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Assessment of Chemical Parameter in Indoor Air Quality that Affect Worker Health in Office

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Structured Abstract

Background:
Indoor air quality (IAQ) is increasingly important in occupational health, especially in office settings where workers may spend time attending to their indoor environment. Chemical agents like particulate matter ($PM_{2.5}$ and PM_{10}), total volatile organic compounds (TVOCs) and carbon dioxide (CO_2), respectively, have been related to health symptoms and decreased work performance. In Malaysia, poor natural ventilation, widespread use of air-conditioning and occupancy of building has contributed to increase indoor pollutant concentration. This research was aimed at measuring selected chemical IAQ parameters in a corporate building in Cyberjaya and to consider any possible implications of such exposures on worker's health.

Methods:
A descriptive cross-sectional study design was applied. Indoor air monitoring was conducted at five strategically selected sampling points representing different functional areas and occupancy levels within the office. Real-time instruments were used to measure $PM_{2.5}$, PM_{10}, TVOCs, and CO_2 concentrations. Data collection was supported by walkthrough inspections and a structured questionnaire survey based on the Malaysian Industry Code of Practice on Indoor Air Quality (ICOP 2010) to identify health symptoms associated with Sick Building Syndrome (SBS). Measured values were compared against national and international exposure limits.

Results:
The results of chemical testing showed presence of material in the monitor to be acceptable. $PM_{2.5}$: 0.2 to1.3 µg/m³, PM10: 0.001 to 0.056 µg/m³, TVOCs: 0.00 ppm for all. CO_2 ranging from 447 to 609 ppm). Although the ventilation rate met standards, and symptoms of headache, lassitude and dry eyes were reported by over 20% building occupants from questionnaire responses which was meting standard for Sick Building Syndrome. These symptoms were poorly related to the levels of chemical pollutants but rather appear to be influenced by physical indoor factors such as low temperature and low relative humidity due to central room air-conditioning.

Conclusion:
This study also found that the tested corporate office had safe chemical indoor air quality. Nevertheless, the occurrence of symptoms SBS related suggests worth considering non-chemical IAQ parameters. Optimization of mechanical ventilation and air-conditioning systems, coupled with periodical IAQ monitoring, is considered a worthwhile investment for improved occupant comfort, health and overall workplace productivity over the long term.

Keywords: Indoor Air Quality (IAQ), Chemical Parameters, Office Environment, Worker Health, Sick Building Syndrome (SBS)

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