UNIVERSITI PUTRA MALAYSIA

ASSOCIATION OF OCCUPATIONAL STRAIN WITH SELECTED FACTORS AND HAIR CORTISOL AS POTENTIAL BIOMARKER AMONG LECTURERS IN COMMUNITY COLLEGES, PENINSULAR MALAYSIA

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FPSK(m) 2015 42

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By

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

March 2015

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

ASSOCIATION OF OCCUPATIONAL STRAIN WITH SELECTED FACTORS AND HAIR CORTISOL AS POTENTIAL BIOMARKER AMONG LECTURERS IN COMMUNITY COLLEGES, PENINSULAR MALAYSIA

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March 2015

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Introduction: Occupational stress occurs when job requirement do not match the capabilities, resources and needs of the workers, and occupational strain is one of the important source of occupational stress that poses a threat to the health of workers and also to the health of organizations. Lecturer is one of the position that mostly reported having high strain and nowadays, the stressfulness of teaching has been recognized as a big number of academic workers are reporting stress, depression and anxiety caused by their work. Hair cortisol was used to measure the occupational strain because it may represent a long term exposure to the stress related hormone **Objectives:** To determine the prevalence of occupational strain, the organizational factors that contributed to occupational strain as well as the association between hair cortisol level and occupational strain among lecturers in Community Colleges. **Methodology:** A cross sectional study was conducted and 189 workers participated in this study. The validated self-administered Malay version of Job Content Questionnaire (JCQ) was used to verify the socio-demographic background, factors contributed to work strain which is organizational factors and the stress level of the respondents. Cronbach's alpha coefficients revealed for organizational factors were 0.75 for decision latitude, 0.84 for social support and 0,80 for psychological job demand and job insecurity. The hair cortisol level was analysed using ALPCO Cortisol ELISA Kit. **Result:** The response rate was 87.1%. The prevalence of occupational strain among the respondents was 25.9% and this was based on the respondent's psychological job demand and decision latitude. Hierarchical multiple regression showed that job insecurity (95% CI: 1.08-2.09) and social support (95% CI: 0.69-0.91) also have significant associations with occupational strain. However, there were no significant association between occupational strain and hair cortisol level (P=0.063). The sensitivity of hair cortisol analysis was only 25.53% while the specificity was 91.47%.

Conclusion: The study showed there is a significant association between occupational strain and social support as well as job insecurity. The low sensitivity of hair cortisol analysis showed that hair cortisol cannot be proposed as biological marker of occupational strain.

Keywords: Occupational Strain, Lecturer, Job Content Questionnaire (JCQ), Hair Cortisol, Community College

Abstrak disertasi yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains.

PERHUBUNGAN ANTARA BEBAN KERJA DENGAN FAKTOR-FAKTOR TERPILIH DAN KORTISOL RAMBUT SEBAGAI PENUNJUK BIOLOGI BERPOTENSI DIKALANGAN PENSYARAH DI KOLEJ KOMUNITI, SEMENANJUNG MALAYSIA

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Pengenalan: Tekanan kerja berlaku sekiranya pekerjaan itu tidak menepati kebolehan dan keperluan seseorang pekerja, manakala beban kerja merupakan salah satu faktor penting bagi tekanan kerja yang mengancam kesihatan pekerja dan organisasi kerja. Pensyarah adalah salah satu pekerjaan yang melaporkan kadar beban kerja tertinggi dan sekarang, beban dalam mendidik telah dikenalpasti sebagai punca utama pengajar mengahadapi tekanan dan depresi yang disebabkan oleh kerja. Kortisol rambut telah digunakan untuk mengukur kadar tekanan kerana hormon kortisol boleh kekal dalam jangka masa yang agak panjang selepas terdedah kepada tekanan. **Objektif:** Untuk mengenalpasti prevalen tekanan kerja , faktor organisasi yang menyumbang kepada tekanan kerja dan juga perhubungan antara kadar hormon kortisol dan tekanan kerja dikalangan pensyarah di Kolej Komuniti, Semenanjung Malaysia. **Metodologi:** Kajian keratan rentas telah dijalankan dan sebanyak 189 pensyarah telah terlibat. Borang soal selidik '*Job Content Questionnaire'* versi Bahasa Melayu telah digunakan untuk mendapatkan maklumat sosiodemografi, faktor tekanan kerja dalam organisasi dan kadar tekanan kerja dikalangan responden. Nilai alfa kronbach yang didapati untuk faktor organisasi ialah 0.75 (latitud keputusan), 0.84 (sokongan sosial), dan 0.80 (permintaan kerja dan ketidakstabilan kerja). Kadar kortisol rambut telah dianalisis menggunakan kit ALPCO Cortisol ELISA. **Keputusan:** Kadar respon ialah 87.1%. prevalen tekanan kerja dikalangan responden ialah 25.9% dan ia adalah berdasarkan permintaan kerja dan latitud keputusan responden. Analisis '*hierarchical multiple regression'* menunjukkan ketidakstabilan kerja (95% CI: 1.08-2.09) dan sokongan sosial (95% CI: 0.69 – 0.91) juga terdapat hubungan yang signifikan dengan tekanan kerja. Walaubagaimanapun, tiada hubungan yang signifikan antara tekanan kerja dan kadar hormon kortisol (P=0.063). kadar sensitiviti analisis hormon kortisol

hanya 25.53% manakala spesifisitinya ialah 91.47%. **Kesimpulan:** Kajian menunjukkan terdapat hubungan signifikan antara beban kerja dengan ketidakstabilan kerja dan juga sokongan sosial. Kadar sensitiviti yang rendah dalam analysis kortisol rambut menunjukkan yang kortisol rambut tidak boleh dicadangkan sebagai penunjuk biologi terhadap tekanan kerja.

Katakunci: Tekanan kerja, Pensyarah, *Job Content Questionnaire*, Kortisol rambut, Kolej Komuniti

ACKNOWLEDGEMENT

Bismillah Ar-Rahman Ar-Rahim. Praise be to ALLAH S.W.T., the Most Compassionate and Most Merciful, whose blessings have helped me throughout my life.

Firstly, I would like to acknowledge and express my sincere appreciation to my project supervisor, Assoc. Prof. Dr. Anita Abd Rahman for her strong guidance, support, encouragement and advices in this project. I am very grateful and lucky being able to learn her insights that had helps me to complete my work on time. I also would like to thank Dr. Emilia Zainal Abidin for being a wonderful co-supervisor that had helped me a lot in this project. Apart from that, I would like to express my gratitude to all lecturers and staffs of Department of Community Health who had contributed directly or indirectly in making this study a success. Besides that, I would like to express my deepest appreciation and gratitude to all Community Colleges and the staffs involved for their cooperation. This study is impossible to be carried out successfully without their participation.

Finally, I would like to thank my beloved husband, Hairul Syafwan for his encouragement, love, endless support and great patience. I also owe a great deal of appreciation to my family especially my parents for their invaluable encouragement and endless moral support throughout this project. A special thanks to my beloved friends, Hilwa, Atikah, Zarith, Rahmah, Asma and Azizah for their continuous support. Thank you so much.

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LIST OF ABBREVIATIONS

ACTH	Adrenocorticotropic Hormone
ANOVA	Analysis of Variance
CI	Confidence Interval
CRF	Corticotrophin-releasing Factor
df	Degree of Freedom
ELISA	Enzyme-linked Immunosorbent Assay
FRP	Lecturer's Record File
FRPel	Student's Record File
HPA	Hypothalamic-pituitary-adrenal
HSE	Health and Safety Executive
JCQ	Job Content Questionnaire
KKPG	Kolej Komuniti Pasir Gudang
NHMS	National Health Morbidity Survey
NIOSH	National Institute of Occupational Safety and Health
OD	Optical Densities
OSHA	Occupational Safety and Health Act
PMS	Pre-Menstrual Syndrome
PSS	Perceived Stress Scale
SD	Standard Deviation
SMK	Sijil Modular Kebangsaan
SPSS	Statistical Program for Social Science
SWI	Self-reported Work-related Ill
USM	Univeristi Sains Malaysia
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Introduction

Everyone have the possibility to feel stress, and it can be caused by many factors in everyday life including occupational factors. Generally, the most stressful workers are those who have the responsibility for other people. The nature of work is changing very fast nowadays and occupational strain is now known to have negative effect on worker's health and also to the health of the organization through the effect on the worker's performance.

Stress is a condition when the body system respond to certain stressors. Stressor is an event or set of conditions that can initiate a stress response in the body. Strain is the body's longer-term reaction to chronic stress. Job strain refers to the negative physical and psychological toll that job stress takes on the jobs involve high demands and workers have little decision-making power. When people experience stress, their normal body systems are like disturbed by something and feel not comfortable with that state. It has been concluded that human body will respond naturally to any threat if they feel uncomfortable. The responds includes the release of adrenaline, and it is commonly known as the "fight or flight" reaction. The body can return to its normal state once the threat is over (NIOSH, 1999).

Nowadays, most of the organization requires their workers to have the cognitive abstract qualification like decision making, understanding of complex organization and strong team work to compete in the market condition. All employees are also required to be able to analyze and solve the problems in unexpected situations at any given time (Mikkelsen, Ogaard & Landsbergis, 2005). It is not an easy part to fulfill all the requirements needed. Along the process of achieving the cognitive abstract qualification, employees may experience one condition that has been recognized which is stress.

Occupational strain is a big issue in many organizations because it can contribute to the adverse effect to the worker's health. Stressful working condition comes from many causes; some of them are heavy workload, uncomfortable working environment, working overtime, bad relationship with the employers and colleague (NIOSH, 1999). Nowadays in the modern world, occupational strain has known as a factor that brings a lot of problems to the workers (Lu, Cooper, Kao & Zhou, 2003). According to the World Health Organization (WHO) and previous studies, occupational strain has been linked to organic disease such as hypertension, psychological illness and musculoskeletal disorder (Kendall *et al*., 2003). Previously, there were several studies that were done to investigate the severity of occupational strain in Malaysia. All the studies which were conducted among nurses, teacher, clerks, laboratory technicians

and automotive workers showed that occupational strain is significantly associated with the organizational factors (Huda *et al.*, 2004; Rosnah & Azmi, 2008; Chandraiah, Agrawal, Marimuthu & Manoharan, 2003; Maizura *et al.*, 2010). There were also few epidemiological studies conducted among Malaysian workers to examine the effects of occupational strain. In determining the risk factor of occupational strain, those studies were using the Job Content Questionnaire (JCQ). Instead, there is no such figure to assess the loss due occupational strain problem, but Ministry of Health Malaysia still believes that the number of cases of occupational related diseases is increasing (Aziah *et al*., 2004).

Strain affects different people in different ways. The different in characteristics of each individual like their personality and coping style, are the most important factors in predicting whether their job will cause strain or not. This indicates that not every single job that is stressful to a person may also be a stressful job for another person. It depends on how the person copes and handles the stress condition. In preventing occupational strain at workplace, the prevention strategies need to be focused on the workers itself and also the ways to help then how to cope with the demanding job conditions.

When strain happen, the body will react by increasing the metabolism, increasing the blood pressure and heart rate as well as other reaction. There was a study conducted among civil servant at the European countries that showed a relationship between health effect and strain. They found that the effect of strain in the body comes from many ways. According to WHO (1999), occupational strain can cause poor physical and poor mental health. Physically, the body will change to the abnormal state, and these might include hypertension, headache, elevated blood pressure, chest pain, heart disease, stroke and diabetes. The change of behavioral actions also takes place which includes reduce in work performance, worse relationship with others, and substance abuse (Nobile & McCormick, 2005). Besides affecting worker's health, occupational strain may also challenge the healthiness and performance of work in the organization, if there is so many workers are being strain.

Occupational strain affects the worker's performance in the organization due to the absenteeism and staff turnover which can reduce performance and productivity. This may also increase complaints from clients or customers, increase unsafe or dangerous working practices and accident rates, and increase cost for substituting the workers and training of the replacement workers (WHO, 2007).

Physiologically, the body reacts to strain by secreting two types of chemical messengers, which are neurotransmitter and hormones. Neurotransmitters are secreted in brain cells and hormones are secreted in the blood. Normally, stress-related hormones are released in small amounts throughout the day, but the levels will increase dramatically when the person perceives an event as stressful. Then, hormones continue to increase throughout the body energizing a variety of metabolic functions in preparation for action, like fighting or running. Some powerful emotions like aggression or anxiety are also triggered to help drive the response. This stress-

related hormone response engages the hypothalamic-pituitary-adrenal (HPA) axis. Hormonal response begins in the hypothalamus, a small gland at the base of the brain which serves as a principal regulatory center for body functions. This is the point where the corticotrophin-releasing factor (CRF) is excreted into the bloodstream. CRF travels through blood vessels going to the pituitary gland which is a pea-sized structure attached by a short stalk below the hypothalamus gland. In the anterior (forward) portion of the pituitary, CRF stimulates the release of adrenocorticotropic hormone (ACTH).ACTH then travels in the bloodstream from the pituitary to the two adrenal glands, one perched atop each kidney. The outer portions of the adrenals (cortex) are stimulated by ACTH to release still other hormones, such as glucocorticoids. Cortisol is the most potent glucocorticoid in humans. It travels through the body as an adaptation to external stress. For example, cortisol increases blood sugar (glucose) and breaks down proteins and fats to help mobilize energy. In the presence of severe strain, cortisol levels may increase up to 10 times.

Cortisol also provides a "negative feedback system" in the body. When cortisol reaches the hypothalamus it inhibits further excess release of CRF, restoring ACTH and cortisol to normal levels. This case happens if the stressor is quite mild. During intense strain, signals in the brain stimulate more CRF release, thus overriding inhibitory mechanisms and the strain reaction continues.

One of the method measuring cortisol concentration is from hair. Hair cortisol can measure chronic strain because hair may represent a long term exposure to the hormone. The normal range for cortisol in hair is 5 - 91pg/mg (Raul, Cirimele, Ludes & Kintz, 2004). Hair cortisol can give a positive result in some cases that showed falsely negative result in blood, saliva or urine in hair, the hormone can be detected even long after the exposure (Gow *et al.*, 2010).

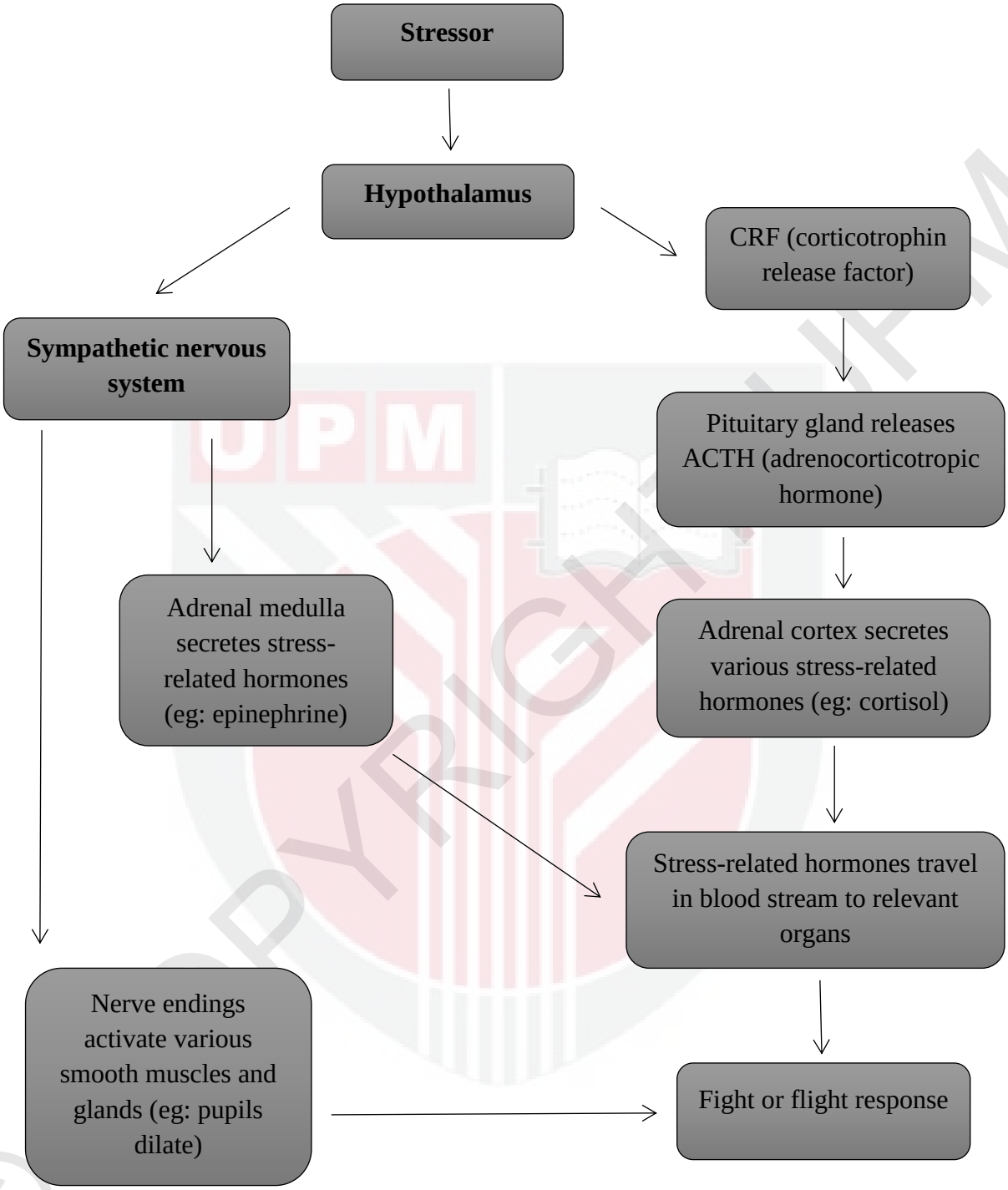

Figure 1.1: Fight or Flight Response in the Body

Source: Julia, 2005

1.2 Problem Statement

Occupational strain is one of the psychosocial hazards that can pose a threat to the health of workers and also to the health of organizations (NIOSH, 1999). In the workplace, there are many causes of psychosocial hazards. It can happen when there are inappropriate interactions between job content, work organization, work management, environmental/organizational conditions, and the employee's competencies. These interactions might affect the worker's health through their perceptions and experience during working (WHO, 2001).

Lecturer is a person who provides formal education for students at the higher institution like university and college. Lecturer is the one who gives lecture in delivering knowledge to the students. The function of lecturer is not only teaching, it may include supervise student on their project, help with the institute organization, and sometimes the lectures need to involve with the research.

National Health and Morbidity Survey (NHMS) 2011 reported that 12% of Malaysian were suffering from mental illnesses which include work-related stress among teachers and lecturers. Previous study on job strain and dissatisfaction among lecturers in School of Medical Sciences, Universiti Sains Malaysia (USM) in 2004 found 23.3% and 42.6% of prevalence for job strain and job dissatisfaction respectively.

Besides Malaysia, the stressfulness of teaching in United Kingdom has also been recognized. Labour Force Survey that conducted among those 15 years old and above in year 1990 found that there are around 183,000 cases of the national problems of work-related stress, anxiety or depression for England and Wales (Hogdson, Jones, Elliot & Osman, 1990). The educational workers like teachers, lecturers and other professionals were reported to have significantly raised rates of such psychiatric illnesses.

A study conducted among academic staffs at University of Wales and College of Cardiff found that the 74% respondents rated work as the most significant cause of stress in their lives, and 40% of them indicate time constraint as main cause of their work stress (Abouserie, 1996). Survey of Self-reported Work-related Illness estimated that 302,000 workers reporting to have stress, depression and anxiety made worse by work, of which 218,000 were caused by their work (Health and Safety Commision, 1996). Health and Safety Executive's Survey on Self-reported Working Conditions in 1995 found that working conditions continued to be sub-optimal in some circumstances. Approximately 60% of the working population had high workload some of the time and the other 20% had to do all of the time. 70% of the respondent reported working to tight deadlines and another 20% reported having insufficient support from the people in charge at workplace. The surveys concluded that jobs with significantly raised numbers of individuals reporting problems with workload

included science and engineering, nursing, professional, related supporting management and managerial, and teaching (Jones, Hodgson, Clegg & Elliot, 1997).

In Malaysia, Community College is a one stop education centre that provides the necessary training and skills at all levels. Their aim is to provide post-secondary educational opportunities so the students have the necessary skills for the job market or continue their education to a higher level. This means that the Community Colleges provide prospective technical talent from the area who are assets to our country to realize that Malaysia as a country that is oriented towards technology.

One of the reasons why lecturers in Community Colleges are having strain is due to the heavy workload. Lecturer needs to prepare lecture note, giving lecture and conducting practical class to the student. Apart of lecture, lecturers in Community Colleges do have their core business. This includes giving lectures to the communities in their surroundings on Saturday and Sunday. Besides, every three to six months the new intake's students will be registered depending on the courses. So lecturers need to manage the new intake's student for about 3 times a year and it will increase their workload. Courses that available are Automotive, Domestic wiring, Bakery, Hotel Hospitality and Management, and so on. So the workload will be increase with the new intakes of student. They need to prepare Lecturer's Record File (FRP) and Student's Record File (FRPel) for every intake.

In Community Colleges, there is a module called Sijil Modular Kebangsaan (SMK) to develop the student's skill. In this module, lecturers have to fulfil their responsibilities in giving lecture from 8 am to 5 pm every day. This may also be one of the reasons of the occupational strain among the lecturers in Community Colleges.

Previous studies have shown the effect of occupational strain to the organizations, which can lead to economical loss up to billion dollars per year. Health influences of the occupational strain are like headache, high blood pressure and hypertension. If strain attacks a large numbers of workers, the healthiness of an organization might also be affected. The performance of the workers might be dropped, and this will increase the unsafe work practices and also increase in staff turn-over (Nina & Ana, 2007).

1.3 Research Justification

Research had found that occupational strain can be a factor as much as 60 to 90% of all illnesses. Failure of the cardiovascular system and affected immune system are the examples of the physical symptoms of the illness that gained from occupational strain. The effects of strain on the digestive system cause chaos. Besides that, stress can also prevent women from conceiving, and stunted growth in children. There is a long and unending list of medical conditions that are attributed to the effects of strain including high blood pressure, ulcer, heartburn, migraine, heart disease, asthma, Pre-Menstrual

Syndrome (PMS), diabetes, obesity, infertility, Irritable Bowel Syndrome, autoimmune diseases, and skin problems (Erickson *et al*., 2001; Johari & Noor Hassim, 2009).

This study is crucial to be carried out so that the occupational strain problems can be detected at the early stage among lecturers in Community Colleges. Therefore, the preventive measure or intervention can be implemented to solve or prevent it from getting worst and give a serious health impact to the workers. The problem must be understood first before any action can be taken.

The result of this study can provide useful information to workers on how to manage their stress well. With the results obtained, appropriate actions can be done. The cortisol reading can be used as baseline in detecting stress in human. It can be objective measurement of stress and occupational strain can be detected directly using hair cortisol as the hair cortisol act as a biological marker for occupational strain. In addition, further studies can be done on towards the intervention of stress in the workplace.

Occupational strain among lecturers must be taken into consideration. Occupational Safety and Health Act (OSHA) 1994 fully recommend that working environment fit with the physiological and psychological of the workers. Occupational Safety and Health side really needs the new data and information about safety and health in their workplace. So this study can give some information to them. Besides, the objective measurement for strain can be obtained as well as the implementation of a standard range for stress by using hair cortisol level.

1.4 Research Objective

1.4.1 General Objective

To determine occupational strain and its associated factors among lecturers in Community Colleges, Peninsular Malaysia

1.4.2 Specific Objectives

1) To determine the prevalence of occupational strain among lecturers in Community Colleges.
2) To determine the association between occupational strain and socio-demography factors among lecturers in Community Colleges.
3) To determine the association between occupational strain and organizational factors (decision latitude, psychological job demand, social support and job insecurity) among lecturers in Community Colleges.

4) To measure the hair cortisol levels among lecturers in Community Colleges.
5) To determine the association between hair cortisol level and socio-demography factors among lecturers in Community Colleges.
6) To determine the association between occupational strain and hair cortisol level among lecturers in Community Colleges.
7) To predict the factors that influence occupational strain among lecturers in Community Colleges.

1.5 Research Hypothesis

1) There is a significant association between occupational strain and socio-demography factors among lecturers in Community Colleges
2) There is a significant association between occupational strain and organizational factors (decision latitude, psychological job demand, social support, and job insecurity) among lecturers in Community Colleges.
3) There is a significant association between hair cortisol level and socio-demography factors among lecturers in Community Colleges.
4) There is a significant association between occupational strain and hair cortisol level among lecturers in Community Colleges.

1.6 Conceptual Framework

Figure 1.2 shows the conceptual framework for this study. There are 4 major factors that contribute to occupational strain. The first one is sociodemographic factors which are age, gender, finance, education, and marital status (Johari & Noor Hassim, 2009). The second factor is environmental factors like temperature, pollution and noise (McLean, 1974). The third factor is personal factors like needs, spiritual, guidance and inner conflict (Mohd Zukri & Noor Hassim, 2010). The other factor is organizational factors which are decision latitude, psychological job demand, social support and job insecurity (Maizura *et al.,* 2010).

Occupational strain can cause two main problems which are health problems and psychological problems which are stress, depression and sleep disturbance. There are two hormones released when someone are exposed to strain which are alpha amylase and cortisol. Cortisol can be measured through urine, blood, saliva or hair. In this study, the concentration of the cortisol will be taken from the hair sample.

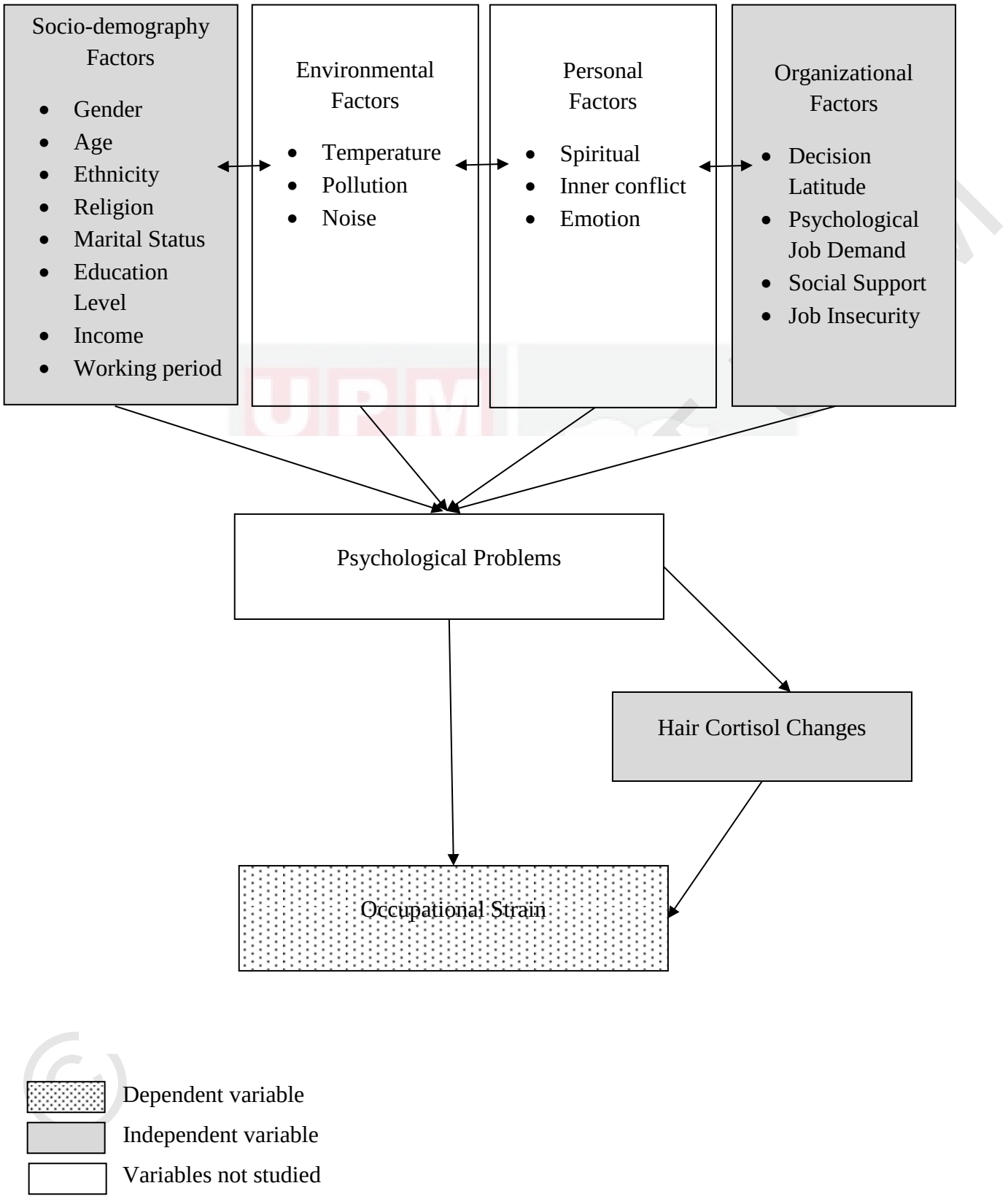

Figure 1.2: Conceptual Framework of Occupational Strain

1.7 Definition of Terms

1.7.1 Conceptual Definition

Stress
Stress is the adverse reaction people have to excessive pressure or other types of demand placed on them (HSE, 2004).

Occupational strain
Occupational strain is a physical and psychological hardships that go along with a job when workers have high demand and pressures at work and they have inadequate power to respond to the demands and expectations imposed to the job. It occurs when job demands are high and job decision latitude is low (Karasek *et al.*, 1985)

Hair cortisol
Hair is one of indicator used to measure stress hormones that are stressor specific where cortisol is the peripheral output of one of the major stress response system (Shirley & Kathy, 2002).

1.7.2 Operational Definition

Occupational strain
The level of strain can be determined by using Job Content Questionnaire (JCQ) instruments based on the score that scored by the respondents. The questionnaires were distributed to the respondents during data collection. The level of occupational strain can be identified based on the total score and the cut-off point of median for each organizational factors. Based on the total score, the respondent was divided into two groups which were high strain and non-high strain (Karasek *et al*., 1985).

Hair cortisol levels
Hair cortisol levels were categorized into high cortisol and normal cortisol where the concentration of hair cortisol obtained were compared to the expected range stated in the Manual of ALPCO Immunoassay ELISA Kit. The reference range for cortisol in hair was taken from the previous study on detection of physiological concentrations on cortisol and cortisone in human. In that study, the range for hair cortisol is 5 – 91pg/mg (Raul, Cirimele, Ludes & Kintz, 2004). Minimum period required was 3 months. Furthermore, the hair samples collected from the respondents were more than 3cm length to identify the cortisol concentration for at least 3 months period.

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