UNIVERSITI PUTRA MALAYSIA

PREVALENCE OF OCCUPATIONAL STRESS USING SALIVARY ALPHAAMYLASE AND ITS ASSOCIATED FACTORS AMONG OIL PALM HARVESTERS AT CAREY ISLAND, SELANGOR, MALAYSIA

NUR SABRINA BINTI MOHD NASIR

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By

NUR SABRINA BINTI MOHD NASIR

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

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October 2016

Chairman : Associate Professor Shamsul Bahri bin Md Tamrin, PhD
Faculty : Medicine and Health Sciences

Methodology: This cross-sectional study was conducted for three weeks at six divisions from two oil palm plantation at Carey Island, Selangor. One hundred and nine oil palm harvesters were recruited. Questionnaire was used to determine socio-demographic and occupation background. Psychological distress was determined using the General Health Questionnaire-12 (GHQ-12). Kestrel Heat Stress Tracker 4400 was used to measure wet bulb globe temperature outdoor (WBGToutdoor) to determine heat stress exposure. Postural analysis was assessed using Rapid Upper Limb Assessment (RULA) method and Borg CR-10 scale was used to determine exerted force during harvesting work task. Salivary alpha-amylase assay kit was used to analyse the salivary alpha-amylase levels which is used as an indicator of occupational stress. **Results**: The response rate was 100%. The Cronbach's alpha coefficient for Indonesian translated version of GHQ-12 is acceptable (α=0.70). Ninety five percent of the respondents were Indonesian aged between 19 to 46 years old. The prevalence of occupational stress among respondents was 77.0% based on high level of salivary alpha-amylase activity at post harvesting. Thirty six percent of respondent experienced a psychological distress state and 45.9% exposed to heat stress during harvesting work task. Postural analysis classified 62.4% of the respondents in Action Level 4 based on RULA method. Maximum of three times cutting the subtending the oil palm frond reported by the respondents. Ninety two percent of the respondents applied high force (≥ %50 MVC) during cutting the stalk of fresh fruit bunch. Result from Chi-square test showed that the stressors significantly associated with occupational stress were psychological distress (χ2=5.524, p=0.019), heat stress exposure (χ2=31.851, p<0.001), working posture (χ2=4.289, p=0.038), force exertion on cutting oil palm frond once (χ2=0.479, p=0.489), force exertion on cutting oil palm frond twice (χ2=0.202, p=0.653), force exertion on cutting oil palm frond for three times (χ2=9.341, p=0.002). Further analysis using simple and multiple linear regression, showed that predictive stressors for occupational stress were WBGToutdoor (ß=0.747, p<0.001) and cutting oil palm frond for three times

(ß=-0.175, p<0.05). **Conclusion**: The prevalence of occupational stress in this study is 77.1%. The prevalence of psychological distress in this study was low (35.8%) but it was significantly associated with occupational stress. Fifty percent of the respondents exposed to heat stress while performing the harvesting task and found to be a contributing factor for occupational stress among oil palm harvesters. The movement and alignment of body posture while performing the harvesting work task is significantly associated with occupational stress. Sixty three percent of the workers are performing the harvesting task in awkward position. Most of the workers experienced stress when they exerted force to cut the subtending oil palm frond for three times. On the contrary, all the workers were pleasant to cut the fresh fruit bunch though many of them exerted the high force to cut the stalk of fresh fruit bunch. It can be concluded that occupational stress among oil palm harvesters is influenced by exposure of excessive heat, awkward working posture, psychological distress and cutting the subtending oil palm frond for three times. The most influencing factors for occupational stress among oil palm harvesters are heat stress exposure and force exertion applied for three times to cut the subtending oil palm frond.

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

PREVALENS TEKANAN PEKERJAAN MENGGUNAKAN AIR LIUR ALFA-AMILASE DAN FAKTOR HUBUNGAN YANG BERKAITAN DI KALANGAN PENUAI BUAH SAWIT PULAU CAREY, SELANGOR, MALAYSIA

Oleh

NUR SABRINA BINTI MOHD NASIR

Oktober 2016

Pengerusi : Profesor Madya Shamsul Bahri bin Md Tamrin, PhD
Fakulti : Perubatan dan Sains Kesihatan

Kaedah: Kajian keratan rentas ini telah dijalankan selama tiga minggu di enam bahagian dari dua ladang sawit di Pulau Carey, Selangor. Satu ratus dan sembilan pemotong buah sawit telah mengambil bahagian. Soal selidik telah digunakan untuk menentukan sosio-demografi dan latar belakang pekerjaan. Tekanan psikologi ditentukan dengan menggunakan General Health Questionnaire-12 (GHQ-12). Kestrel Heat Stress Tracker 4400 telah digunakan untuk mengukur wet bulb globe temperature outdoor (WBGToutdoor) bagi menentukan pendedahan tekanan haba. Analisis postur dinilai dengan menggunakan kaedah Rapid Upper Limb Assessment (RULA) dan skala Borg CR-10 digunakan untuk menentukan daya yang dikenakan semasa melaksanakan kerja menuai. Air liur alfa-amilase kit asai digunakan untuk menganalisis tahap air liur alfa-amilase yang merupakan petunjuk kepada tekanan pekerjaan. **Keputusan**: Jumlah penglibatan responden yang terlibat adalah 100%. Nilai Cronbach's alpha untuk versi terjemahan Indonesia GHQ-12 adalah diterima (α = 0.70). Sembilan puluh lima peratus daripada responden Indonesia berusia antara 19 hingga 46 tahun. Prevalens tekanan pekerjaan di kalangan responden adalah 77.0% berdasarkan tahap tinggi aktiviti air luir alfa-amilase liur di selepas menuai. Tiga puluh enam peratus daripada responden mengalami tekanan psikologi dan 45.9% terdedah kepada tekanan haba semasa menjalankan tugasan menuai. Analisis postur diklasifikasikan dalam Tindakan Level 4 berdasarkan kaedah RULA adalah 62.4% daripada jumlah responden. Maksimum sebanyak tiga kali daya yang digunakan untuk memotong pelepah kelapa sawit dilaporkan oleh responden. Sembilan puluh dua peratus daripada responden menggunakan kuasa tinggi (≥% 50 MVC) semasa memotong tangkai buah tandan segar. Keputusan daripada ujian Chi-square menunjukkan bahawa tekanan ketara yang berkaitan dengan tekanan kerja adalah tekanan psikologi ($_X2$ = 5,524, p = 0.019), pendedahan tekanan haba ($_X2$ = 31,851, p <0.001), postur ($_X2$ = 4,289 bekerja , p = 0.038), daya yang dikenakan untuk memotong pelepah kelapa sawit kali pertama ($_X2$ =

0,479, p = 0,489), daya yang dikenakan untuk memotong pelepah kelapa sawit kali kedua kali (($_X$2 = 0,202, p = 0,653), daya yang dikenakan untuk memotong pelepah kelapa sawit pelepah untuk kali ketiga kali (($_X$2 = 9,341, p = 0.002). Analisis selanjutnya menggunakan regresi linear mudah dan pelbagai, menunjukkan bahawa ramalan tekanan untuk tekanan pekerjaan adalah WBGToutdoor (ß = 0.747, p <0.001) daya yang dikenakan untuk memotong pelepah kelapa sawit pelepah untuk kali ketiga (ß = -0,175, p <0.05). **Kesimpulan**: Prevalens tekanan kerja dalam kajian ini adalah 77.1%. Prevalens tekanan psikologi dalam kajian ini adalah rendah (35.8%) tetapi ia ketara yang berkaitan dengan tekanan kerja. Lima puluh peratus daripada responden terdedah kepada tekanan haba semasa menjalankan tugas menuai dan didapati menjadi faktor penyumbang kepada tekanan kerja di kalangan penuai kelapa sawit. Pergerakan dan penyelarasan postur badan semasa melakukan tugas kerja penuaian didapati berkaitan dengan tekanan kerja. Enam puluh tiga peratus daripada pekerja melaksanakan tugas penuaian dalam kedudukan yang janggal. Kebanyakan pekerja yang mengalami tekanan apabila mereka dikenakan daya untuk memotong pelepah kelapa sawit untuk tiga kali. Sebaliknya, semua pekerja adalahgembira dan tidak mengalami tekanan untuk memotong buah tandan segar walaupun ramai daripada mereka dikenakan daya yang tinggi untuk memotong tangkai buah tandan segar tersebut. Rumusan kajian ini adalah bahawa tekanan kerja di kalangan pemotong kelapa sawit dipengaruhi oleh pendedahan haba yang melampau, postur kerja yang janggal, tekanan psikologi dan memotong pelepah kelapa sawit untuk tiga kali. Faktor yang paling mempengaruhinya untuk tekanan kerja di kalangan pemotong kelapa sawit adalah pendedahan tekanan haba dan memaksa melakukan senaman memohon tiga kali untuk memotong pelepah kelapa sawit yang mencangkum.

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Nur Sabrina binti Mohd Nasir

This thesis was submitted to the Senate of the 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:

Shamsul Bahri bin Md Tamrin, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Chairman)

Kulanthayan Subramaniam @ K. C. Maniam, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Member)

_____
ROBIAH BINTI YUNUS, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

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This is to confirm that:

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Signature:	
Name of Member of Supervisory Committee:	Associate Professor Dr. Kulanthayan Subramaniam @ K. C. Maniam

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Occupational stress is an important global issue that has received a great attention in many countries. This is because the negative stress impacts at work may increase the physical, physiological, psycho-social factors among the workers. Stress at work may lead to poor work performance, low productivity and high accidents or incidents and injury rate (ILO, 2012). Hence it is vital to optimize work conditions and organization. Regus (2013) reported 70% of Malaysian workers showed an increased number of stress-related illnesses due to global economic crisis and 48% reported of increased stress level. Ruzanna (2014) also discussed that 77% experienced of physical symptoms and 73% claimed of psychological symptoms. Lee (2013) stated that work-related stress has grown into a major concern and advised employers to recognise it as it could lead to health problems.

Agricultural industry in Malaysia has been contributing to increase Malaysia's economy via exporting the agriculture products such as vegetables and fruits within Asian's region. This industry commenced to plant the commercialized crops such as rubber, oil palm and cocoa after British introduced since last two decades. Agricultural industry is still depend on manual labours that currently been dominated by foreign workforce. At oil palm plantation 69% of the workforce is foreign workers. Foreign workers are mainly hired to do extensive manual work and critical jobs such as oil palm harvesters and field workers (Ramli et al., 2011).

Oil palm harvesters need to use so much energy and force that exposed to the development of musculoskeletal illness or disorders. This condition cannot be neglected and need to be addressed because it can affect workers' health and productivity which may lead to occupational stress. However, it is also important to address other potential factors that might lead to occupational problem among oil palm harvesters. Occupational health issue should be well-addressed so that it can be minimized in order to improve the workers' productivity and create a sustainable and good plantation practices.

1.2 Problem statement

The importance of assessing occupational stress has emerged almost every job and position. Most studies have focused on education, healthcare, and manufacturing industries. There has not been adequate focus given to agricultural workers especially to oil palm harvesters. The level of occupational stress among oil palm harvesters has not been discovered yet though the job

category are most likely related to ergonomics issues among oil palm plantation workers.

In Malaysia, the process of harvesting oil palm fruit consists mainly of males where males make up most of the workforce. The nature of work as an oil palm harvester requires both physical and psychological training. During harvesting process, they must able to adjust their body into different postures in accordance to the height of oil palm trees and location of the oil palm fruit on the trunk. Moreover, it requires a great skill and great energy to cut the fresh fruit bunches weighs from 5kg to 50kg. These processes also involve a cognitive skill in order to ensure that correct harvesting tools are used according to the height of oil palm tree. Furthermore, the most essential part is to identify the correct and quality fresh fruit bunch. The process of identification is to ensure that the harvested fresh fruit bunches had reached the maturity standards in order to obtain good oil extraction rate.

1.3 Study justification

World Health Organisation (WHO) raised awareness for employers and employees by providing a booklet on work-related stress management in developing countries. In Malaysia, the Department of Occupational Safety and Health (DOSH) Malaysia published “Guidance for the prevention of stress and violence at the workplace” since 2001. This is an example of a good initiative done by DOSH Malaysia due to emerging stress condition to handle stress situation at work. However, this guidance should be updated and improved as the contents are mainly emphasised and highlighted to the office workers. Therefore, it is important to study the predisposing factors for outdoor workers such as manual labour workers that contributed to stress condition other than office workers. The finding from the study can provide the specific contents for outdoor workers to prevent stress rather than totally focused on stress prevention for office workers.

1.4 Conceptual framework

Figure 1.1 shows the conceptual framework for this study. The independent variables of this study were socio-demographics factors, workplace stressors and psychological distress. Socio-demographic factors and workplace stressors are the predisposing factors that can contribute to occupational stress. Workplace stressors include force exertion, working posture and environmental temperature. Salivary alpha-amylase is the only dependent variable in this study.

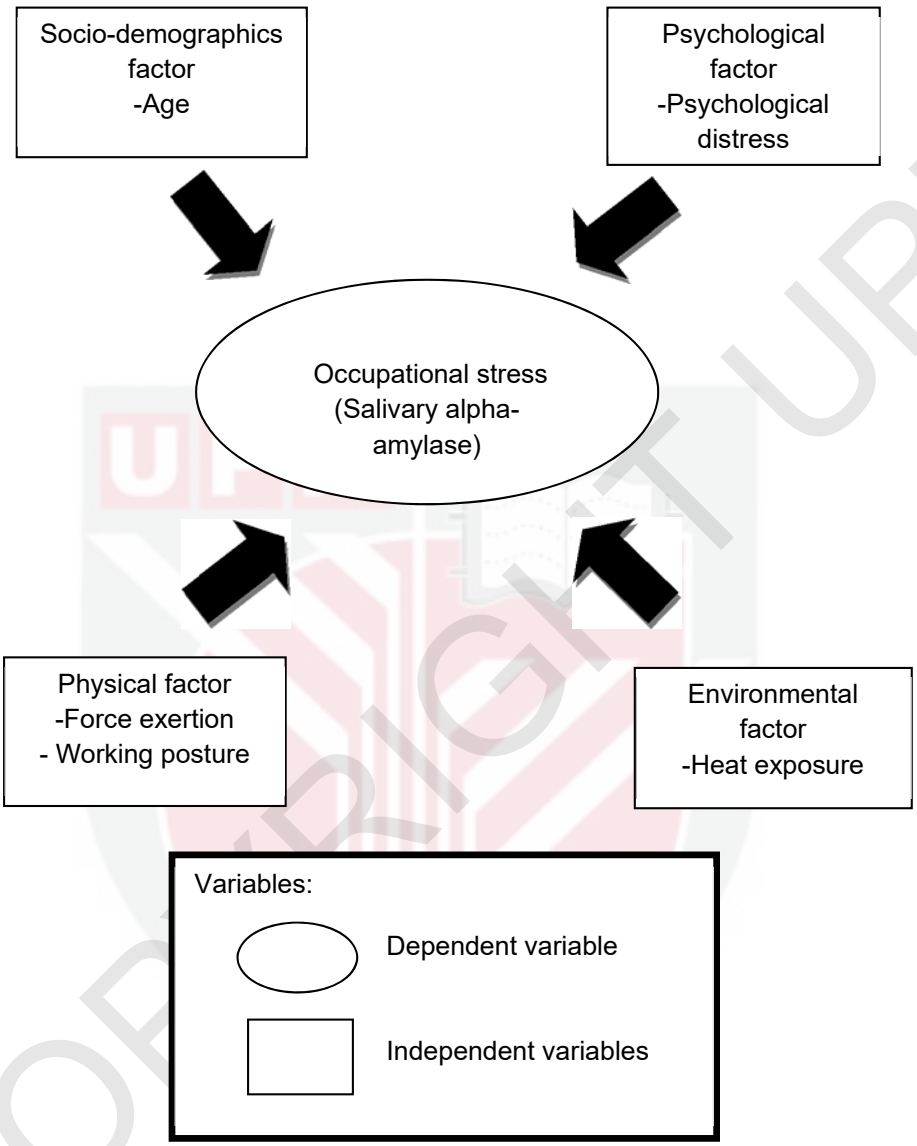

Figure 1.1 : Conceptual framework

1.5 Research objective

1.5.1 General objective

To determine the prevalence of occupational stress by using salivary alpha-amylase activity and its association with workplace stressors (age, psychological distress, heat stress exposure, working posture and force exertion) among oil palm harvesters.

1.5.2 Specific objective

i. To determine the socio-demographic factors and occupational background among oil palm harvesters.
ii. To determine the salivary alpha-amylase activity level (pre and post harvesting work task) and prevalence of occupational stress by using salivary alpha-amylase activity among oil palm harvesters.
iii. To determine the force exertion level during harvesting work task among oil palm harvesters.
iv. To determine the prevalence of heat stress exposure during harvesting work task among oil palm harvesters.
v. To determine the prevalence of psychological distress among oil palm harvesters.
vi. To determine the working posture (RULA action level) during harvesting work task among oil palm harvesters.
vii. To determine the relationship and predictive workplace stressors (age, psychological distress, heat stress exposure, working posture and force exertion) with occupational stress among oil palm harvesters.

1.6 Study hypothesis

i. There is a significant relationship between psychological distress and occupational stress among oil palm harvesters.
ii. There is a significant relationship between heat stress exposure during harvesting work task and occupational stress.
iii. There is a significant relationship between working posture (RULA action level) during harvesting work task and occupational stress among oil palm harvesters.
iv. There is a significant relationship between force exertion level during harvesting work task and occupational stress.

1.7 Definitions of variables

1.7.1 Conceptual definitions

1.7.1.1 Prevalence

Prevalence is one of the two basic ways to describe the occurrence of disease in a population. A proportion of people in the entire population found to be with the disease at the certain point of time (Durham et al., 2012).

1.7.1.2 Occupational stress

The harmful physical and psychological responses when the requirements of the jobs do not match the capabilities, resources or needs of the workers. (NIOSH, 1999).

1.7.1.3 Workplace stressors

Change in workers' physical or mental state in response to workplaces that poses an appraised challenge or threat to those workers (Higgins, 2005).

1.7.1.4 Oil palm harvesters

Oil palm plantation workers who involved in the harvesting process as the fresh fruit bunch cutter, fresh fruit bunch collector, frond stacker and loose fruit collector (Pye et al, 2016).

1.7.1.5 Fresh fruit bunch

The ripen oil palm fruit that is ready to be harvested by the fresh fruit bunch cutter (Roseleena et al., 2011).

1.7.1.6 Salivary alpha-amylase

Salivary alpha-amylase is an enzyme that has a structure of an 8-stranded alpha-beta barrel containing the active site, interrupted by a~70 a.a. calcium-binding protruding between beta strand 3 and alpha helix, and a carboxyl-terminal Greek key beta-barrel domain (World of Chemicals, 2016).

1.7.1.7 Psychological distress

Any unpleasant emotions or feelings that influence the normal level of functioning (Williams, 2016).

1.7.2 Operational definitions

1.7.2.1 Prevalence of occupational stress

Prevalence of occupational stress determined from the number of workers who had been identified to be stress through the measurement of salivary alpha-amylase activity (post harvesting period) among the respondents.

1.7.2.2 Occupational stress

The level of occupational stress among respondents acquired through the salivary alpha-amylase activity level. The level of salivary alpha-amylase level more than 80.0U/ml is categorised as stress.

1.7.2.3 Oil palm harvesters

Oil palm plantation workers who harvest a fresh fruit bunch.

1.7.2.4 Fresh fruit bunch

Oil palm fruits that have a minimum maturity standard of 2 loose fruit.

1.7.2.5 Salivary alpha-amylase

Salivary alpha-amylase level was collected by using SalivaBio Oral Swab (SOS) method (Item no. 5002.01) by following the instruction from Saliva Collection Handbook and analysed according to salivary α-amylase kinetic enzyme assay kit's guideline provided by the manufacturer.

1.7.2.6 Psychological distress

Psychological distress was measured and determined by using the General Health Questionnaire-12.

1.8 Study limitation

This study selects participants by a non-probability sampling and is less desirable than probability samples. This study was a purposive sampling and did not represent subset of a larger population because it was constructed to a specific target group that fulfils the inclusive criteria. The sampling method might not truly representative because the probability sampling method will provide the most valid or credible results because it reflect the characteristics of the population.

The measurement of force was done based on subjective perception of the respondents and it might not completely reflect to the level of force exerted during harvesting work task. Direct measurement such as electromyography for this study will be much preferable to quantify the exerted force. However due to time consuming and constrain, this method was applied for this study because this study did not intend to disturb the operation flow and management during operation hours. Moreover, direct measurement consumes at higher cost for device rental and maintenance during data collection.

ISO 7243 Threshold Limit Values for work-rest regimen and clothing factors were adapted from ACGIH to determine the heat stress exposure but no heat stress index was referred. Initial finding presented the irrelevant level of heat stress among respondents because the finding exceeded the recommended level by

ACGIH. The available index did not applicable to be applied for outdoor workplace in a tropical country.

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