Environmental Engineering and Management Journal xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

MULTIVARIATE ANALYSIS BETWEEN COVID-19, AIR QUALITY AND METEOROLOGICAL PARAMETERS: A CASE STUDY OF ISTANBUL METROPOLITAN CITY, TURKEY

Kadir Ulutaş[1]*, Abbas Alkarkhi[2], Sohaib Abujayyab[3], Salem Abu Amr[4], Fahad Alqahtani[5]*, Sibel Duman[6]

[1]İstanbul Medeniyet University, Department of Health Management, İstanbul, Türkiye
[2]Cihan University, Department of Medical Biochemical Analysis, Erbil, Iraq
[3]Department of Geography, Karabuk University, Karabuk, 78050, Turkey
[4]International College of Engineering and Management, Health, Safety and Environmental Management, Oman
[5]Department of Industrial Engineering, College of Engineering, King Saud University, P. O. Box 800, Riyadh 11421, Saudi Arabia
[6]Department of Chemistry, Bingol University, Bingol, 12000, Türkiye

Abstract

Air quality is one of the most important environmental factors significantly affecting public health. The correlation between the new number of COVID-19 cases and air quality parameters (AQP) was assessed for the metropolitan city of Istanbul in Turkey. The impact of seven AQPs (SO_2, CO, PM_{10}, $PM_{2.5}$, NO_2, NO_X, and O_3) and four meteorological parameters (MP; temperature, humidity, pressure, and wind speed) on the new cases of COVID-19 was investigated. A strong negative significant correlation was found between the number of new cases of COVID-19 with SO_2, NO_X, O_3, and temperature. In contrast, a significant positive correlation was observed between humidity and pressure. Principal components showed that only three components can be used to explain more than 81% of the total variation in the data of AQP and MP, which represent the main sources that affect new cases of COVID-19, where the first component explains 42.5% of the total variance and represents six parameters (PM_{10}, NO_2, NO_X, O_3, $PM_{2.5}$, and wind speed). The second component explains 25.6% and represents SO_2, CO, O_3, temperature, humidity, and pressure, while the third component explains 13.5% and represents SO_2, CO, and pressure. The results revealed a significant correlation between AQP and the new number of COVID-19 cases.

Key words: air quality, COVID-19 new cases, meteorological parameters, public health management

Received: June, 2024; Revised final: October, 2025; Accepted: October, 2025

* Author to whom all correspondence should be addressed: e-mail: kadir.ulutas@medeniyet.edu.tr, afahad@ksu.edu.sa; Phone: +90 5325681564; Fax: +02162803199