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A Statistical Analysis: "Impact of Weather in Homogeneity of Covid-19 Variations In India"

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***Abstract*:- Corona virus recently has become a unique universal severe problem required much attention of researcher to come out with optimum solution. The specific intention of this research is to make comparison and test the homogeneity of various averages. Analyses of Variance (ANOVA) by using the R-Studio and tests concern to the effects of weather in corona spread were observed. Over the rapid increased in daily and widespread active reported positive cases of covid-19 in the set of three neighboring state of India were observed. Objective of this paper is to find indication and homogeneity of COVID-19 variations under the specific weather effects with the conclusion at 5% and 1% level of significance.**

Key Words: Statistics, P-value, Covid-19, Weather, R-Studio, ANOVA

1. INTRODUCTION:

Corona virus disease 2019 is described as severe acute respiratory syndrome corona virus 2 (SARS-CoV-2), 2019-nCoV previously. When a new virus comes in existence, for the cope-up, we have to much more familiar about it consequences. As we already informed by media and medical staff that most respiratory viruses are spread by large droplets that come out when people cough and sneeze and stay in the open sky air usually for about six feet in front of them. They land on metal surfaces and transmitted between one human to another human by touching those metals, instance door latch or any other surfaces. Rest viruses can wide spread in the atmosphere and remain up for a longer duration in the form of tiny droplet nuclei.

The whole world has put glances on the second most populated entity, India, which is having about 17.7% of the global population. Till 22th June, recorded total of 4, 26197 confirmed cases and 13707 reported deceased all over Country. This deplorable situation informs about future outbreaks.

Present published studies have acknowledged that the widespread of COVID-19 is supposed to be more in the cold climate then the warm and hot climate, regular with seasonal flu (Bloom-Feshbach et al., 2013). Many viruses from the Corona group, with the SARS CoV-1 along with MERS CoV, also illustrate seasonality and inclination for minimum temperature as well as humidity (Casanova et al., 2010). The SARS CoV-2, which is known as COVID-19, has been examined to be like that of SARS CoV-1 on many types of metal surfaces in particular weather (van Doremalen et al., 2020). Sajadi et al. (2020) have examined the average temperature and concern humidity in many parts of the global from November, 2019 to Feb, 2020 and examined the widespread particularly in the entities lying in among latitudes 30–50° North, and having concern similar weather functioning. In another observation, Oliveiros et al. (2020) recorded the impact of similar temperature, humidity and wind velocity on the rate of COVID-19 infection in China during Jan 23 to Mar 1, 2020. The rate of augment and doubling duration of corona patient cases were examined and classified with the weather inputs using linear regression study. The consequences have indicated that the doubling duration of the corona patient cases were positively correlated along with temperature as well as negatively correlated with humidity. Though, these concern correlations numerical were less ($R^2 < 0.18$) to describe any positive conclusion. Precipitation and wind velocity were established to exhibit no correlation with the doubling duration of the corona patient cases. Bukhari and Jameel (2020) observed the impact of humidity as well as temperature on the rising COVID-19 worldwide cases during January 2020 to March 19, 2020. The observations have indicated absolute humidity as best metric compare to relative humidity as well as temperature or weather for study purpose of this spread. It was also examined that 90% of the new infected cases up to 21 March 2020 had arisen within a definite range of AH (4 to 9 g/m^3) as well as T (3 to 17 °C). Further many other observations may help us to enhance our perception on the realistic impact of weather and temperature on the wide spreading.

2. OBJECTIVES

The specific objectives of this observation is to measure and make precise comparison under the effects of covid-19 reported cases at non-similar weather in the two set of three neighboring states in India

The objectives may be accomplished through the following objectives.

i. To make comparison in COVID-19 cases due to weather at Gujarat, Maharashtra and Tamil Nadu.
ii. To make comparison in COVID-19 cases due to weather at Delhi, Rajasthan and Madhya Pradesh.

3.1 Hypotheses 1

i. **H_0**: There is no significance effect on COVID-19 reported cases in different level of weather
ii. **H_1:** There is significance effect on COVID-19 reported cases in different level of weather

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3.2 Hypothesis 2

iii. **H_0:** There is no significance effect on the increase in COVID-19 reported cases in different level of weather.

iv. **H_1:** There is significance effect on the increase in COVID-19 reported cases in different level of weather.

3.3 Hypothesis 3

v. **H_0:** There is no significance effect on the two sets of states concerned to COVID-19 reported cases and their interaction with different level of weather.

vi. **H_1:** There is significance effect on the two sets of states concerned to COVID-19 reported cases and their interaction with different level of weather.

Significance level

We have used 5% level of significance throughout this study.

4. DATA ANALYSIS FOR GUJARAT, MAHARASHTRA AND TAMIL NADU

Table 1
Summary of ANOVA 1

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Weather	1	9.414e+08	941399813	59.10	5.44e-13 ***
State	1	4.717e+08	471722201	29.61	1.44e-07 ***
Residuals	213	3.393e+09	15928673	---	

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 2
Summary of ANOVA 2

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Weather	1	9.414e+08	941399813	63.31	1.05e-13 ***
State	1	4.717e+08	471722201	31.73	5.60e-08 ***
Weather : state	1	2.407e+08	240705093	16.19	7.98e-05 ***
Residuals	212	3.152e+09	14868406	---	

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

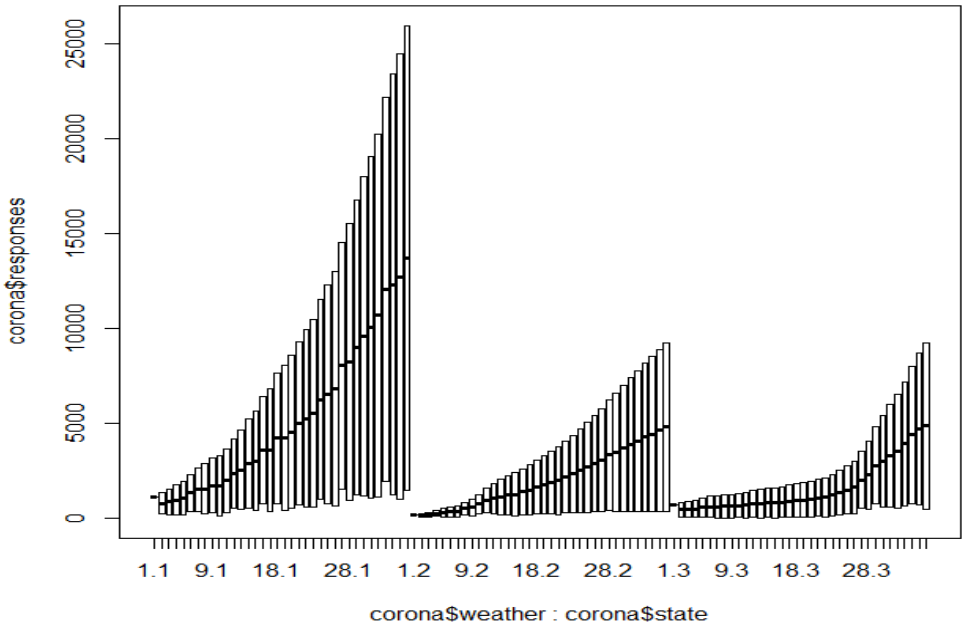

Fig 1. Box plot of COVID-19 cases, three neighbor states on their level of weather.

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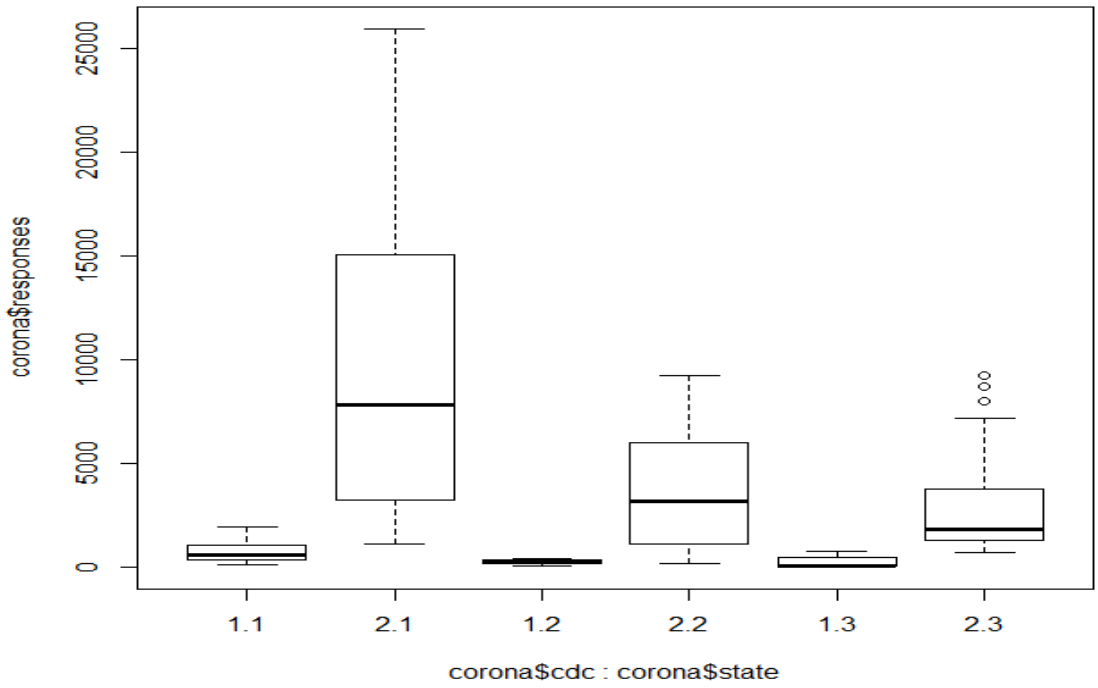

Fig 2. Cumulative and daily reported cases of COVID-19 in three neighbor state.

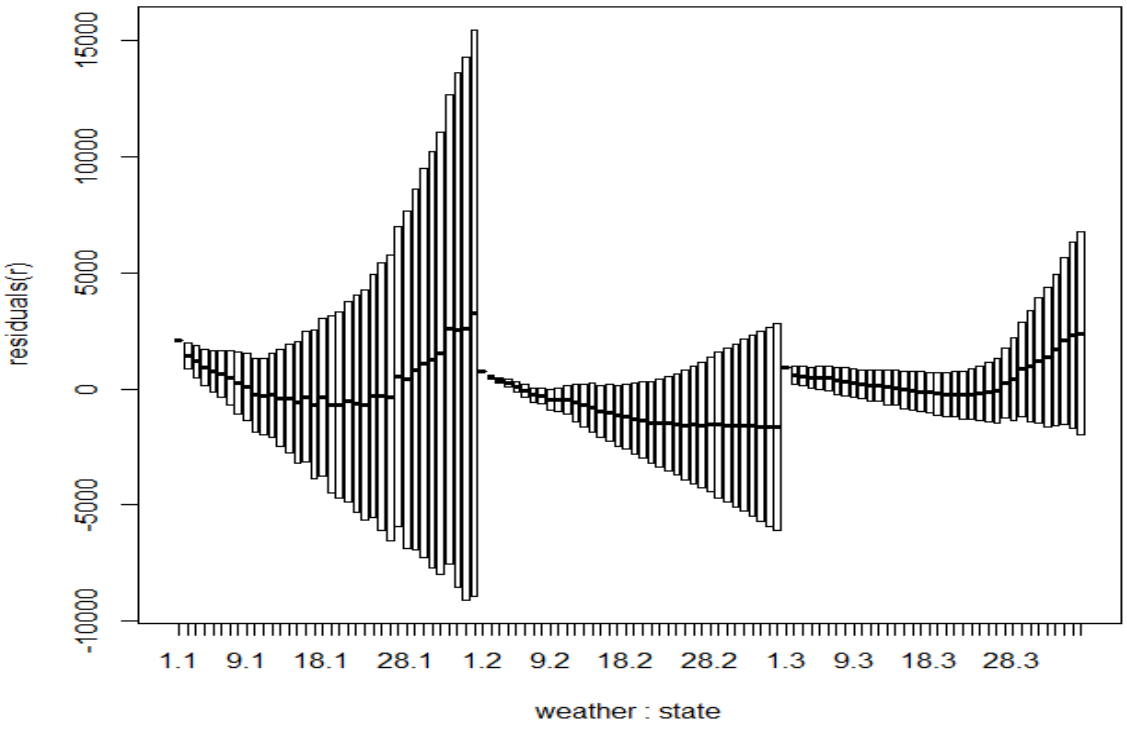

Fig 3. Residuals plot of the analysis on weather and states.

INTERPRETATION OF RESULT 1:

In table 1 and table 2, the ANOVA analysis shows that the different level weather in Maharashtra, Gujarat and Tamil Nadu is directly proportional to the COVID-19 reported cases. The effects of each level of weather on the rate of COVID -19 cases are proved to be statistically significant. Therefore we have sufficient statistical evidence at 5% significant level to reject the null hypothesis and concluded that there is significance effect of weather level on the cases of covid-19 in these mentioned three neighbouring state of India.

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Additionally, the possible values of weather, state and their interactions clearly indicate a very strong significance in this study. Figure 1 has depicted equally pattern among all the variables. Figure 2 describes cumulative and daily reported cases of COVID-19 on three neighbouring state which distributed equally pattern among the variables. Figure 3 has revealed residuals plot of the analysis on weather and states serves as additional evidence in justifying the alternative hypothesis.

Table 3
Summary of ANOVA 3

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
cdc	1	1.381e+09	1.381e+09	99.57	< 2e-16 ***
state	1	4.717e+08	4.717e+08	34.02	2.01e-08 ***
Residuals	213	2.954e+09	1.387e+07	---	

Significance. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 4
Summary of ANOVA 4

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
cdc	1	1.381e+09	1.381e+09	112.80	< 2e-16 ***
state	1	4.717e+08	4.717e+08	38.54	2.79e-09 ***
cdc: state	1	3.586e+08	3.586e+08	29.30	1.67e-07 ***
Residuals	212	2.595e+09	1.224e+07	---	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

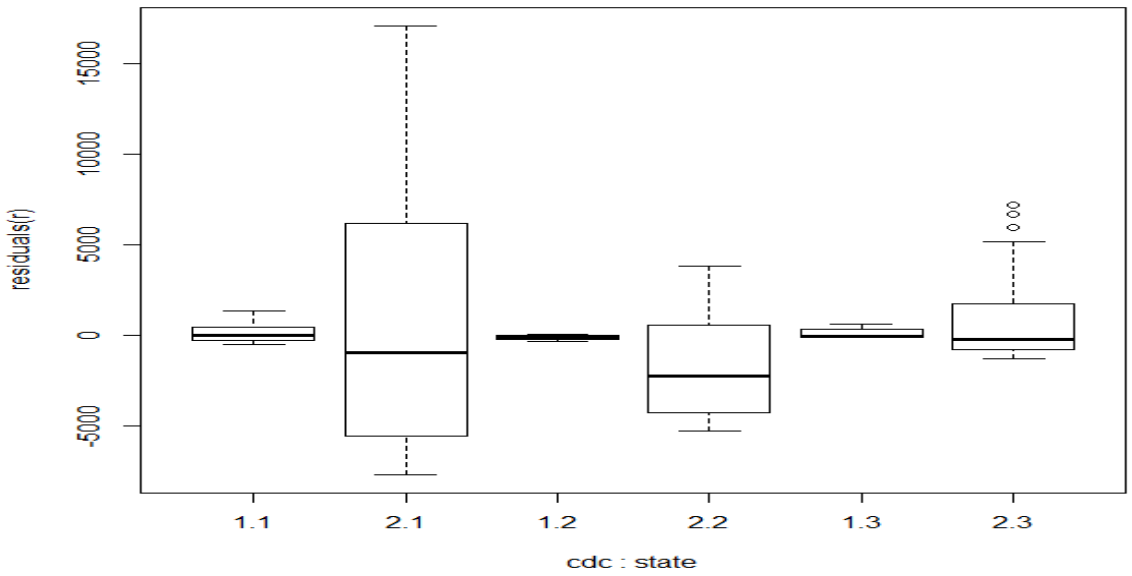

Fig 4. Residuals plot of the analysis on cumulative and daily reported cases of COVID-19 and states

INTERPRETATION OF RESULT 2:

Dependent on the possible values in table 3 and 4, the analysis shows different level of cumulative and daily increased COVID-19 reported cases in Maharashtra, Gujarat and Tamil Nadu is statistically significance. The effects of each level of reported COVID-19 cases are proved statistically significant. Therefore we have sufficient statistical confirmation at 5% significant level to reject the null hypothesis and concluded that there is significance effect between the cumulative and daily cases of COVID-19 in these mentioned three neighboring state of India. Further, the possible values of cumulative and daily reported cases, state and their interactions clearly indicate a very strong significance in this analysis. Figure 4 shows residuals plot of the analysis on cumulative and daily reported cases of COVID-19 so states serves as additional proof in justifying the alternative hypothesis.

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2.7 Data Analysis for Maharashtra, Gujarat and Tamil Nadu

Table 5
Summary of ANOVA 5

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Weather	1	113182771	113182771	48.365	4.27e-11 ***
State	1	25202	25202	0.011	0.917
Residuals	213	498462993	2340202	---	

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Table 6
Summary of ANOVA 6

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Weather	1	113182771	113182771	48.137	4.74e-11 ***
State	1	25202	25202	0.011	0.918
Weather: State	1	0	0	0.000	1.000
Residuals	212	498462993	2351241	---	

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

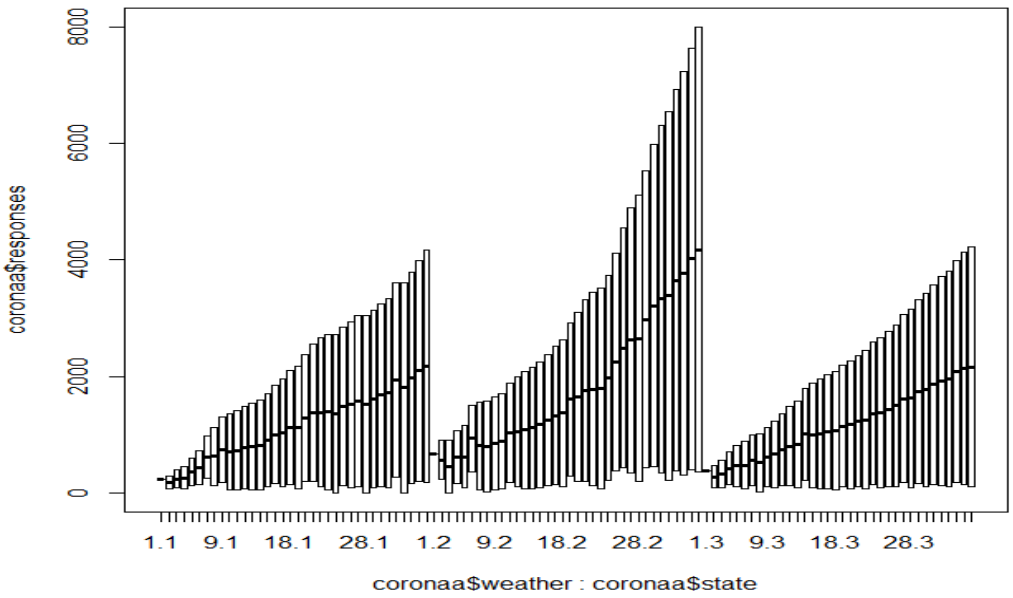

Fig 5. Residuals plot of the analysis on weather and states.

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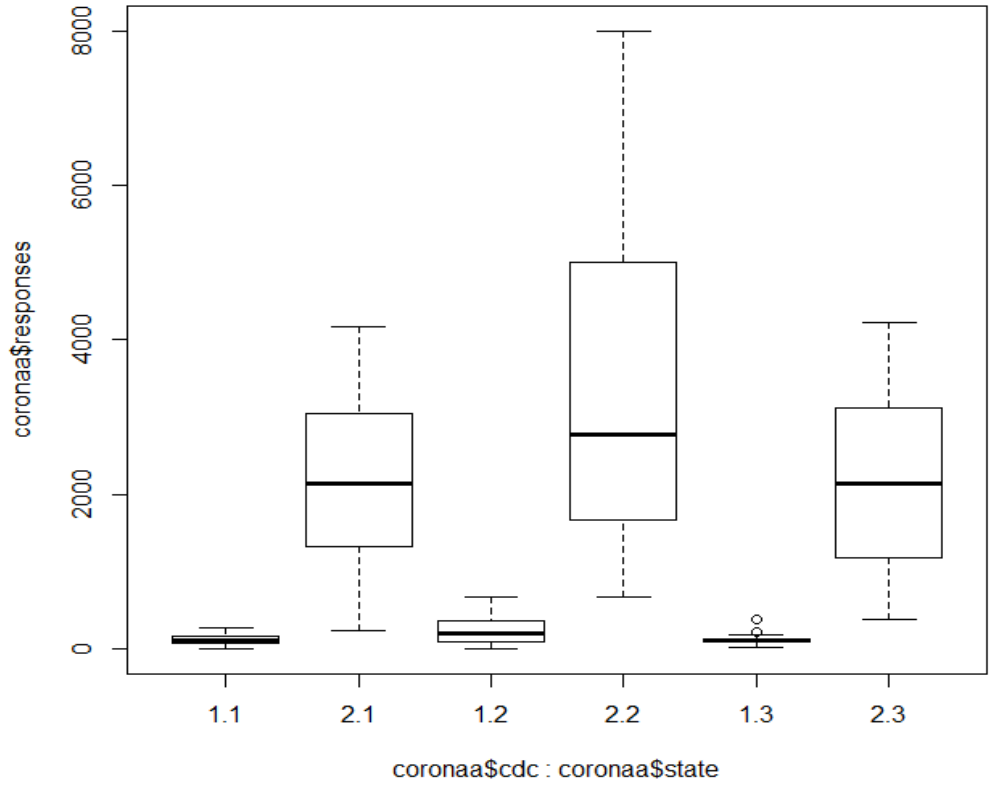

Fig 6. Cumulative and daily reported cases of covid-19 on three neighboring state.

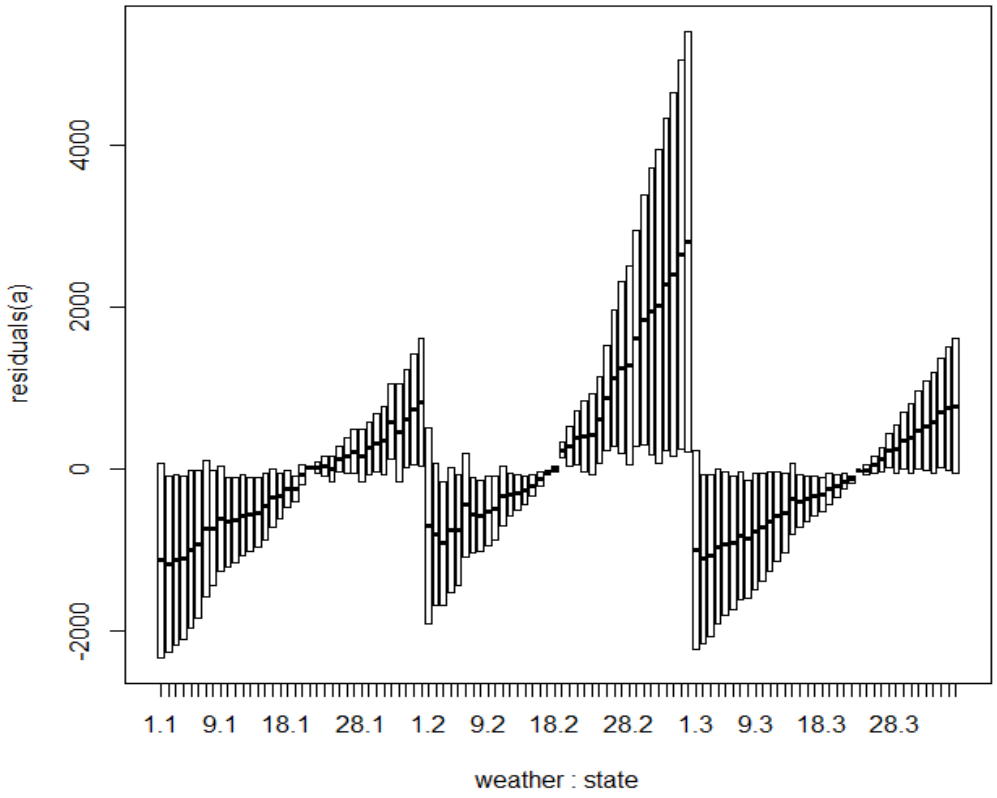

Fig 7. Residuals plot of the analysis on weather and states.

The possible values in table 5 and 6, the analysis shows the different level weather at Delhi, Rajasthan and Madhya Pradesh is statistically significance of COVID-19 reported cases. The weather effects on the COVID-19 cases are proved statistically significant. Therefore, we have sufficient statistical evidence at 5% significant level to reject the null hypothesis and concluded that there is significance effect of weather level on the cases of COVID-19 in these mentioned three neighboring states of India. Further required values of state's weather and their interactions clearly indicate a very weak significance in this analysis. Figure

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5 depicts the Box plot of COVID-19 cases, three neighboring states on their level of weather which distributed equally pattern among these variables. Figure 6 describes the cumulative and daily reported cases of COVID-19 on three neighboring states which distributed equally pattern among the variables. Figure 7 shows the residuals plot of the analysis on weather and states serves as additional evidence in justifying the alternative hypothesis.

Table 7
Summary of ANOVA 7

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
cdc	1	320316960	320316960	234.194	<2e-16 ***
state	1	25202	25202	0.018	0.892
Residuals	213	291328804	1367741	---	

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

>a<-aov(responses~cdc+state+cdc:state,data = coronaa) Call:
aov(formula = responses ~ cdc + state + cdc:state, data = coronaa)

Table 8
Summary of ANOVA 8

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
cdc	1	320316960	320316960	233.113	<2e-16 ***
state	1	25202	25202	0.018	0.892
cdc:state	1	22375	22375	0.016	0.899
Residuals	212	291306429	1374087	---	

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

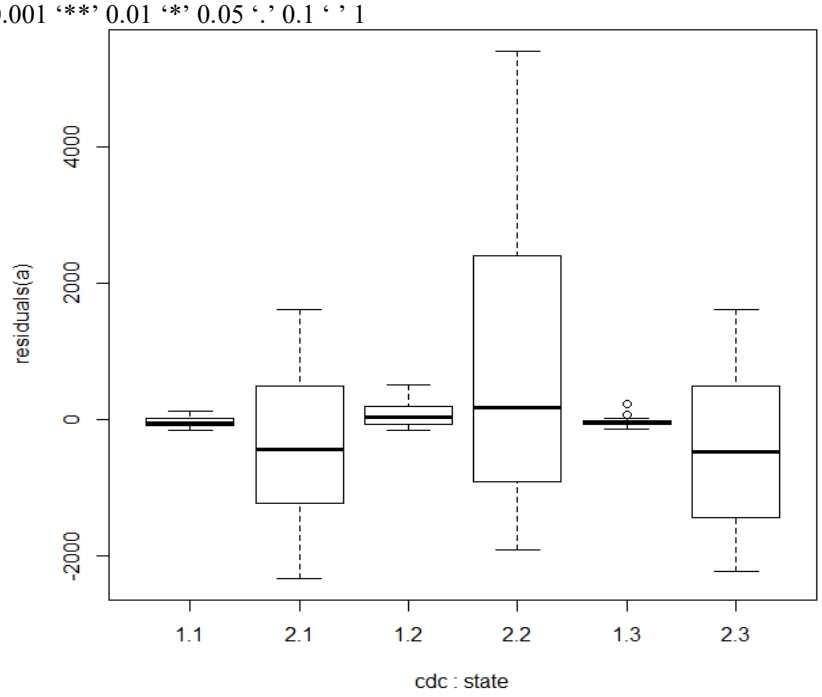

Fig 8. Residuals plot of the analysis on weather and states.

INTERPRETATION OF RESULT 4:

In table 7 and 8, this analysis shows, different level of cumulative and daily increased COVID-19 reported cases in Delhi, Rajasthan and Madhya Pradesh is statistically significance. The effects of each level of reported COVID-19 cases are proved to be statistically significant. So, we have sufficient statistical evidence at 5% significant level to reject the null hypothesis and concluded that there is significance effect between the cumulative and daily cases of COVID-19, in these mentioned three neighboring state in India. Further by the values of cumulative and daily cases, state and their interactions clearly indicates a very weak significance in the analysis. Figure 8 reveals the residuals plot of the analysis on cumulative and daily cases of COVID-19 and states serves as additional proof in justifying the alternative hypothesis.

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CONCLUSION

In this study, we have discussed the comparison of COVID-19 cases due to weather at Maharashtra, Gujarat and Tamil Nadu as well as Delhi, Rajasthan and Madhya Pradesh. The distribution of new Corona cases examined between 23 March and June 15, 2020 across all mentioned states. Through statistical precise analysis, we have identified the vulnerable ranges of weather variables and validate them. Using our calculations, we have examined comparison among most infected states in India, which may be more dangerous for the transmission of corona in the present and arrival months in 2020. We predicted our results are not only be beneficial to the mentioned states, but also rest states which are supposed to wide infected soon due to weather conditions in 2020, to get ready socially, medically, and economically against mass and wide spreading of novel COVID-19.

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