

The Effects of Air Pollution on Kidney Function in Isfahan City

Introduction: Air pollution is a critical global environmental issue that significantly impacts human health. Among its various effects, exposure to airborne pollutants can lead to systemic health complications, including impaired kidney function.

Material and Methods: This study investigates the correlation between air pollution and kidney dysfunction in Isfahan, Iran, by assessing the spatial distribution of key pollutants including nitrogen dioxide (NO₂), carbon monoxide (CO), sulfur dioxide (SO₂), and ozone (O₃) and analyzing their association with blood creatinine levels. Using data from Sentinel-5P satellite products for 2023, pollutant concentrations were mapped and quantified. To establish the relationship between air pollution and kidney function, creatinine levels and residential geographic coordinates of 92 patients were analyzed through a linear regression model.

Results and Discussion: The results indicate a direct correlation between increased pollutant concentration and elevated blood creatinine levels, with carbon monoxide presenting the strongest regression model ($R^2 = 0.234$). In contrast, ozone exhibited a weak correlation ($R^2 = 0.023$).

Conclusion: The results suggest that air pollution contributes to increased blood pressure and activation of the renin-angiotensin-aldosterone system, which can lead to kidney dysfunction and elevated creatinine levels. The study highlights the necessity for improved urban air quality management and public health policies to mitigate the impact of air pollution on vulnerable populations. By demonstrating the adverse effects of air pollution on kidney health, this research underscores the need for proactive measures to reduce pollutant exposure and protect public health.

Keywords: Kidney Function, Sentinel-5P, Linear Regression, Creatinine