in the workplace around the world (Vanwonderghem, 1996). Although it ranks as second largest industry, however, Malaysia is one of the top exporters of natural rubber and vis-a-vis the work force will dominate the growth in this agriculture sector. It is predicted the number of workers in this industries will increase from 0.982 million to 1.11 million workers in year of 2010 (Department of Statistics and Economic Planning Unit, 2006).

Risk factors of WMSS in rubber plantation such as past injury in rubber tapping, age, height of tapping area, technique of tapping and number of area tapped. However, the associations in prevalence of WMSS with risk factors stated above were not extensively

studied in detailed as most of the research was done in preliminary study method. This problem rise may due to health care providers were primarily looking for the signs of pesticides exposure and many people make assumption that WMSS are an unavoidable result of farm labor. Moreover, in rubber plantation industries, this population is left to manage their safety and health on their own as workers in rubber factories and other agriculture processing plant is relatively organized.

Previous study among rubber tappers on prevalence of low back pain associated with physical factors and personal factors has been recently investigated. Nevertheless, detailed on the overall prevalence of WMSS especially on neck and shoulder pain with personal characteristic, ergonomic factors and psychosocial factors was not done comprehensively which is consider as an important factors. Although neck pain and shoulder pain seems less prevalence (Holmberg, 2004), the insight of the problem may significantly influence the health of the workers. Technique and methods that had been thoroughly used in MSS research were Nordic Questionnaire, Rapid Upper Limb Assessment (RULA), Ovako Working Postures Analysis System (OWAS), Rapid Entire Body Assessment (REBA) and Job Content Questionnaire methods to investigate and observe the prevalence of WMSS.

#### **1.4 Justification**

The rapid growth of the rubber industry especially in the rubber plantation will cause the increase number of work forces and form substantial working population at risk of

developing multiple health problems. Thus, it is worth to know the comprehensive health problems and in particular MSS and the specific anatomical site such as low back pain, neck and shoulder.

Anticipated high prevalence of WMSS call for detailed research on WMSS which will trigger attention to the specific authorities involved in order to make improvement in term of ergonomic design tools and workplace, in the rubber plantation industry.

Identifying the risk factors of WMSS among rubber workers especially personal characteristics, ergonomic and psychosocial factors are needed to complement the lack of data resources particularly as an augmentation for the available data in Malaysia. Research on psychosocial, ergonomic and personal characteristics factors is required; will not only provide awareness and alert for the workers and management concerning on the workplace design for the suitability for workers, thus improve management support from FELDA to workers. Moreover, specific intervention program can be institutionalize to the rubber workers as well as to the management of other stakeholders.

The risk factors that contribute in the development of WMSS will be determine in this study by using SNQ and JCQ questionnaire which is cheap, feasible and reliable measurement tools that can be duplicate by relevant stakeholders which is an effective way to empowering farming.

## 1.5 Conceptual Framework

WMSS commonly occur as a result of a combination and interaction among personal characteristics, ergonomic factors and psychosocial factors which shown in Figure 1. Other risk factors such as age and height of rubber trees etc. are contributing factors for WMSS. In rubber plantation, WMSS faced among rubber workers are low back pain, neck pain, shoulder pain, wrist pain and etc. The specific factors for WMSS are descending awkward postures, forceful movements, heavy lifting, neck flexion, obesity, age of the workers and vibration.

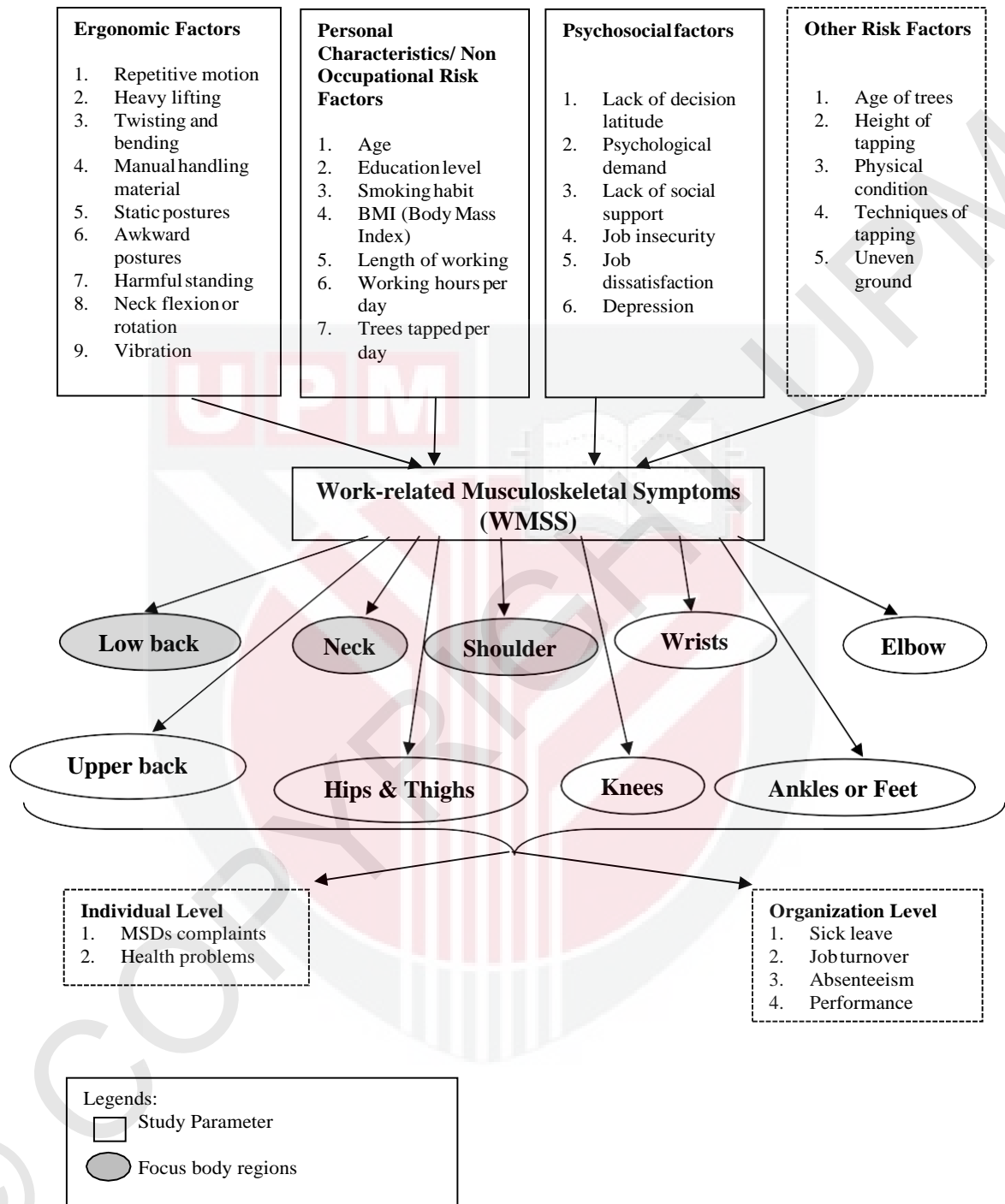
Tasks of rubber tapping are anticipated to expose rubber tappers to repetitiveness, awkward postures, static muscle loading and forceful exertion (Asyraf *et al.*, 2007). A repetitive movement can also be an awkward posture if the postures is maintain in a long period of time during work. Although minimal force apply in repetition work, but the fatigue of the muscles and acid lactic will steadily increases in the body parts that will slowly develop the risk of WMSS. The contracted muscles squeeze the blood vessels, which restricts the flow of blood all the way down to the working muscles of the hand.

Among other risk factors presented in rubber tapping process include age of the trees, height of tapping areas, uneven ground and technique of performing the tapping. The older the trees, the more force that need to be use to conduct the rubber tapping process since they need to extend their postures which stress and force will place upon the

muscle especially on neck region, shoulder and forearm region. These awkward postures will seriously affect their neck, shoulder and forearm that will induce the risk of neck pain, shoulder pain, arm pain and low back pain and more seriously injuries and accident will occurs. The longer a fixed or awkward body position is used, the more likely to develop WMSS (Canadian Center for Occupational Health and Safety, 2002).

Psychosocial risk factors are things that may affect workers' psychological response to their work and workplace conditions for example high psychological demand, lack of decision latitudes and social support, job insecurity and depression. Psychosocial risk factors had been proven by other studies to be the risk factors of WMSS and will cause one's disability.

Consequences of WMSS can be divided into two which are individual level and organizational level. For individual level, workers will develop health problem and exhaustion while for organizational level; it will affect workers performance in their work as well as increase absenteeism, sick leave and job turnover. In agriculture, forestry and fishing, MSDs accounted for 8733 incidents (22%) out of 40,153 nonfatal occupational injuries resulting in lost work time in United State (Steven and Guilia, 2006).



**Figure 1: Conceptual Framework of WMSS and Risk Factors**

## **1.6 Objectives**

### **1.6.1 General Objective**

To determine the association between ergonomic and psychosocial factors with work-related musculoskeletal symptoms (WMSS) among rubber tappers in FELDA Settlements at Jempol, Negeri Sembilan.

### **1.6.2 Specific Objectives**

- i. To determine personal characteristics (age, BMI, education level, duration of working time, duration of working year and smoking habit) among rubber tappers.
- ii. To determine psychosocial factors and prevalence of occupational stress level among rubber tappers.
- iii. To determine prevalence of WMSS among rubber tappers.
- iv. To determine association between personal characteristics (age, BMI, education level etc.) and overall prevalence of WMSS.
- v. To determine association between personal characteristics (age, BMI, education level etc.) and WMSS (LBP, NP, SP).
- vi. To determine association between ergonomic factors and overall prevalence of WMSS.

- vii. To determine association between ergonomic factors and WMSS (LBP, NP, SP).
- viii. To determine association between psychosocial factors (decision latitude, psychological demand, social support, job insecurity job dissatisfaction and depression) and overall prevalence of WMSS.
- ix. To determine association between psychosocial factors (decision latitude, psychological demand, social support, job insecurity job dissatisfaction and depression) and WMSS (LBP, NP, SP).
- x. To determine the predictors and WMSS (LBP, NP, SP) among rubber tappers

### **1.7 Null Hypotheses**

$H_0$ : There is no significant association between personal characteristics (age, BMI, education level, duration of working time, duration of working year and smoking habit) and WMSS.

$H_0$ : There is no significant association between ergonomic factors (repetitive motion, heavy lifting, manual handling material, twisting and bending, static postures, awkward postures, neck flexion or rotation, harmful standing and vibration) and WMSS.

$H_0$ : There is no significant association between psychosocial factors (decision latitude, psychological demand, social support, job insecurity, job dissatisfaction and depression) and WMSS.



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