ABSTRACT

Climate Change has an influences on air quality, which may be harmful to human health. Disruptions to weather patterns impact air quality by creating and distributing air pollutants such as ground-level ozone, fine particles, smoke from wildfires, and dust. Methane gas, carbon dioxide, and other greenhouse gases produced into the atmosphere through burning fossil fuels are the primary drivers of change in the climate. Researchers are paying close attention to the role that climate and air quality play in the dissemination of COVID-19. The primary objective of this research is to examine how environmental conditions affect the dispersal and persistence of particles that resemble coronaviruses. The main objective of this study is to examine the relationship between COVID-19 (i.e., Active cases and fatalities) with different meteorological parameters and air pollutant parameters with the help of different statistical techniques. And also analyze the impact of the epidemic prevention and control action (i.e., lockdown) during COVID-19 on Climate Change and Air Quality. The air quality data for the variable, Suspended Particulate Matter ($PM2.5$) for main cities (i.e., Lahore, Islamabad, Karachi, Peshawar) from duration 2019 to 2021 was collected from the website **(https://aqicn. org),** COVID-19 data for variables, Daily Positive Cases of COVID-19 and Number of COVID-19-related deaths, from duration 2020 to 2021 was collected from the Government Department **"Primary and Secondary Health Care Department, Punjab"** and meteorological parameters data for variables, Maximum Temperature, Minimum Temperature, Humidity at 8:00 AM, Humidity at 5:00 PM, from duration 2018 to 2021 was collected from the Government Department **"Met Station-Weather Radar, Punjab"**. To perceive harmful exceedances, the Shewhart chart, exponential weighted moving average (EWMA), double exponential weighted moving average (DEWMA), and triple exponential weighted moving average (TEWMA) control charts, authentic statistical process control tools have been considered, which have not been adopted in past assessments for observing the air quality data of Lahore, Karachi, Islamabad, and Peshawar. The outcomes show that EWMA is more delicate than the Shewhart chart and DEWMA is more liable than EWMA whereas TEWMA is more sensitive than DEWMA in detecting the shift when AQI of PM2.5 transcended the upper control limit. Moreover, Descriptive statistics were also investigated for all the variables which show the variability between observations is often the cause of the variance value being 2 greater than the mean for all the variables, which indicates higher dispersion for selected Punjab districts, (i.e., Bahawalnagar, Bahawalpur, Dera Ghazi Khan, Faisalabad, Lahore, Multan, and Rahim Yaar Khan). The Negative Binomial regression and correlation coefficient was used to check the association between, the dependent variables (i.e., Number of COVID-19-related deaths and Daily Positive Cases of COVID-19), with the independent meteorological variables (i.e., the maximum temperature, the minimum temperature, the humidity at 8:00 AM, and the humidity at 5:00 PM). The t-test, Levene's test and Bar chart were also used to compare the mean and variance of two groups (i.e., Before Covid-19 period and After COVID-19 period). In the conclusion, the results show that there was a connection and relationship between COVID-19 deaths and Daily cases with the Metrological Parameters as well as the Air Quality Index of $PM2.5$