

**ASSOCIATED FACTORS AND SALIVARY  
BIOMARKER OF STRESS AMONG ASSISTANT  
MEDICAL OFFICERS IN MINISTRY OF HEALTH  
(MOH) HOSPITALS IN KELANTAN AND  
TERENGGANU**

**By**

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## **LIST OF ABBREVIATIONS**

<b>ABBREVIATION</b>	<b>DESCRIPTION</b>
CI	Confidence Interval
DASS	Depression, Anxiety and Stress Score
ERI	Effort-Reward Imbalance
GLR	General Linear Regression
HPA	Hypothalamic–Pituitary–Adrenal
HSE	Health and Safety Executive
ILO	International Labour Organization
JCQ	Job Content Questionnaires
JDC	Job Demand-Control
LR	Log-likelihood Ratio
MBI	Maslach Burnout Inventory
MOH	Ministry of Health
NIH	National Institutes of Health
NIOSH	National Institute for Occupational Safety and Health
OD	Optical Density
ROC	Receiver Operating Characteristic
SLR	Simple Linear Regression
TMB	Tetramethylbenzidine
USA	United States of America
USM	Universiti Sains Malaysia
VIF	Variance Inflation Factor
WHO	World Health Organization

## ABSTRAK

**Tajuk:** Faktor berkaitan dan biomarker stress di dalam air dalam kalangan penolong pegawai perubatan di hospital-hospital Kementerian Kesihatan Malaysia di Kelantan dan Terengganu.

**Pengenalan:** Stres adalah keadaan psikologikal dan fizikal yang berlaku apabila individu tidak dapat menangani kehendak dan tekanan keadaan. Stres dalam kalangan kakitangan kesihatan sering berlaku disebabkan oleh ekspektasi yang tinggi, kekurangan masa, kepakaran dan/atau sokongan sosial di tempat kerja. Ini akan menjurus kepada kemurungan atau penyakit fizikal dan akhirnya mengurangkan kualiti hidup dan kualiti perkhidmatan. Kewujudan pangkalan data mengenai stres adalah penting untuk meningkatkan mutu latihan kakitangan supaya mereka dapat menjalankan tugas dengan lebih efisien dan penyayang.

**Objektif:** Kajian ini bertujuan untuk menentukan prevalens stres dan faktor-faktor yang berkaitan dengan stres dalam kalangan penolong pegawai perubatan di hospital-hospital Kementerian Kesihatan Malaysia di Kelantan dan Terengganu.

**Kaedah:** Satu kajian hirisan lintang telah dijalankan ke atas 194 penolong pegawai perubatan. Borang soal selidik terdiri daripada soalan sosio-demografi, soalan dari 'Depression, Anxiety and Stress Score 42 (DASS-42)' dan juga 'Job Content Questionnaires (JCQ)'. Ujian kortisol ke atas air liur dijalankan menggunakan 'Expanded

Range High Sensitivity Salivary Cortisol Enzyme Immunoassay Kit' keluaran Salimetrics, Amerika Syarikat.

**Keputusan:** Prevalens stres adalah 13.7% (95% CI: 8.61, 18.79). Regresi mudah menunjukkan bahawa umur ( $P=0.012$ ), tempoh perkhidmatan ( $P=0.023$ ), keupayaan pelbagai ( $P=0.039$ ), kuasa membuat keputusan ( $P=0.039$ ), latitud keputusan ( $P=0.012$ ), kehendak psikologikal kerja ( $P=0.015$ ), ketidakselamatan kerja ( $P=0.000$ ), sokongan rakan sekerja ( $P=0.001$ ), sokongan sosial ( $P=0.003$ ), keadaan berbahaya ( $P=0.001$ ), pendedahan toksik ( $P=0.008$ ) dan jumlah fizikal berbahaya ( $P=0.001$ ) adalah faktor berkaitan yang signifikan. Namun begitu, regresi berganda menunjukkan hanya latitud keputusan ( $P=0.025$ ), kehendak psikologikal kerja ( $P=0.021$ ), ketidakselamatan kerja ( $P=0.009$ ) dan jumlah fizikal berbahaya ( $P=0.008$ ) adalah berkaitan secara signifikan dengan stres. Tiada hubungkait signifikan di antara kortisol di dalam air liur and stres. Hubungkait Spearman menunjukkan tiada hubungkait (0.066). Kortisol di dalam air liur adalah lebih tinggi ( $P=0.033$ ) dalam penolong pegawai perubatan yang stress berbanding yang tidak stress (0.78 berbanding 0.67  $\mu\text{g/dL}$ ).

**Kesimpulan:** Prevalens stres adalah 13.7%. Latitud keputusan, kehendak psikologikal kerja, ketidakselamatan kerja dan jumlah fizikal berbahaya merupakan faktor-faktor yang berkaitan dengan stres. Tiada hubungkait signifikan di antara kortisol di dalam air liur and stres. Walau bagaimanapun, kortisol di dalam air liur adalah lebih tinggi dalam kalangan penolong pegawai perubatan yang stress. Maka, meningkatkan persekitaran kerja, usaha

**bersepadu, kerja berkumpulan, memperkasa dan memberi lebih kuasa akan memulihkan suasana bekerja dan menghalang stres dalam kalangan penolong pegawai perubatan.**

## **ABSTRACT**

**Topic:** Associated factors and salivary biomarker of stress among assistant medical officers in Ministry of Health hospitals in Kelantan and Terengganu.

**Introduction:** Stress is the psychological and physical state that results when the resources of the individual are not sufficient to cope with the demands and pressures of the situation. Stress among healthcare staff often resulting from high expectations coupled with insufficient time, skills and/or social support at work. This can lead to severe distress, burnout or physical illness, and finally to a decrease in quality of life and service provision. Development of a stress database is important to facilitate a better personnel training in the future regarding the task and duty as an efficient and caring health care providers.

**Objectives:** The study is aimed to determine the prevalence and associated factors of stress among assistant medical officers in Ministry of Health hospitals in Kelantan and Terengganu.

**Methods:** A cross-sectional study was conducted on 194 randomly selected assistant medical officers in all Ministry of Health hospitals in Kelantan and Terengganu. The questionnaire was a self-administered questionnaire which required responses on socio-demographic data, Depression, Anxiety and Stress Score 42 (DASS-42) and Job Content Questionnaires (JCQ). Salivary cortisol level was measured using Expanded Range High Sensitivity Salivary Cortisol Enzyme Immunoassay Kit by Salimetrics, USA.

**Result:** The prevalence of stress among assistant medical officers was 13.7% (95% CI: 8.61, 18.79). Simple Linear Regression showed that age ( $P=0.012$ ), duration of employment ( $P=0.023$ ), skill discretion ( $P=0.039$ ), decision authority ( $P=0.039$ ), decision latitude ( $P=0.012$ ), psychological job demand ( $P=0.015$ ), job insecurity ( $P=0.000$ ), coworker support ( $P=0.001$ ), social support ( $P=0.003$ ), hazardous conditions ( $P=0.001$ ), toxic exposures ( $P=0.008$ ) and total physical hazards ( $P=0.001$ ) were significant associated factors. However, only decision latitude ( $P=0.025$ ), psychological job demand ( $P=0.021$ ), job insecurity ( $P=0.009$ ) and total physical hazards ( $P=0.008$ ) were significant by General Linear Regression. There was no significant ( $P=0.393$ ) correlation between salivary cortisol and stress score. The observed Spearman correlation was 0.066 suggest no correlation. Salivary cortisol was significantly higher ( $P=0.033$ ) among stressed compared to non-stressed assistant medical officers (0.78 versus 0.67  $\mu\text{g/dL}$  respectively)

**Conclusion:** The prevalence of stress was 13.7%. Decision latitude, psychological job demand, job insecurity and total physical hazards were the significant associated factors of stress. There was no correlation between salivary cortisol and stress score. However, salivary cortisol was significantly higher among stressed assistant medical officers. Hence, improving the working environment, joint workplace initiatives, team-oriented approaches practice, empowering and giving more autonomy would improve the work climate and alleviate stress among assistant medical officers.

# **CHAPTER 1**

## **INTRODUCTION**



# CHAPTER 1

## INTRODUCTION

Stress affects most people in some way. Acute stress leads to rapid changes throughout the body. Almost all body systems including heart and blood vessels, immune system, lungs, digestive system, sensory organs and brain gear up to meet the perceived danger. These stresses could prove beneficial in a critical, life-or-death situation. Over time, however, repeated stressful situations put a strain on the body that may contribute to physical and psychological problems. Chronic stress can have real health consequences and should be addressed like any other health concern. Stress is an increasingly important occupational health problem and a significant cause of economic loss (LaDou, 2004).

Assistant medical officer is an occupation characterised by a number of features not experienced in most other professions. These include not only dealing with situations involving death and dying (on a regular basis), but also more stressors such as working long hours, working shifts and weekends. This provides an indication of the complex and demanding nature of this profession and has encouraged much recent research on specific issues, including shift systems, work organisation and violence in the workplace.

In the past, many studies of stress in healthcare staff have indicated a probable high prevalence of stress (Weinberg and Creed, 2000). Increased stress has been associated with heavy workload and its effect of home life (Sutherland and Cooper, 1992), pressure of work, complaints from patients and relatives, risk of violence, poor management style (Tham *et al.*, 2004), inadequate resources, insufficient training, lack of control over work,

low involvement in decision-making (Okada *et al.*, 2005), low job satisfaction and harassment (Weinberg and Creed, 2000).

Stress among healthcare staff often resulting from high expectations from management and coupled with insufficient time, skills and social support at work. This can lead to severe stress, burnout or physical illness and finally to a decrease in quality of life and patient care service provision which include increase absenteeism and turnover (Marine *et al.*, 2009, Michie, 2002).

The modern understanding of stress is seen as a combination of external forces and internal responses. i.e. toxic environmental pressures and pathological physiological response (Hayward, 2005). Stress result from a mismatch between the demand and pressure on the person, their knowledge and abilities. Stress challenges their ability to cope with their work. This includes not only situations where the pressure of work exceed the worker's ability to cope but also where the worker's knowledge and abilities are not sufficiently utilized while performing their duty and this can make them in stress (Leka *et al.*, 2003).

The long term effects of work stress and the higher incidences of burnout of medical staff in emergency and intensive care units are more common compared to other units (J K Sluiter *et al.*, 2003). Stress is also likely to reduce work performance and increase rate of accidents among them (Michie, 2002).

Job stress is recognized world-wide as a major challenge to workers' health and the healthiness of their organizations. Workers who are stressed are also more likely to be

unhealthy, poorly motivated, less productive and less safe at work (Leka *et al.*, 2003) which later on lead to poor quality of life (Michie, 2002).

Study done in Belgium, found that cumulative experience and recent onset of job stress in terms of high effort spent and low reward received were associated with elevated risk of poor mental health (Godin *et al.*, 2005). Hence, identifying the risk factors of stress caused by job factors could lead to early prevention. Prevention of job stress includes measures that interrupt or slow the progression of illness, hence, identifying and modifying risk factors, such as job factors at susceptible stage, may prevent the occurrence of job stress (Aziah *et al.*, 2004).

Several studies had shown job stress has correlation with several salivary biomarkers such as salivary cortisol, salivary alpha amylase and chromogranin A. Activation of the hypothalamic–pituitary–adrenal (HPA) axis which measured by salivary cortisol reflects the chronic stress where as activation of the sympatho–adreno–medullary (SAM) system, which measured by salivary alpha-amylase and chromogranin A reflects acute stress exposure (Koh and Koh, 2007).

Cortisol is a glucocorticosteroid of the adrenal cortex and affects the metabolism of proteins, carbohydrates, and lipids. Cortisol stimulates gluconeogenesis by liver, inhibits the effect of insulin and decreases the rate of glucose used by cells. In healthy normal individual, the secretion rate of cortisol is higher in the early morning (6.00-8.00 am) and lower in the evening (4.00-6.00 pm). However, this variation is lost in patient with Cushing's syndrome and person under stress (Fischbach, 2000).

# **CHAPTER 2**

# **LITERATURE REVIEW**

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Definition Of Stress**

Stress derives from the Latin verb, stringo (stringere) meaning to bind or draw tight, but also to graze, touch, pluck, or prune. It entered the English language in the 14<sup>th</sup> century as a modified form of distress or distraint. In its early uses it referred to a physical hardship or trial, but by the 16<sup>th</sup> century it also indicated a form of physical injury. In these early uses, stress was seen as an unpleasant condition of the environment rather than of the individual. It was not until the 17<sup>th</sup> century that the word began to refer to an inner state (Hayward, 2005).

Stress has been defined in different ways over the years. Initially, it was defined as pressure from the environment, then as strain within the person. The currently accepted definition is, the interaction between the situation and the individual. It is the psychological and physical state that results when the resources of the individual are not sufficient to cope with the demands and pressures of the situation. The magnitude of stress is more likely in some situations than others and in some individuals than others. Stress can undermine the achievement of goals, both for individuals and for organizations (Michie, 2002).

Job stress can be defined as the harmful physical and emotional responses that occur when the requirements of the job do not match the capabilities, resources, or needs of the worker. Job stress can lead to poor health and even injury (NIOSH, 1998).

## **2.2 Job stress concepts and models**

There are many different theories that explain how job stress occurs and causes adverse health effect. Even though the theories may differ, nevertheless the theories overlap and complement each other.

An interesting concept is burnout. The burnout syndrome has three distinct but loosely coupled dimensions: emotional exhaustion (feelings of being emotionally overextended and exhausted with one's work), depersonalization (the development of negative and uncaring attitudes towards others), and negative personal accomplishment (the loss of feelings of self-competence and dissatisfaction with one's achievements) (Poghosyan *et al.*, 2009). The Maslach Burnout Inventory (MBI) is an instrument that assesses these three dimensions. This instrument has been used in burnout research across a wide range of human environments (Kirwan and Amstrong, 1995).

Another model, the Effort-Reward Imbalance (ERI) model explains that workers expend effort at work and they expect rewards (money, esteem, status control) as part of a socially (negotiated) organized exchange process of work. According to the model, strain can occur if there is an imbalance between the efforts a worker puts in, and the received rewards. It focuses on the reciprocity of exchange at work where high costs/low gain conditions (i.e. high effort and low reward) are considered particularly stressful (Siegrist, 1996).

The National Institute for Occupational Safety and Health (NIOSH) model favors the views that working conditions play a primary role in causing job stress. However, the role of individual factors is not ignored. According to the NIOSH view, exposure to stressful

working conditions (job stressors) can have a direct influence on workers' safety and health. However, individual and other situational factors can intervene to strengthen or weaken this influence. Examples of individual and situational factors that can help to reduce the effects of stressful working conditions include balance between work and family or personal life, a support network of friends and coworkers and a relaxed and positive outlook (NIOSH, 1998).

Palmer *et al.* (2001) developed a simplified model of job stress based on information from the Health and Safety Executive (HSE). This model summarizes potential causes, symptoms, negative outcomes and financial cost due to stress. The HSE recommends a five-step stress risk assessment that focuses on seven major hazards (1) culture of the organization and how it deals with stress; (2) demands of the job that include exposure to physical hazards and workload (such as volume and complexity of work and shift work); (3) control of the job at hand that specifies employee involvement and how they do their work; (4) relationship at work; (5) change and its management and communication to staff (such as staff understanding as to why change is necessary); (6) roles expected of employees and that jobs are clearly defined; and (7) support in the workplace such as those from peers and line managers (Palmer *et al.*, 2001).

The Job Demand-Control (JDC) model focuses more on the work environment. This model argues that job strain results from the combined effects of high job demand and low job control. Many models of stress attempt to integrate individual and environmental factors to show how stress is generated. An ideal model for occupational stress should be useful to both research and in practical problem-solving. It should have a clear definition of how

stress develops which explains certain events cause stress in some individual but not in others, as well reasons for stress may lead to pathologic or beneficial effects depending on circumstances and all major factors that determine the stress response should be considered in the model. None of the available models meet all these criteria (LaDou, 2004). However, JDC and ERI models that focus on job and personal factors, provides key elements for stress prevention (Dollard, 2001).

Many of the international researches on job stress focused on the effects of job stress on its adverse outcomes such as cardiovascular disease and its risk factors (blood cholesterol, smoking, distribution of body fat), hypertension etc. While many studies show good epidemiologic evidence associating occupational stress with a number of disease states, the pathophysiological mechanisms often remain obscure.

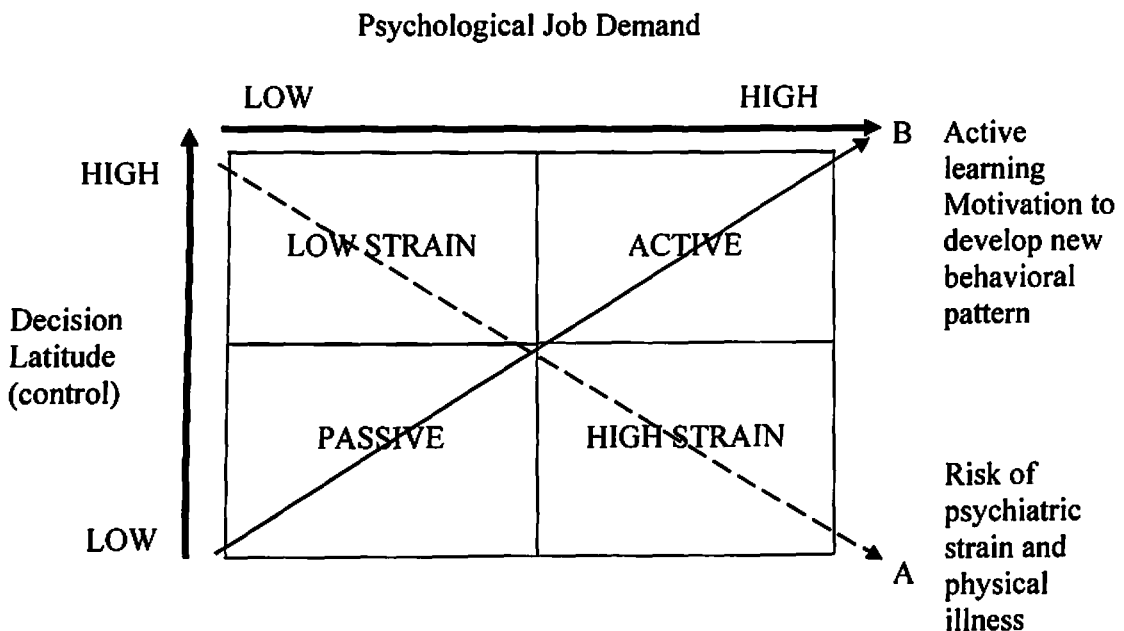


Figure 1. Karasek's Job Strain Model