

# Association of Physical Workload with Salivary Cortisol in Clinical Pharmacist

Errisa Sulfiana<sup>1</sup>, Abdul Rohim Tualeka<sup>2</sup>, Noeroel Widajati<sup>2</sup>

<sup>1</sup>Student in Magister of Occupational Health and Safety, <sup>2</sup>Lecturer in Department of Occupational Health and Safety, Faculty of Public Health, Airlangga University, Campus C Mulyorejo, Surabaya-Indonesia

## ABSTRACT

**Objectives:** Identify physical workload, identify salivary cortisol levels in clinical pharmacist, analyze physical workload and cortisol levels in clinical pharmacist **Method:** using calorimeter HR watch to measure physical workload specifically for work metabolic, and using ECLIA method to measure salivary cortisol **Results:** There was a 47.1% correlation between physical workload and cortisol levels.

**Keywords :** Pharmacist, Workload, Stress, And Salivary Cortisol.

## BACKGROUND

Prolonged negative stress can affect physical and psychological health. Its called distress, can affects the intentions, appearance and daily behavior while working, if the level of distress increases in a company and industry, then there will be decreased performance and the emergence of several diseases caused by stress<sup>27</sup>. Reaction to stress, in the defense mechanism of the body, physically and psychology known as General Adaptation Syndrome (GAS)<sup>27</sup>. There are consist of, the first stage is the alarm stage, then the stage of survival and fatigue stage<sup>27</sup>. At the alarm stage is notification to the body about events that are not in accordance with the expectations, it is necessary to adjust psychologically by physiological coping and adjustment mechanism, where this phase of the body began to secrete hormones for defense. In the autonomic nervous system there are two processes that must run simultaneously when the stress is approaching, the sympathetic nervous system that makes coping mechanisms and parasympathetic nervous system responsible for the increase of the hormone cortisol<sup>27</sup>.

When stress comes, the kidney-parasympathetic kidney system (the adrenal cortex) secretes excessive hormones through the central nervous system of the pituitary gland. The hormone cortisol will affect the metabolism of proteins, carbohydrates and fats in the body. The protein synthesis is reduced and glucose production is enhanced by the mobilization of glycogen reserves, as well as the release of fatty acids into the blood. As a result of these changes, the body can adapt to stressful pressures that threaten it, and therefore cortisol plays an important role in the metabolism of carbohydrates. The effect of catabolism from cortisol causes the inhibition of protein formation of amino acids, whereas glucose conversion is accelerated, whereas potassium increases excretion by maintaining electrolyte and water balance.

Measurement of cortisol in the body especially in the salivary glands has been set as a bio indicator of individual stress response<sup>20</sup>. There is a significant relationship between cortisol in saliva and the hormone cortisol in the body<sup>28</sup>. Cortisol in saliva occurs as a result of activation by the adrenal cortex gland at the alarm stage of the general adaptation syndrome process. Therefore long-lasting stress will continuously increased with very different levels as normal cortisol as usual in the body. This will cause changes in function and hormones in the body that should be in a state of normal and down at night but levels remain high at night, especially the hormone cortisol<sup>11</sup>.

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### Corresponding author:

**Dr. Abdul Rohim Tualeka**

Lecturer in Department of Occupational Health and Safety, Faculty of Public Health, Airlangga University Campus C Mulyorejo 60115 Surabaya-Indonesia, E-mail: Inzut.tualeka@gmail.com

The greatest factor of job stress in the pharmaceutical worker is the result of much work to be done. That Caused also by a change of mindset and the times, of which initially only aimed for an increase in drug services turn out to be an increase in services to patients<sup>13</sup>. In Johnson et al (2014) study due to overworked workload and the large number of duties of pharmaceutical workers, the turn-over rate increased as well as the occurrence of burn-out syndrome due to the very defeat, causing illness to the pharmaceutical workers. Physiologically, when pharmaceutical workers, are required to work effectively and efficiently, the body will release hormones to match the workload. The hormone release cortisol that is needed in the metabolism of carbohydrates and fats for energy formation will soon be adjusted to the needs of the worker's body. This situation is abnormal if the load exceeds the limit that is given that could not be tolerated to cause mental and physical stress, and ultimately change concentrations several hormones in the body quickly<sup>11</sup>. The level of salivary cortisol before work and after work can be a biomarker of stress level of physical and mental effort pharmacy so that mistakes in work such as medication errors, and achieve productivity with efficiency and effectiveness in working on the recipe and do not damage the health of workers .

## MATERIALS AND METHOD

The study conducted in Pharmacy Installation of Bhakti Dharma Husada General Hospital, Surabaya, East Java province, Indonesia. Population of the study were clinical pharmacist under the pharmacy installation, and worked on emergency unit, outpatient unit, inpatient unit, and drug warehouse, with total population of 20 clinical pharmacist. The variables in this study were cortisol in saliva as dependent variable, and physical workload as independent variable. The physical workload is measured using calorimeter HR watch. The calorimeter used for 4 hours as long as they work. Levels of salivary cortisol were measured using the ECLIA method (electron chemo luminescent immune assay) taken during and before work.

## RESULTS AND DISCUSSION

Pharmaceutical activity such as pharmaceutical preparation, medical devices and medical consumables and clinical pharmacy services demanding very heavy and exhausting physical and mental activity. As a result of physical and mental activity there is an imbalance between

the tasks that must be done by pharmaceutical personnel with physiological capacity owned by pharmaceutical workers. This imbalance causes adaptation mechanism. At the time of the adaptation mechanism the body will activate the HPA axis, by producing a large cortisol and channeled to several organs for use as a mechanism of body adaptation to workload. This is done so that the body can perform metabolic processes to produce enough energy to meet the physical and mental demands of pharmaceutical personnel.

Physical work is an activity to complete a job requiring physical energy in the human muscle that will serve as a source of energy. Physical work will be entirely dependent on human efforts that serve as a source of energy and work control. Physical demands on pharmaceutical workers such as work stations, workplace layouts, work tools and equipment, working conditions or workplace, work attitude. Physical demands require muscle work during the working period, and energy consumption is a major factor in making the benchmark determinants of weight / light of a job.

The physical work load measuring instrument uses the ultimate gear calorimeter watch. Pharmaceutical workers in pairs of these tools when they start to work and released after the respondents use these watches for 4 hours they work. This HR watch calorimeter works by keeping track of the calories released by the user's body, the calories in the can from the results of metabolism. Metabolism is a chemical process to change some substances especially carbohydrates out heat, that heat will be recorded by the calorimeter. The metabolic process is strongly influenced by the body area then height and weight data is required. If the metabolism process occurs then the activation of HPA axis also occurs, because HPA axis is the activating process of metabolism.

The results of measurements of 16 pharmaceutical workers to remove calories of 100 -200 calories and included in the category of light workload, while 4 people remove calories from 201 to 350 calories and included the category of medium workload. Pharmaceutical work is a category of light work, because pharmaceutical work does not require much muscle activity. The results of the observation of the respondents are more like entering patient data, preparing recipe and communication to fellow colleagues. Activities that are not in a sitting position are when taking drugs on shelves, in warehouses,

counseling with patients and distributing drugs to the spaces and visit with other colleagues.

The measurement of the physical workload using the calorimeter becomes less precise because the number recorded on the monitor is the heat released by the body due to metabolism, while the pharmaceutical work in the cold and moist heat, so that the release of body heat is hampered by cold room. The cold room is required to maintain the stability of drugs stored in the same room where the pharmacy works. Physical workload will produce fairly accurate results if measured not only calories, but calculate the overall energy needs<sup>10</sup>. Energy requirements are needed for basal metabolism, metabolism rest and metabolism work.

The result of statistical analysis, the correlation coefficient of kendall-tau obtained is 0.228, with the strength of the relationship of 47.1%. Correlation coefficient is a test to see how the relationship between independent and bounded variables. Coefficient is 0.228 can be said to be closer to the number 0 which means having a weak relationship, with the strength of the relationship is only 47.1%. The relationship between the variables is weak because the researchers only perform the measurement of 1 metabolism results alone, while for measure physical workload in need calculate the total metabolism. Levels of cortical have metabolic functions throughout the body so it needs to be measured overall as basal metabolism and rest should also be measured. The researchers did not make the measurements because of the limitations of pulse measuring devices, heart rate measurers, and health workers in hospitals unlike workers who have hours of rest because the service to patients is preferred if doing a complete measurement will disrupt the pharmaceutical job.

Results from the measurement of cortical levels 20 pharmaceutical population of 5 people had elevated levels of cortical after work. When viewed from the workload that tends to be mild and moderate, 5 pharmaceutical workers are producing excessive levels of cortical. This abnormal level of cortical may occur because the pharmaceutical worker must continue to perform all of the pharmaceutical work to serve the patient, other peers, while in the body continuously activates the HPA axis pressure, causing cortical levels that do not follow the rhythm diurnal with the level high because it always activates cortical secretion.

According to Manauba (2000), task demands in this case the task and material characteristics, organizational characteristics and environmental characteristics must be balanced with a person's work ability, if the demands of work are too low or too high will cause stress. Judging from the demands of pharmaceutical work is in need of speed and accuracy, while the physiological ability of the pharmaceutical workers is cortical levels in abnormal circumstances, there is an upside down situation. This situation is turning to prepare a work full of pressure so that the body is always vigilant. Jobs that are too low because of the work of pharmacy is a job that is not much use of muscle, so that energy is not much for physical activity but mental activity, so it needs to do a review related to the pharmaceutical task in do 5 people. Working efficiently is expected to increase the rest time so that it can be productive again, while not working for 1 month, it is necessary to reduce the task because the pharmaceutical worker is still in the process of adjusting the given task.

## CONCLUSION

Physical workload for clinical pharmacist in pharmaceutical installations in hospitals account for 16 pharmaceutical workers have calories of 100 - 200 calories in the category of light workload, while 4 people have calories from 201 to 350 calories and in the category of medium workload There is a weak correlation between the physical workload is 0,228 with the strength of the relationship is only 47.1%.

**Conflict of Interest:** None

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**Ethical Clearance:** The research proposal has been approved by Health Research Ethical Commission of Public Health Faculty Airlangga University, number: 540-KEPK. All respondents were given explanation and information about the purposes and methods of the research, and also had signed informed consent forms.

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