

HEALTH RISK ASSESSMENT OF AMBIENT AIR BTEX AMONG ADULTS AND CHILDREN IN CITIES OF MALAYSIA

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Introduction

Benzene, toluene, ethyl-benzene and xylene (BTEX) are groups of volatile organic compounds (VOCs) that hazardous to human health. Benzene is an example of carcinogen that could cause malignancy of the blood (Group A, USEPA). In Malaysia, BTEX is not included in the National Ambient Air Quality Standards (NAAQS). Therefore, the aim is to assess the chronic health risk following exposure to ambient air BTEX among adults and children in the cities of Malaysia in 2022.

Methods

The Continuous Ambient Quality Monitoring Stations (CAQMS) measured the ambient air BTEX. We obtained the data for 2022 from the Department of Environment (DOE) Malaysia. Health risk assessment (HRA) was used to assess chronic health effect following exposure to ambient air toxicants. The calculation of health risk was performed for adults and children in 11 cities in Malaysia based on the standard method from the United States Environment Protection Agency (USEPA) using the highest monthly readings of ambient air BTEX. The assumptions used for the calculation of health risk, such as inhalation rate and body weight, were based on Malaysian settings.

Results

The ambient air BTEX in this scenario are mainly contributed by transportation followed by industrialization. All ambient air BTEX levels in all cities was found to be below the standard limits. The top 3 cities with the lowest ambient air BTEX level in descending order are Kuala Terengganu, Seremban, and Ipoh. While Shah Alam and Seberang Jaya are among the cities that recorded highest ambient air BTEX. The hazard quotient (HQ) values among the adults and children for ambient air BTEX in all cities of Malaysia were not more than 1, indicates that the risk of getting chronic illnesses related to cardiovascular, respiratory, blood, kidney, neurology, and immune system is low. The excess lifetime cancer risk (ELCR) values among the adults and children for ambient air benzene exposure in all cities of Malaysia were not more than 1×10^{-4} (1 in 10,000 population), indicates that the risk of developing cancer related to blood is also low.

Discussion

The limitation of this study is the limited number of CAQMS which could not represent a more specific and smaller area (subdistrict, village and residential area). Status of air quality in cities of Malaysia in 2022 in the context of ambient BTEX is good and can be considered as clean. In conclusion, exposure to ambient air BTEX among adults and children in these cities during the same year poses a low risk of chronic health effect in their lifetime.

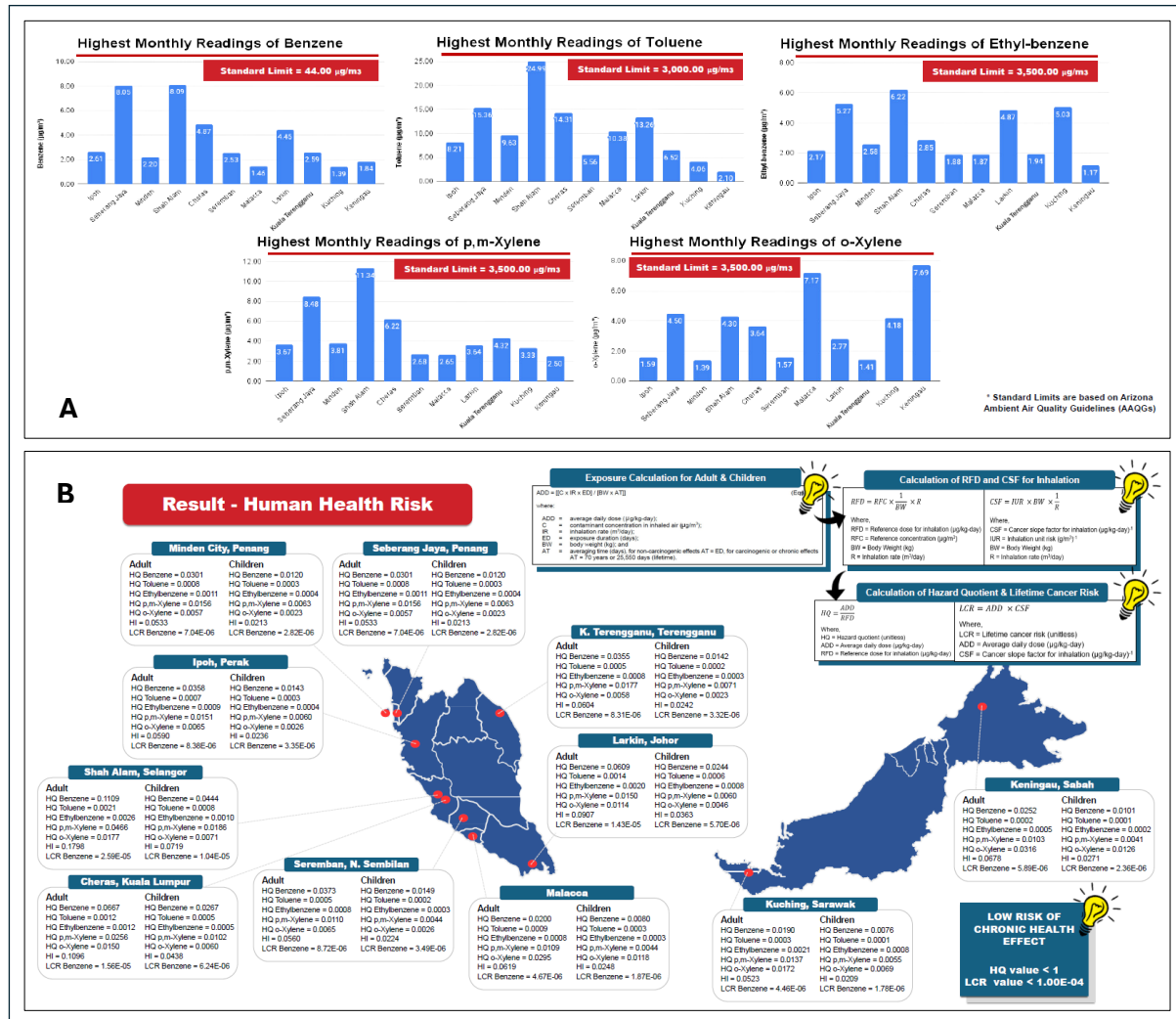


Figure 1. The highest monthly levels of ambient air BTEX, (B) Human health risk assessment of ambient air BTEX exposure among children and adult in Malaysia

Keywords: Health risk assessment, HRA, ambient, air, BTEX, adult, children, Malaysia