Impact of Temperature on Covid-19 Transmission Dynamics in Union Territory Chandigarh of India

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Abstract. Covid-19 has affected almost all countries around the world and some countries are still facing the subsequent waves of this disease. India has also witnessed the dangerous the dangerous effects of this deadly viral disease during second wave in the months of May and June, 2021. In spite of implementing lockdown like strategies in some parts of India and awaking its countrymen about all the precautionary measures, India struggled badly in its fight in controlling or minimizing the loss of human lives during this second wave. Many people die due to lack of proper medical infrastructure facilities even in some metro cities of India. This paper aims to study the environmental factors like maximum and minimum temperature on transmission dynamics of Covid-19 in union territory Chandigarh of India. SPSS software is used to calculate the bivariate correlation coefficient between different variables. The results from the present paper will surely helpful in further drafting of combat policies for the possible future waves of this deadly virus.

Keywords: Covid-19, pandemic, maximum temperature, minimum temperature, correlation coefficient.

1 Introduction

At present, World is facing a real threat to human life due to Covid-19 pandemic [2, 11]. The highly communicable virus started from China and the disease was declared as Pandemic by WHO on March 11th2020. At present, India is facing the crucial second wave of this contagious viral disease. The most affected states in India are Maharashtra, Kerala, Tamilnadu, New Delhi, Gujarat and Karnataka[8].It has been suggested by the researchers that influenza and Ebola, had significant relationship with environmental indicators[1, 3-5, 9, 14, 17, 18]. Some of the researches explained thatdynamics of coronavirus changes with change in geographical/climatological indicators mainly on temperature [6, 12, 13, 16, 19] and humidity [10, 15].Their study reveals that change in humidity along with temperature could affect communication risk which in turns leads to guess the survival period of coronavirus. So, it is reasonable to study in detail the connection between environmental factors &new confirmed cases of Covid-19.

Chandigarh, the UT of India is famous for its beautiful and well managed life, popularly known as City Beautiful. It is combined capital of Punjab & Haryana states of India and famous for its clean roads and greenery along with a disciplined life of its residents. It is one of the most affected parts of northern India during the second wave of Covid-19. The administration of Chandigarh takes every probable early step to minimize the loss of human lives during the second wave, yet the UT struggled in its combat actions against this highly contagious viral disease.

2 Methodology

The 31 days dataset for the confirmed cases of Covid-19 along with daily reported deaths has been taken from the official website of Indian Government (https://www.covid19india.org/) for the time period 16th May, 2021 to 15th June, 2021. The motive for selecting this time period is that India is facing the major decline in daily confirmed cases during this time period. Moreover there are some significant temperature changes observed in this northern part of India The day wise data of maximum and minimum temperatures of Chandigarh has been taken from website accuweather which provides the reliable data across any part of the World. (https://www.accuweather.com/en/in/chandigarh/2959195/may-weather/2959195?year=2021).

We used statistical package of SPSS software for calculating the bivariate correlation coefficient between different variables of the dataset. The main objective of this study is to investigate the association between temperatures (Maximum, Minimum) and confirmed COVID-19 cases along with daily deaths reported in UT Chandigarh of India.

3 Results and Discussions

In this section, firstly we analyze the pattern of Covid-19 confirmed cases in UT Chandigarh starting from the period 16th May to 15th June, 2021. It can be seen that Chandigarh observed highest number of cases in 3rd week of May with the highest single day case count of 4492 recorded on 19th May, 2021. The cases

start declining significantly in the month of June with lowest recorded 263 cases on 13th June, 2021 (Figure-1). Moreover, the highest number of deaths of 223 individuals was observed on 17th May, 2021 and lowest being 7 on 13th June, 2021(Figure-2). Also it has been seen that Chandigarh recorded the average 1748.7097 ≈1749 cases per day during this time period with S.D of 1445.99286≈ 1446. The average deaths per day are 76.1935≈ 76 with S.D of 55.80825≈ 56 (Table-1). Further Fig.3 and Fig.4 shows the respective variation of maximum and minimum temperatures of Chandigarh for the same period. A sharp variation in temperature has been noticed for this period with highest maximum temperature of 44 degree Celsius observed on 9th June, 2021 and lowest minimum temperature of 20 degree Celsius observed on 21st May, 2021(Figure-3 & Figure-4). The average maximum temperature has been calculated to be 37.5484 degree Celsius with S.D of 3.49. The same values for minimum temperature are calculated to be 23.8387 degrees Celsius & 2.709 (Table-1).

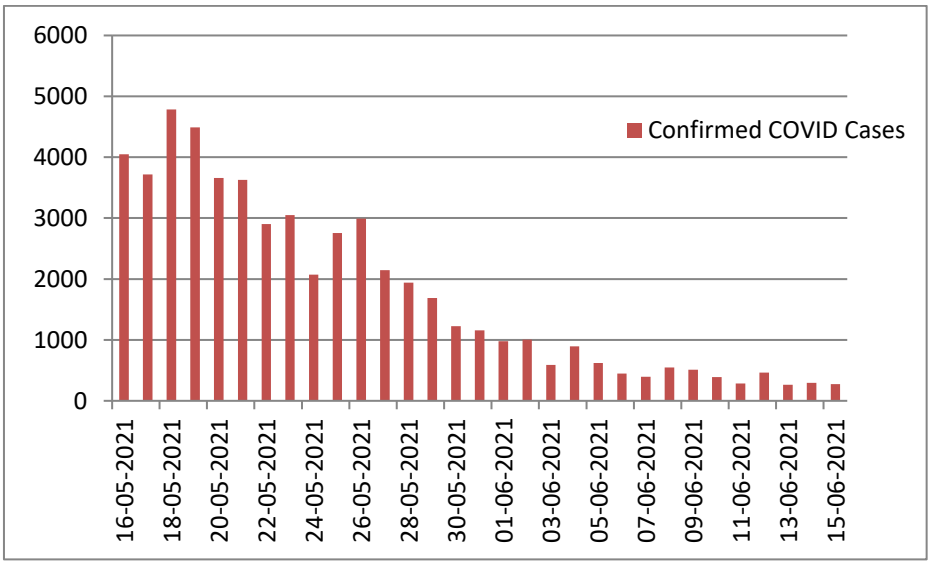

Fig. 1variation of daily confirmed covid-19 cases in UT Chandigarh

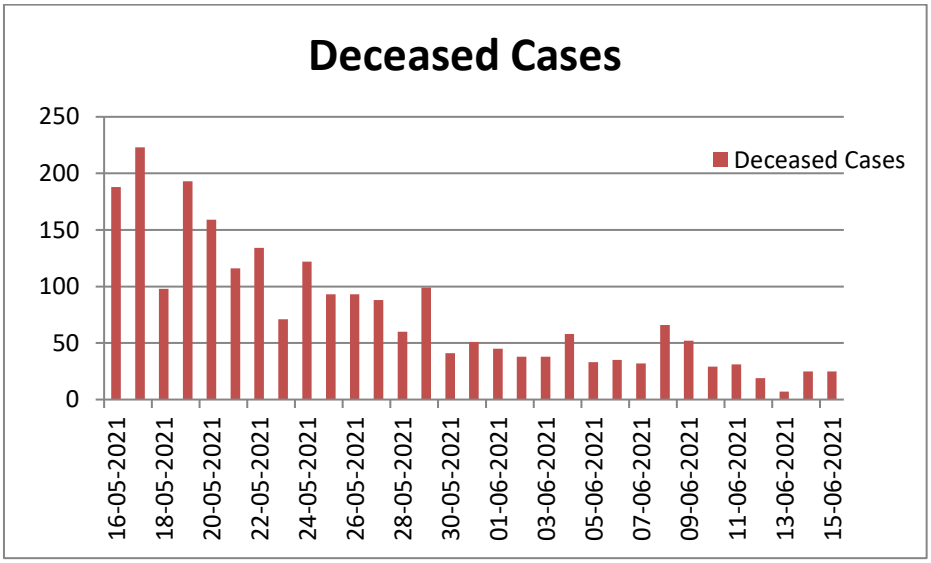

Fig. 2 variation of daily deaths from covid-19 in UT Chandigarh

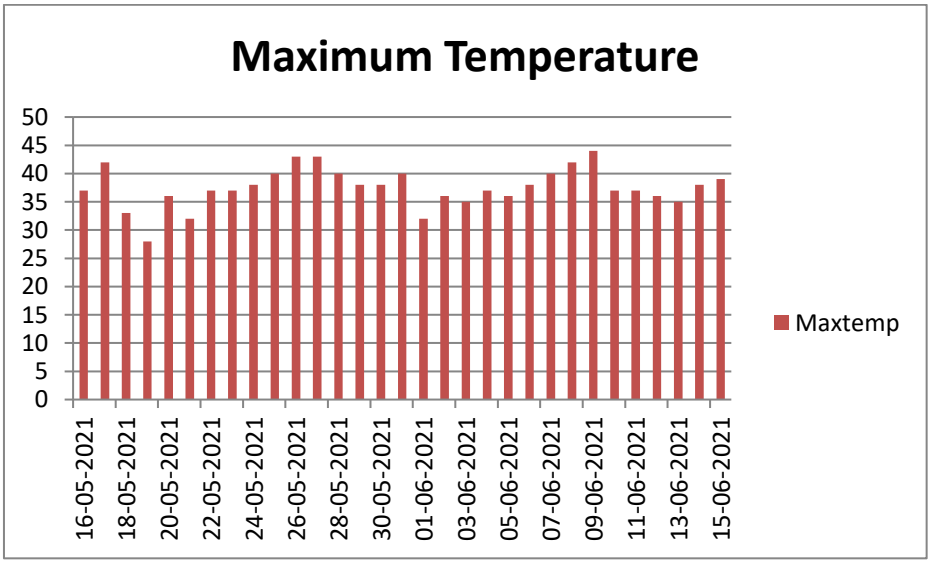

Fig. 3variation of daily maximum temperature in UT Chandigarh

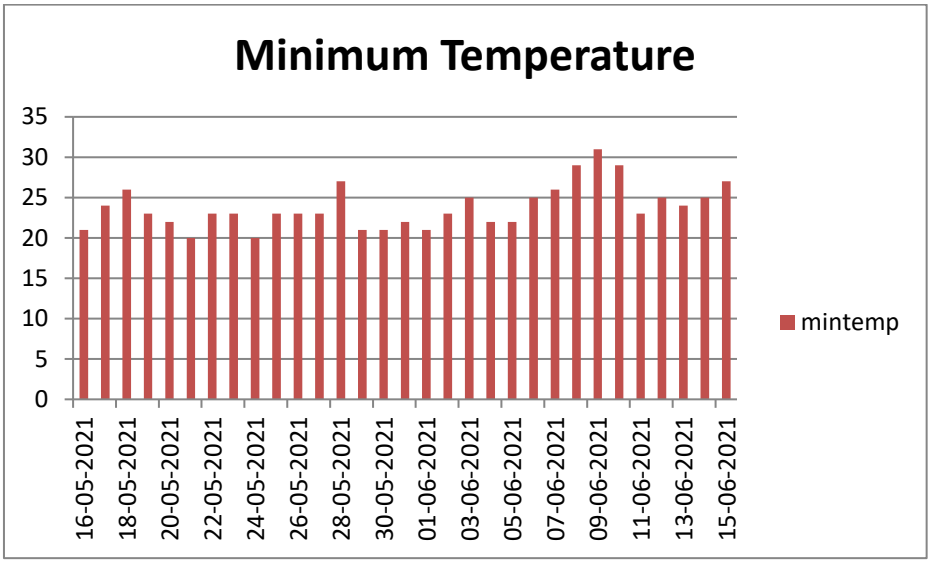

Fig. 4variation of daily minimum temperature in UT Chandigarh

Finally, we will calculate the correlation coefficient between various variables using SPSS software. As the data is not normally distributed, so we will calculate Pearson Correlation coefficient for the statistical analysis. It has been seen that daily confirmed covid-19 cases are moderately correlated with maximum and minimum temperature with respective values - 0.258 and - 0.367 (Table-2&3). The negative sign shows that the number of daily confirmed cases will surely decline with increase in maximum and minimum temperatures.

Table-1 Descriptive statistics

Descriptive Statistics		
	Mean	**S.D**
Confirmed cases	1748.7097	1445.99286
Deaths	76.1935	55.80825
Maximum Temperature	37.5484	3.49
Minimum Temperature	23.8387	2.709

Table-2 correlation coefficient between confirmed cases and maximum temperature

Correlations			
		Confirmed Cases	Max. Temp.
Confirmed Cases	Pearson Correlation	1	-.258
	Sig. (2-tailed)		.162
	N	31	31
Max. Temp.	Pearson Correlation	-.258	1
	Sig. (2-tailed)	.162	
	N	31	31

Table-3 correlation coefficient between confirmed cases and minimum temperature

Correlations			
		Confirmed Cases	Min. Temp.
Confirmed Cases	Pearson Correlation	1	-.367*
	Sig. (2-tailed)		.043
	N	31	31
Min. Temp.	Pearson Correlation	-.367*	1
	Sig. (2-tailed)	.043	
	N	31	31
*. Correlation is significant at the 0.05 level (2-tailed).			

Table-4 correlation coefficient between daily deaths and maximum temperature

Correlations			
		Deaths	Max. Temp.
Deaths	Pearson Correlation	1	-.101
	Sig. (2-tailed)		.587
	N	31	31
Max. Temp.	Pearson Correlation	-.101	1
	Sig. (2-tailed)	.587	
	N	31	31

Table-5 correlation coefficient between daily deaths and minimum temperature

Correlations			
		Deaths	Min. Temp.
Deaths	Pearson Correlation	1	-.344
	Sig. (2-tailed)		.058
	N	31	31
Min. Temp.	Pearson Correlation	-.344	1
	Sig. (2-tailed)	.058	
	N	31	31

Now we see the statistical values of correlation coefficient between daily deaths reported & maximum temperature. It has been observed that there is weak correlation between daily deaths and maximum temperature with a correlation coefficient value of -0.101

(Table-4) however daily deaths are strongly correlated with minimum temperature with a value of -0.344 (Table-5). The negative sign accounts for the sharp decrease in deaths due to covid-19 with increase in minimum temperature.

4 Conclusion

The descriptive analysis and value of Bivariate correlation coefficients have been calculated for UT Chandigarh of India. It has been observed that daily confirmed cases of covid-19 decrease significantly with increase in temperature whereas in Kerala, the cases decline significantly with increase in maximum and minimum temperatures. Thus, we can say that maximum and minimum temperatures played the main role in steeping the Covid-19 curve of India during second wave of this pandemic disease. However, maximum temperature has no significant effect on daily reported death cases in UT Chandigarh, whereas minimum temperature significantly helps in reducing the deaths during this time period. Earlier also many researchers reported that there exists an optimum temperature for this deadly virus and elevated temperature will certainly decrease the viability of this virus. So, the air temperature has been observed to be significantly affecting the covid-19 transmission due to change in natural behavior of the virus at high temperatures. Our study also acknowledges the previous studies in this part of India. The present study indicates the temperature variation have significant impact on transmission dynamics of Covid-19 in UT Chandigarh, yet the precautionary measures like health hygiene, hand washing, social distancing should not be ignored and government policies should not wait for higher temperatures to defeat COVID-19.

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