

ABSTRACT

The air pollution has become a critical environmental issue in the world with the growth of industrialization, urbanization and automobiles, which has adversely affected the quality of life, human health and the environment. Particulate Matter (PM) is one of the most damaging air pollutants as it causes various types of health effects such as cough, asthma, lungs damage and premature deaths. The mega cities of Pakistan are also experiencing poor air quality conditions. Lahore is often described as one of the most polluted cities in the world and the $PM_{2.5}$ and PM_{10} concentrations often exceed Pak-NEQS and WHO standards.

The present study investigates the spatial and temporal variation of Particulate Matter in Shalimar Town, Lahore from December, 2019 to August, 2020 covering the four seasons (winter, post-winter, pre-monsoon and monsoon). On the spatial basis, highest values of $PM_{2.5}$ were found at the main road-crossings with Do-Moria Pul as the most polluted site in the town. The highest values of PM_{10} were recorded at main road-crossings and along Lahore Ring Road. The lowest values of $PM_{2.5}$ and PM_{10} were found in the northern part of the town which is mainly an agricultural region and also has scattered rural settlements and open land. The moderate values were recorded for residential areas, parks and hospitals mainly south of Lahore Ring Road. On the temporal basis, highest values were recorded during winter season ($169 \mu\text{g}/\text{m}^3$ for $PM_{2.5}$ and $614 \mu\text{g}/\text{m}^3$ for PM_{10}), followed by monsoon season ($30 \mu\text{g}/\text{m}^3$ for $PM_{2.5}$ and $161 \mu\text{g}/\text{m}^3$ for PM_{10}), pre-monsoon season ($25 \mu\text{g}/\text{m}^3$ for $PM_{2.5}$ and $162 \mu\text{g}/\text{m}^3$ for PM_{10}) and the lowest during post-winter season ($18 \mu\text{g}/\text{m}^3$ for $PM_{2.5}$ and $101 \mu\text{g}/\text{m}^3$ for PM_{10}). The lockdown imposed due to Covid-19 significantly reduced the emissions from vehicular and industrial sources which resulted in lowest values during the post-winter season.

The correlation coefficient was calculated between Particulate Matter concentration and various meteorological parameters. Significant negative correlation was recorded between Particulate Matter concentration and temperature, wind speed and the amount of precipitation while a moderate positive correlation was found between pollutant levels and relative humidity.