Association of Indoor Air Pollutants with Leukotriene B4 (LTB4) on Airway Inflammation among Preschool Children in Selected Areas of Selangor

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Abstract

Preschool children are especially vulnerable to indoor air pollutants (IAPs) due to their developing respiratory systems and prolonged indoor exposure. While poor indoor air quality (IAQ) may trigger respiratory symptoms and airway inflammation, evidence linking specific IAPs to inflammatory biomarkers remains limited. This study examined the association between IAPs and airway inflammation, measured by salivary leukotriene B4 (LTB4), in urban and suburban areas. A cross-sectional study was conducted among children aged 4–6 years in Selangor, Malaysia. Data collection included a structured questionnaire adapted from the American Thoracic Society (ATS) and the International Study of Asthma and Allergies in Childhood (ISAAC), saliva sampling for LTB4 analysis, and IAQ assessments in classrooms. Parameters measured included temperature, relative humidity, air velocity, carbon dioxide (CO_2), particulate matter (PM_{10} and $PM_{2.5}$), volatile organic compounds (VOCs), carbon monoxide (CO), and airborne bacteria and fungi. Significant differences were found between urban and suburban preschools in PM_{10}, $PM_{2.5}$, VOCs, CO, and microbial levels ($p<0.05$). Elevated indoor bacterial levels were significantly associated with higher LTB4 concentrations ($\beta = 1.600$, $p = 0.021$) and blocked nose symptoms (OR = 5.2). Although mean LTB4 levels did not differ significantly by area ($p = 0.423$), associations were observed between LTB4 and blocked nose (OR = 3.1). PM_{10} exposure was linked to phlegm (OR = 2.7). These findings suggest that specific IAPs, particularly airborne bacteria, may contribute to airway inflammation in preschoolers. Accordingly, policy measures such as regular IAQ monitoring, microbial source control, air filtration, and improved ventilation are recommended to reduce early-life exposure to indoor pollutants and to safeguard respiratory health in preschool settings.

Keywords: Leukotriene B4 (LTB4); preschool children; respiratory health; indoor air pollutants (IAP); airway inflammation