

Assessment of Heat Stress and Physiological Changes among Paint Manufacturing Workers

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Structured Abstract

Background: Daily heat exposure during the summer season poses a significant challenge, particularly for individuals employed in occupations where air conditioning or other technical cooling methods cannot be effectively implemented. Outdoor workers in Malaysia performed tasks under temperature of 30.5°C for 8 hours work shift. This cross-sectional study aims to evaluate the heat stress level among the workers in different working conditions, i.e., outdoor and indoor, observe the physiological changes, i.e., blood pressure, core body temperature, and heart rate among them and finding the correlation between WBGT index with physiological changes.

Methods: A self-developed questionnaire adopted from previous study was also used to determine the heat-related symptoms among the workers. A total of 60 workers were included in this study. The level of heat stress was identified by comparing Wet Bulb Globe Temperature (WBGT) index with Action Limit (AL) and Threshold Limit Value (TLV), while the physiological changes were measured by using digital blood pressure monitor and tympanic thermometer.

Results: Raw material department (outdoor condition) recorded the highest WBGT index which is 32.9 °C ± 2.0°C compared with indoor WBGT index which are 28.5 °C ± 0.1°C and 26.7 °C ± 0.6°C. Based on the results, the level of heat stress risk in indoor conditions is considered as medium while the outdoor conditions heat stress level is denoted as high risk. The most common heat-related symptoms are thirst (93.3%) and heavy sweating (80%). As for the physiological changes, core body temperature showed a significant increase after the work shift, particularly among outdoor workers (+0.7°C). There is a decrease in the blood pressure reading for both conditions. Only diastolic blood pressure showed a statistically significant correlation with WBGT ($p < 0.01$), indicating a strong inverse relationship where diastolic BP consistently decreased as heat stress increased.

Conclusion: Although most of the findings showed no significant correlation, mitigation measures should be taken to control future heat exposure.

Keywords: Wet Bulb Globe Temperature, Heat Stress, Physiological Changes, Correlation, Manufacturing

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