MAEH Journal of Environmental Health eISSN 2637-1359
Jurnal Kesihatan Persekitaran MAEH
Published By Malaysian Association of Environmental Health
http://www.maeh4u.org.my/journal

RESEARCH ARTICLE

Cross-sectional Study of Heat Stress and Blood Pressure Among Quarry Workers in Bukit Mertajam

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Abstract

A cross-sectional study was conducted on quarry workers located in Bukit Mertajam. The objective of this study was to study the exposure to heat and blood pressure of quarry workers. A total of 38 employees was selected as respondents in this study. The variables studied were the Heat stress index, systolic and diastolic blood pressure, duration of work and heat exposure time. The results showed that there was no significant relationship between work duration and heat stress where the p = 0.564 values exceeded the alpha value of 0.05. The study also found that there was no significant relationship between heat exposure and heat stress with p=0.639 and above the alpha value 0.05. The results showed that the heat exposure period had a significant relationship between heat exposure and systolic blood pressure (p = 0.001) where this value was less than alpha 0.05 but there was no significant relationship between heat exposure and diastolic blood pressure (p = 0.295) where this value exceeds p = 0.05. Correlation analysis of Heat Stress with systolic and diastolic blood pressure showed that there was no significant relationship where the Heat Stress value with systolic blood pressure was r = 0.037, p = 0.825 while sig Heat pressure with blood diastolic pressure was r = 0.236, p = 0.153, where both values exceed the alpha value of 0.05. Heat can respond to the human body due to environmental and non-environmental factors.

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Keywords**:** *Heat Stress, systolic and diastolic blood pressure.*

INTRODUCTION

Working environment is a broad term and means all your surroundings when working. Any physical working environment is combination of air temperature, humidity, light. noise and heat radiation. Among all this the four factors, which is associated with the production of heat from the body, is called heat stress. The physical condition of working environment affects the capacity or performance of a worker. Productivity, efficiency, and effectiveness of work are strongly influenced by the climate (weather) of work (Suma'mur, 2009).

Working in a hot environment or exposure to high temperatures can cause stress to the body. When this stress combined with physical activities can lead to dehydration, fatigue. and disruptions in the body When dehydration and fatigue or fatigue combine with stress can cause health problems such as heat rash, heat cramps, heat exhaustion, heat stroke and heat exhaustion. Heat stress is a physical hazard and can cause severe health problems, either directly or indirectly to workers. Heat stress can occur when the body fails to control the internal temperature and may not return to normal temperature by itself.

Workers in many occupations are at high risk for exposure to heat stress. Some of the higher risk occupations include local council workers, grass cutters, land surveyors, road builders, firefighter, bakery worker, miner, military personnel, construction worker, factory worker, security guards, boiler room worker, landscaper, some athletes and agricultural worker. Therefore, a comfortable and comfortable work environment is essential for employees to work optimally and productively.

Heat stress occurs when our body is unable to cool itself enough to maintain a healthy temperature. Normally, the body cools itself by sweating, but sometimes sweating isn't enough and the body temperature keeps rising.

PROBLEM STATEMENT AND RESEARCH OBJECTIVE

Many employers and workers in Malaysia remain relatively unaware of how dangerous working under the sun is despite some places having seen temperatures up to 37°C. The Department of Occupational Safety and Health (DOSH) enforcement activities showed that various workplaces had a high risk of machinery or work processes that generated high amounts of heat. The awareness among employers and workers on the exposure to heat stress situations is low and has to be overcome," it said in an e-mail response to queries on the dangers of heatstroke among workers. DOSH, it said, came up with guidelines for employers to deal with heat stress situations at workplaces in 2016, which should be in place in all sectors, including construction.

According to Section 15(1) and Section 15(2)(e) of Occupational Safety and Health Act 1994 stipulates the duty of employers and self-employed persons to their employees. The provision and maintenance of a working environment for the employees should be as far as is practicable, safe and without risk to health while at work. Under Factories and Machinery Act 1967 Section 22(d) (i) stipulates effective and suitable provision shall be made for securing and maintaining such temperature in ensuring reasonable conditions of comfort and prevention from bodily injury to any person employed in a factory. Section 22(d) (ii) stipulates, a standard of reasonable temperature may be prescribed by the Minister to prohibit the use of any methods of maintaining a reasonable temperature, which in his opinion are likely to be injurious.

DOSH said that as of July 2018, 151 cases of employers flouting rules on their workers' safety had been brought to court, resulting in RM1.9mil in penalties. Last year, there were 288 cases with RM 3.2mil penalties. There were also 716 compounds and 19,695 notices issued against errant employers.

Research in occupational heat stress in developing countries like Malaysia is limited because of several challenges and constraints. There are a few challenges such as permission conduct research and to publish the data of industries, resistance for change from employers and workers, improper record of any occupational disease by the employer or worker.

Therefore this study was designed to find the current status of heat stress and its association elevated blood pressure between occupational heat exposure and health impacts among factory workers. This study will to examine this association between blood pressure and heat stress among workers in quarry workers of FYS Marketing Sdn Bhd Bukit Mertajam. This research will provide valuable information to protect worker's health with regard to heat exposure in working environment and to review the current guideline on heat stress management by DOSH.

METHODOLOGY

This cross sectional study was conducted in a quarry company in Bukit Mertajam. A universal sampling method was used to evaluate heat stress and blood pressure among all employees. Demographic data of all 38 respondence were collected using validated self-administered questionnaire. Wet Bulb Globe Temperature (WBGT) instrument were used according to the standard operating procedure to measure the heat stress among study group. WBGT used to determine by computing air temperature (TA) and relative humidity (RH %) in accordance to the standardized Heat Stress Index table. Data on blood pressure were obtained using the Omron Blood Pressure Meter. Systolic and diastolic blood pressure were measured.

FINDINGS

A non-parametric test were run for all parameters as the Shapiro will test shows p value for each test was below 0.05. Therefore, non-parametric test was run for all analysis. Spearman rho correlation test was used to analyse the correlation between heat stress and duration of service among 38 respondents reveal that the value r = 0.097 with p = 0.564 (table 1.0) Therefore there is no positive correlation between duration of employment and heat stress of the workers.

Table 1: Correlation between heat stress and duration of service

	Heat stress		
	N	r	p
Duration of work	38	0.097	0.564

** *p,0.05*

To determine correlation between duration of heat exposure in a working day with Heat Stress was analyzed using Kruskal Wallis test was used. The results in table 2.0 indicate that duration of working in a day does not gives any significant effect to heat stress (p=0.650). However, the highest ranking heat stress was recorded among those works more than 7 hours in a day.

Table 2: Correlation test between exposure duration and heat stress.

Duration of heat exposure	Heat Stress			
	N	Mean rank	Test statistic	p
1-3 hours	7	17.14		
4-6 hours	17	18.76	0.896	0.639
>7 hours	14	21.57		

** *p,0.05*

In order to find the effect of heat stress to workers blood pressure Kruskal-Wallis was used to compare mean heat stress between systolic and diastolic blood pressure. The analysis shows that the highest mean systolic and diastolic blood pressure showed that the highest mean systolic 26.76 and 22.62 for diastolic was recorded among 5 to 6 hour working in a heat producing working environment. Thus duration of occupational heat exposure does significantly affect the systolic (p = 0.001) but not significant with diastolic (p = 0.295).

Table 3: Mean systolic and diastolic with duration of exposure.

Duration of heat exposure	Blood pressure			
			systolic	
	N	Mean rank	Test statistic	p
1-3 hours	7	11.71		
4-6 hours	17	26.76	13.461	0.001
>7 hours	14	14.57		

Duration of heat exposure	Blood pressure			
			diastolic	
	N	Mean rank	Test statistic	p
1-3 hours	7	16.57		
4-6 hours	17	22.62	2.442	0.295
>7 hours	14	0.295		

*** p,0.05*

Correlation spearman test was performed to test the correlation between heat stress with systolic and diastolic blood pressure showed. Output of the test indicate r = 0.037 with p = 0.825 for systolic blood pressure and r = 0.236 with p = 0.153 for diastolic blood pressure. Therefore heat Stress does not affect the systolic and diastolic blood pressure where with p value exceeding 0.05.

Table 4: Correlation Spearman Test to compare mean systolic and diastolic with duration of exposure.

Blood pressure	Heat stress		
	N	r	p
systolic	38	0.037	0.825
diastolic	38	0.236	0.153

*** p,0.05*

CONCLUSION

The human body can react with heat due to environmental or non-environmental factors. A healthy body can maintain an internal temperature of about 37oC. Temperature changes of less than 1oC occur at certain times depending on the level of physical activity or emotional state. Temperature changes of more than 1oC occur during illness or when environmental conditions exceed the body's ability to handle extreme heat. In very hot conditions, the rate of heat reception is higher than the rate of heat loss and body temperature begins to rise. Increasing body temperature can lead to heat-related illnesses. In addition, it is hoped that future studies will provide more detailed emphasis on other aspects of the environment and physiology so that Heat Stress events can be detected early and as a precautionary measure in the event of more serious and serious health problems.

Occupational heat stress is a major health burden with several potential negative health and well-being outcomes. Workers in certain industries are regularly exposed to heat stress due to thermal heat in working environment. Duration of working in such working environment does has positive effect to blood pressure especially on systolic. Prolonged exposure to heat stress will adverse health effect to the workers. Therefore, it is much essential in the current scenario to study the broader spectrum of health impacts due to heat stress among workers. This may provide valuable data and information to protect their health through proper planning and implementing suitable interventions to reduce morbidity and mortality of workers. Such policies subsequently will increase the productivity of any workplace. All employers are required to adopt and adapt the relevant guideline in managing heat stress at workplace and to fulfil one of the general duties under the Occupational Safety and Health Act 1994 and the Factories and Machinery Act 1967.

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