

Abstract

ASSESSMENT OF THE IMPACT OF FINE SUSPENDED PARTICLES PM₁₀ AND LEAD ABSORBED ONTO THEM IN AMBIENT AIR OF PANČEVO ON PUBLIC HEALTH

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Abstract

This study presents a three-year air pollution monitoring (from 2022 to 2024) of fine particulate matters (PM₁₀) and lead (Pb) absorbed onto them in Pančevo. Two datasets were created for PM₁₀ concentrations with average values from measurement points Strelište and Nova Misa: daily PM₁₀ and a subset for days when lead was measured. *AirQ+* software was applied for health impact assessment – the evaluation of PM₁₀ impact on total adult mortality (30+ years) applied for both datasets. Attributable risk was estimated for excess deaths from natural causes in adults. Lead concentration was analyzed relative to PM₁₀ levels as its percentage in PM₁₀ (for data subset, for corresponding days). The average annual concentration of PM₁₀, calculated as the mean from both monitoring sites, amounted to 34.15 (2022), 30.36 (2023) and 34.49 (2024) µg/m³, or 33,00 µg/m³ in three-year period, and for subset data – for days with lead measurements 37.38 (2022), 33.22 (2023) and 36.50 (2024) µg/m³, or 35.70 µg/m³ in three-year period.

The average annual concentration of Pb, calculated as the mean from both monitoring sites, amounted to 0.0041 (2022), 0.0061 (2023) and 0.0021 (2024) µg/m³ or 0.0040 µg/m³ in three-year period. The estimated number of deaths from all natural causes among the adult population aged 30+ years attributable to air pollution by PM₁₀ during reported period was 103 cases (95% CI: 78–150, AP 6.82%) - attributable cases per 100.000 population at risk was 126.92 (95%CI: 96.48–185.40, AP 6.82%) at an average three-year mean PM₁₀ concentration on 33,00 µg/m³; and for subset data was 117 cases (95% CI: 89–171, AP 7.80%) - attributable cases per 100.000 population at risk was 145,20 (95%CI: (110.51-211.57, AP 7,80%)) at an average three-year mean PM₁₀ concentration of 35.70 µg/m³. There was no statistically significant difference between the main data set for

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PM₁₀ and the subset of days when lead measurement were conducted was performed. The percentage of Pb present in fine particles, based on annual mean values, was 0.011% in 2022, 0.018% in 2023, and 0.005% in 2024.

The number of deaths from all causes among the adult population attributable to PM₁₀ levels is significant. Although PM₁₀ annual mean values are lower than those in Serbian national regulations, they remain above the limit values recommended by World Health Organization. Therefore, action plans for reducing particulate air pollution in Pančevo should continue to be developed. A simple conclusion that the share of lead is negligible in mortality from all natural causes cannot be drawn; further investigation of this impact (e.g., carcinogenic risk and other outcomes) is required. Additional research is also needed through epidemiological studies that have applied the AirQ+ software, but for parameters not predefined by the software.

Keywords: PM₁₀, Pb, Impact Assessment, AirQ+, Air Pollution

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