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The Study of Indoor Air Quality (Biological Contaminants) Between Air-Conditioned and Non-Air-Conditioned Restaurants

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Structured Abstract

Background: Indoor air quality (IAQ) is a significant source of the public health concern in the restaurant working environment, where the workers are constantly exposed to air pollutants. Biological contaminants (bacteria and fungi) are frequently ignored as compared to physical and chemical parameters, although they can also lead to respiratory symptoms, allergies, and poor work performance. The ventilation systems especially air-conditioned versus non-air-conditioned may play a significant role in the degree of airborne biological contamination. However, biological IAQ has not been well studied in Malaysian restaurants. Thus, this study compared airborne bacterial and fungal in air-conditioned and non-air-conditioned restaurants and assessed their potential health effects on workers.

Methods: The study was conducted in four selected restaurants located in Seksyen 13, Shah Alam, comprising two air-conditioned and two non-air-conditioned premises. Active air sampling was carried out using a BioStage single-stage impactor with Trypticase Soy Agar (TSA) for bacteria and Malt Extract Agar (MEA) for fungi. The concentrations of microbes were expressed as colony-forming units per cubic meter (CFU/m^3) and compared them with the ICOP IAQ 2010 limits. Workers received questionnaires to determine environmental conditions and health symptoms, and SPSS Version 29 was used to analyse the data.

Results: The findings showed the bacterial concentrations in air-conditioned restaurants were higher with mean of 759.72 CFU/m^3, which was above the ICOP IAQ 2010 permissible limit of 500 CFU/m^3. However, non-air-conditioned restaurants had more fungal concentrations with highest mean of 197.88 CFU/m^3, shows all fungal concentrations were lower than the recommended concentration of 1000 CFU/m^3. The correlation analysis showed that there was a significant positive correlation between bacterial concentration and drowsiness ($r = 0.528$, $p < 0.05$). There were strong positive correlations between fungal concentrations and high temperature ($r = 0.706$), plus correlations with passive smoking and unpleasant odour.

Conclusion: The results reveal that the type of ventilation has a significant impact on the level of airborne biological contaminants in restaurants and could be the cause of the health symptoms in the workers. Monitoring of IAQ regularly and effective ventilation control are necessary to reduce the occupational exposure and enhance the quality of indoor environment in restaurant environments.

Keywords: Indoor Air Quality, Microbial Air Contamination, Ventilation

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