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Geospatial Distribution of District Data in Delhi and Telangana: A Comparative Study of Covid-19

Prisilla Jayanthi[1*],Muralikrishna Iyyanki[2],Goutham Vanam[3], PrakuthiVadakattu[4]

[1*]*KG Reddy College of Engineering and Technology, Hyderabad.*
[2]*Defence Research and Development Organization, Hyderabad.*
[3]*Geethanjali College of Engineering and Technology, Hyderabad.*
[4]*Biomedical Engineering Student, Manipal University (MAHE), India*
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Abstract: In India, Covid-19 spread has set panic in the mindset of humans. In this study, the focus is on the districts of Delhi and Telangana. Delhi is third leading state with almost 1,07,051 confirmed cases (as on July 10, 2020) of Covid-19. Geoinformatics is the tool used to map hotspot areas in Delhi with Central Delhi (184) cases and Telangana where Hyderabad stands with 24,710 cases. In this study, coronavirus affected areas are mapped using GIS to monitor the viral infected areas within each city. Thus, helps to take the preventive measures for the virus spread. Thereby determines containment zone areas and integrates with socio-demographic data for assessment and making necessary action plan during lockdown situation. Spatial data is an excellent way for measuring the impact of Covid-19 pandemic disease over all the affected regions. In fact, it gives the glance of total visualization at a time over the whole world. On comparison of both curves of day-wise increase of Delhi and Telangana, Telangana state does not flattened as Delhi curve.
Keywords: Covid-19, Delhi, Telangana, Day-wise Cases, Mobility trends

I. INTRODUCTION

Covid-19 has left no space for any age or culture but rather attacked all range of people with its virus. The virus spread increased rapidly in all states of India and abroad. In India, Delhi is a state of mixed culture with different communities. The Covid-19 cases were known to affect people of Delhi with 30% of rise suddenly the event of TablighiJamaat held at NizamuddinMarka. WHO claims that the deadly coronavirus infection is an airborne disease, after a team of 239 scientists and researchers from 32 countries submitted an evidence-based report onthe smaller particles of the virus circulating in the air can infect people nearby/close by. After unlock (2.0) Hyderabad city (24,710) in Telangana has more number of cases and the curve of Covid-19 shows that it does not decrease as compared to Delhi.

COVID-19 is a most highly infectious disease, with reproductive number (R0) that ranges from 1.4 to 3.5 (Chatterjee et al., 2020). Gupta et al. (2020) reported that growth rate of infected cases was controlled with the National Lockdown, however there were few uncontrolled mass level events that had negatively impact on the infected cases [1] [2]. Further the exponential and polynomial regression modelling was performed by Gupta et al. (2020) for predicting confirmed cases that the results were up to 75,000 cases by the end of April 2020. Chatterjee et al. (2020) reviewed the ongoing efforts to prevent COVID-19 and identifies the need for investing health systems, community-led response mechanisms and the need for preparedness and global health security. Airborne precautions with a fit-tested N95 respirator and additional protective equipment are suggested Huang et al. (2020) [3].

The world incidence cases of Covid-19 are increasing (Sohrabi et al., 2020) due to various reasons one suggested by Lupia et al. (2020) that Covid-19 epidemic is associated with respiratory disease and occurred in males mostly between the ages of 8–92 years [5], . The corona virus infects the upper or lower tract of respiratory system (Chang et al., 2020) [6]. The high-risk groups are above the 60 years of age, diabetes mellitus, renal failure, chronic lung disease and immunocompromised persons (Bhatnagar et al., 2020) [7]. Mittal (2020) claim that the people suffering with blood pressure, cardiovascular disease or diabetes are more likely prone to get infected [8]. Raju &Patil (2020) analyzed that the COVID-19 is a global pandemic and collaborative research in this hour of need to mitigate this infectious disease [9].

Chatterjee et al. (2020) did a study for preventing the COVID-19 and identifies the purpose for investing into health systems, community-led responses and for preparedness and global health security [1]. Ghosh (2020) performed the exponential, the logistic and the SIS models for the Covid-19 cases state –wise along with daily infection-rate (DIR) [10]. Hamzah et al. (2020) developed the Corona Tracker community and aims to predict and COVID- 19 cases, deaths, and recoveries through predictive modelling [11].

1.1Clinical indicators

The most complications of COVID-19 are acute respiratory distress syndrome (ARDS), arrhythmias, acute cardiac injury, shock and acute kidney injury. The in-hospital virus transmission is very high with rates of 40% and above. Patients those who had acute respiratory illness were prone to Covid-19 (Chatterjee et al., 2020) [1]. Following steps to be followed at hospital for any patients (WHO, 2020) [12]:

1. Screening and isolation of all the patients with suspected COVID-19 at the first contact.
2. Initiate IPC at entry level of the hospital.
3. Screening at every emergency department or outpatient clinics.
4. Patients with mild disease are not permitted for hospital mediations, only isolation is required.
5. Auxiliary oxygen therapy immediately for the targets (SpO2 > 94%).
6. Empiric antimicrobials for treating all pathogens causing SARI and sepsis.
7. Identify severe hypoxemic respiratory failure when a patient with respiratory distress is failing to respond to standard oxygen therapy
8. High-flow nasal oxygen is used in patients with hypoxemic respiratory failure.
9. Non-invasive ventilation should be used for selected patients with hypoxemic respiratory failure.

According to Huang et al. (2020), almost many patients had pneumonia who was the Covid-19 patients. Few suffered with ARDS, RNAaemia, acute cardiac injury, and few diagnoses was confirmed with lower respiratory tract specimens and no paired nasopharyngeal swabs. Few outpatients, primary care were identified with kinetics of viral load and antibody titres [4].

The Covid-19 effect on the production of plasma cytokines or chemokines (IL1B, IL1RA, IL2, IL4, IL5, IL6, IL7, IL8, IL9, IL10, IL12p70, IL13, IL15, IL17A, CCL11, basic FGF2, GCSF (CSF3), GMCSF (CSF2), IFNγ, IP10 (CXCL10), MCP1 (CCL2), MIP1A (CCL3), MIP1B (CCL4), PDGFB, RANTES (CCL5), TNFα, and VEGFA were measured using Human Cytokine Standard 27-Plex Assays panel and the Bio-Plex 200 system for all patients according to the manufacturer's instructions.

1.2PRACRITI

PRACRITI (*PRediction and Assesment of CoRona Infections and Transmission in India*) is a mobile-friendly web portal that is freely accessible to everyone. The COVID-19 predictions are based on a mathematical model known as Adaptive, Interacting, Cluster-based, Susceptible, Exposed, Infected, Removed (AICSEIR) model. This model is an extension form of the traditional SEIR model and it has interactions between sub-populations such as districts or states. It represents a more realistic approach towards prediction of COVID-19 trajectory than the traditional SEIR models. According to the study in epidemiology, R_0 is known as the basic reproduction number. R_0 of an infection refers to the number of people who are newly infected from a currently infected person. Reducing the R_0 is the key to reducing transmission of infections (http://pracriti.iitd.ac.in/).

The figure 1 shows the *district borders* and *within district lockdown* graphs made available by PRACRITI. *District border* refers to controlling admission/exit along the district borders and has three different levels. This is for controlling the infection transmission from one district to another. *Level 0* is the normal traffic across the district borders. *Level 1* is to permit only essential movement across the border (appro. 10% traffic). *Level 2* discusses the zero or insignificant movement across the borders.

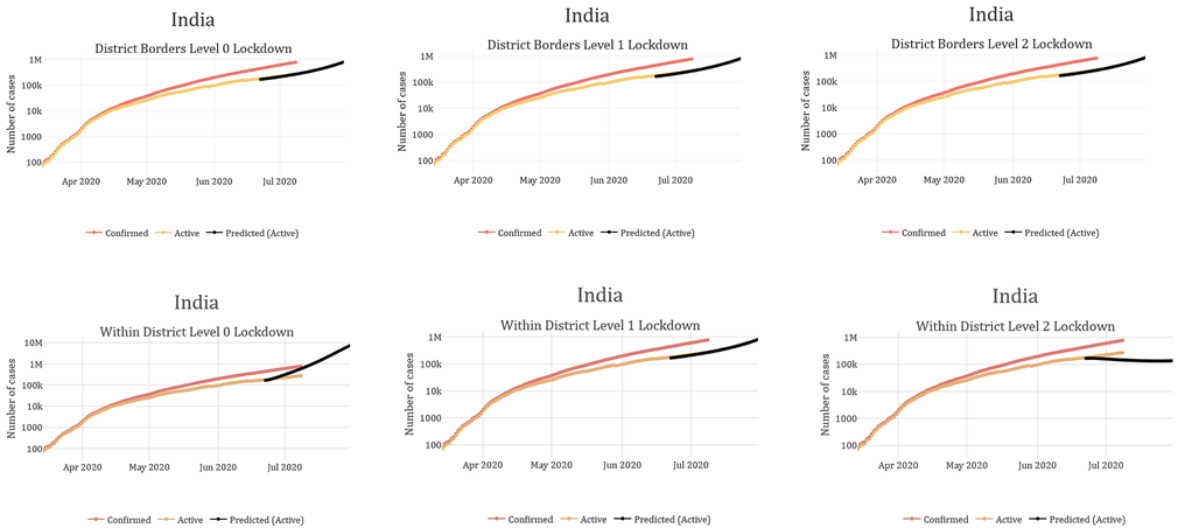

Fig 1. India graphs –R_0, Confirmed and Recovered and Deceased Source: https://home.iitd.ac.in/pracriti.php

Similarly the term *within the district* is to control the number of people who move outside their habitation within a district. If more people move outside their house, the infections or growth rate will increase within a district. *Level 0* is where there is no control on people moving out of their habitation. *Level 1* allows essential services to work and allows people to move out for essential services. *Level 2* is that where people are not allowed to move out even for essential commodities shown in figure 2.

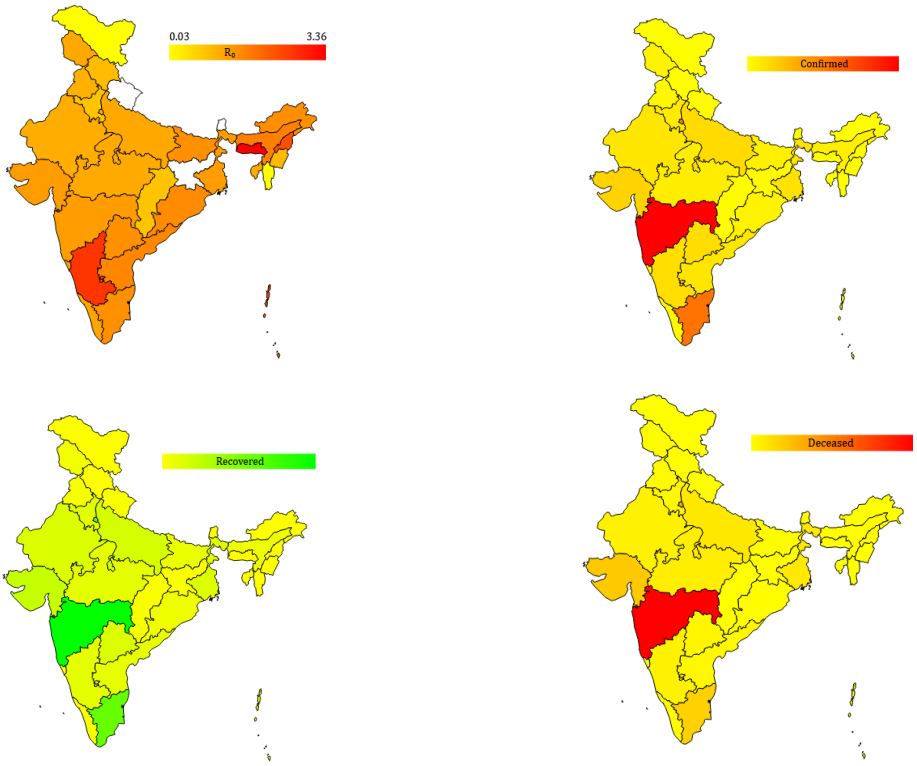

Fig 2. India Lockdown –District and within District maps Source: http://pracriti.iitd.ac.in/

II. DISCUSSION AND RESULTS

2.1 Delhi

As of July 1, 2020 Delhi has confirmed cases (87360) and has third highest cases in a row after Maharashtra and Tamil Nadu in India. There are a total of 445 hotspots Covid-19 areas in Delhi. After second unlock was announced on July 1, 2020, a building in HauzKhas's Arjun Nagar in Delhi was been sealed after

identifying around 15 cases from the building. The nearby buildings in the area are also sealed or under vigils, according to reports received.

Unlock 2.0 declared that the historic Jama Masjid will reassume its reopen from July 4 for public prayers (namaz). The mosque was closed on June 11, 2020 after its reopen on June 8 with a gap of over two months due to Covid-19 lockdown. As on July 1, the total number of containment zones in Delhi were 542, including 97 de-contained zones, 39 areas which are waiting to be de-contained but are now just scaled-down, and 406 active containment zones, taking the tally of actual remaining containment zones to 445. A total of 212 areas have been added to the new list of containment zones after June 21.

On July 3, 2020 in Delhi the curve seems to be flattening with the decrease in the cases per day as 2,494 compared to 3,446 cases per day in the previous week. The number of testing increased from July 1, 2020 and early hospitalization was the only way to help reduce the infection transmission rate. Also, the wide use of application named AarogyaSetu&Itihaas App to trace and map of COVID-19 in Delhi and its satellite cities. On July 5, 2020 Health ministry informed that ASHAs pillars of COVID-19 response have reached nearly to 39 cr. people to help out the families.

On July 9, 2020 the very next day when the Centre and state governments relieved certain restriction, all India has recorded 9,983 fresh COVID-19 cases in single-day spike for the seventh consecutive day. With this it is very clear people after relaxation on movements, is not maintaining the social distancing and stopped sanitizers. But it is not the government who need to decide the functioning of the Covid-19 affected region; it is the responsibility of each individual how to manage the situation shouldering them.

On comparing the Table 1, 2 and 3 helps to understand the total in containment were 309 (June 14), 542 (July 1) and 570 (July 7). The decontained zones were 67 (June 14), 97 (July 1) and 112 (July 7). There is increase of 233 in containment from June 14 to July 1, 2020 similar an increase of 30 (decontained zones). On comparing Table 2 and Table 3, the difference in decontained zone were only 15 as this zones have no entries from outside and followed strict discipline.

Table 1. Containment Zone Summary as on June 14, 2020

District	Containment Zone (A)	Decontained (B)	Scaling Down but not decontained (C)	Active CZ (D)	Actual CZ Remaining (E) = A-B
North	38	2	1	35	36
New Delhi	19	3	3	13	16
North West	22	0	2	20	22
South West	39	5	3	31	34
West	39	15	0	24	24
South East	34	15	3	16	19
South	37	6	6	25	31
Shahdara	21	5	1	15	16
East	33	11	0	22	22
North East	5	2	3	0	3
Central	22	3	0	19	19
Total	309	67	22	220	242

Table 2. Containment Zone Summary as on July 1, 2020

District	Containment Zone (A)	Decontained (B)	Scaling Down but not decontained (C)	Active CZ (D)	Actual CZ Remaining (E) = A-B	Fresh Containment Zone after 21 June 2020
North	69	4	11	54	65	31
New Delhi	28	4	5	19	24	9
North West	28	0	8	20	28	6
South West	88	7	3	78	81	42

West	60	31	0	29	29	21
South East	51	20	1	30	31	15
South	69	8	4	57	61	28
Shahdara	43	5	4	34	38	22
East	44	13	0	31	31	6
North East	11	2	3	6	9	6
Central	51	3	0	48	48	26
Total	542	97	39	406	445	212

Table 3. Containment Zone Summary as on July 7, 2020

District	Containment Zone (A)	Decontained (B)	Scaling Down but not decontained (C)	Active CZ (D)	Actual CZ Remaining (E) = A-B	Fresh Containment Zone after 21 June 2020
North	75	7	8	60	68	37
New Delhi	28	4	5	19	24	9
North West	28	1	8	19	27	6
South West	93	11	2	80	82	47
West	64	36	0	28	28	25
South East	58	21	1	36	37	22
South	71	8	5	58	63	30
Shahdara	44	6	8	30	38	23
East	45	13	8	24	32	7
North East	12	2	3	7	10	7
Central	52	3	0	49	49	27
Total	570	112	48	410	458	240

2.2 Telangana

As on June 8, 2020 in Telangana (TS) after three months lockdown, the state government had permitted religious places for public worship. However, the devotees were allowed to enter only after thermal screening with face masks. Even circles were drawn in few temples for maintaining social distancing. But according to the sources available on July 3, 2020, TS witnessed over 1,000 cases of COVID-19 patients with Hyderabad emerging as the worst-hit city in TS.

The sources as of July 4, 2020 stated that the rising number of COVID-19 cases in Hyderabad is pondering the decision over imposing fresh lockdown. The daily-wage earners have started to go back to their villages fearing lockdown. A total of 3,000 patients are untraceable in Hyderabad. On July 8, 2020, TIMS Hospital started to reach out Covid-19 patients in TS with bed capacity of 1,224 of which 1,000 beds have oxygen capacity and 100 beds have ventilators. And also, freshwater supply through water tankers was supplied to TIMS. Moreover, the hospital was built to reach the Covid-19 patient and testing of samples on the conversion of the Gachibowli sports stadium.

On July 13, 2020 few districts in TS were reported with Covid-19 cases as Karimnagar (86), Nalgonda (41), Khammam (38), Kamareddy (33), Sangareddy (19), Warangal Urban (16), Mahabubabad (13) and Mahabubnagar (13), Kothagudem (10), Jangaon (10), Siddipet (10) and Suryapet (10), Warangal Rural (8), Nizamabad(8), and from Sircilla (7), Peddapally (6), Medak (6) and Bhupalpally (6), Yadadri (5), Gadwal (5), Vikarabad (3), Nagarkurnoo (2) and from Nirmal (1), Mancherial (1), Adilabad and Wanaparthy (1).

2.3Confirmed Cases Distribution in India, Delhi and Telangana

From figure 3, all India graph of day-wise increase seems to be increasing with no dropping and India is third in position in the World Covid-19 cases.In India, Delhi (107051) is the third state and Telangana (30946) is seventh in position in India. The graph of day wise increase of confirmed cases in Delhi was carried out using STATA;there is a tremendous drop in the curve of Covid-19 positivity rate from 23.80 to 11.39 per cent in last 10 days shown in figure 4.

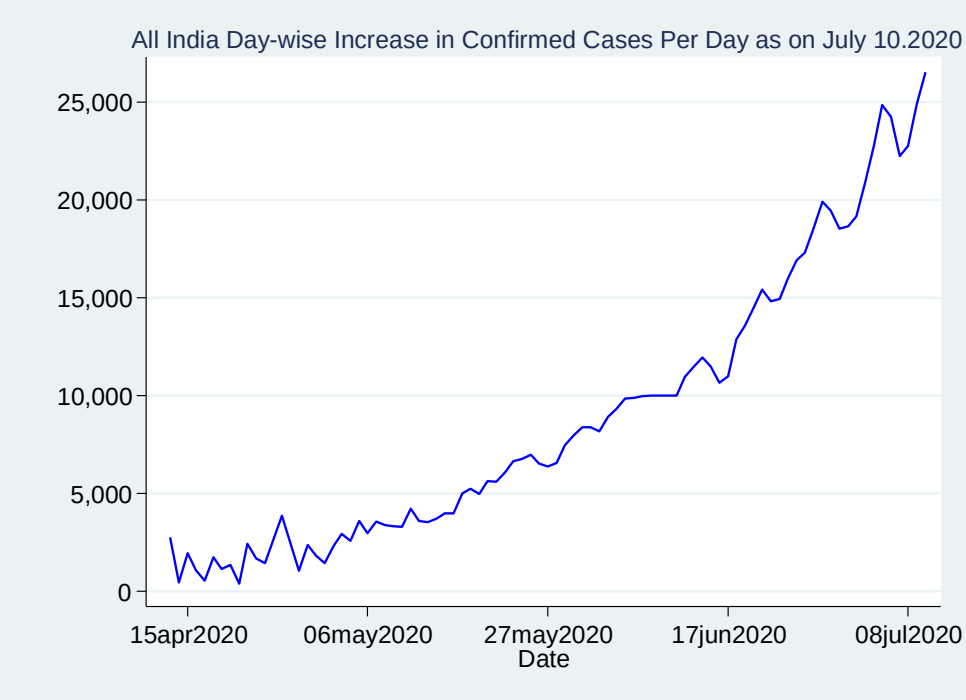

Fig 3. All India Day wise increase of confirmed cases Source: www.mohfw.gov.in

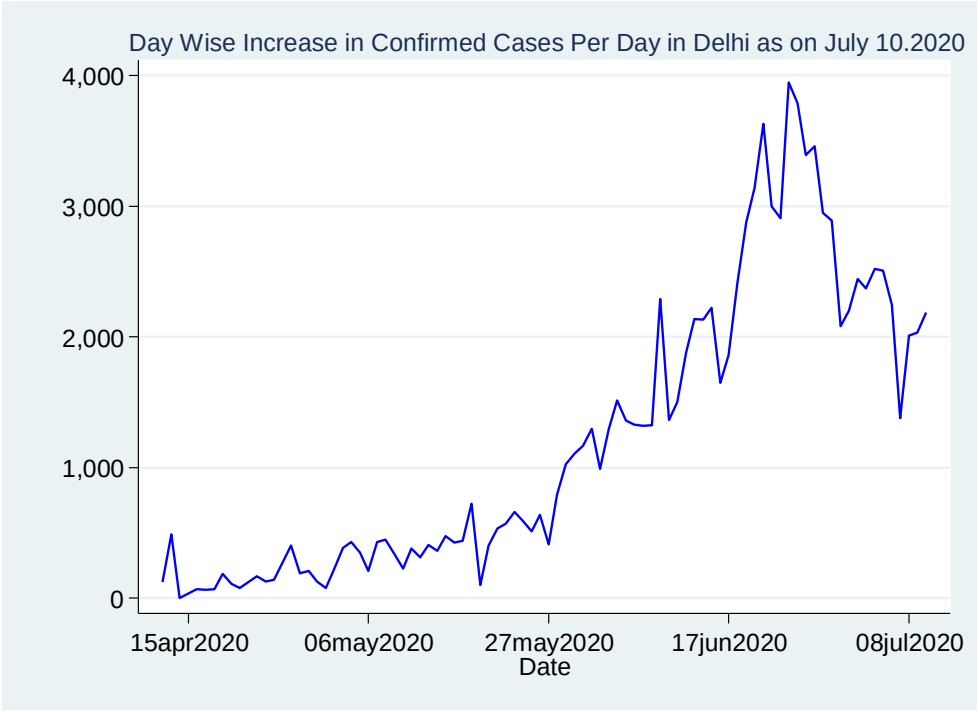

Fig 4. Day wise increase of confirmed cases in Delhi Source: www.mohfw.gov.in

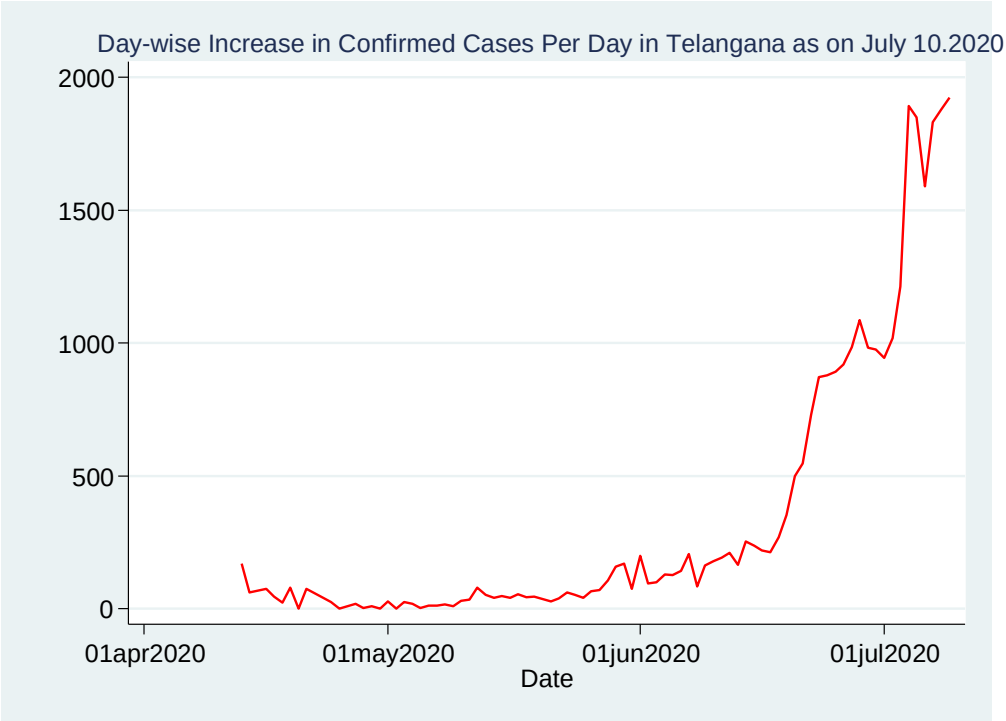

Fig 5. Day wise increase of confirmed cases in Telangana Source: www.mohfw.gov.in

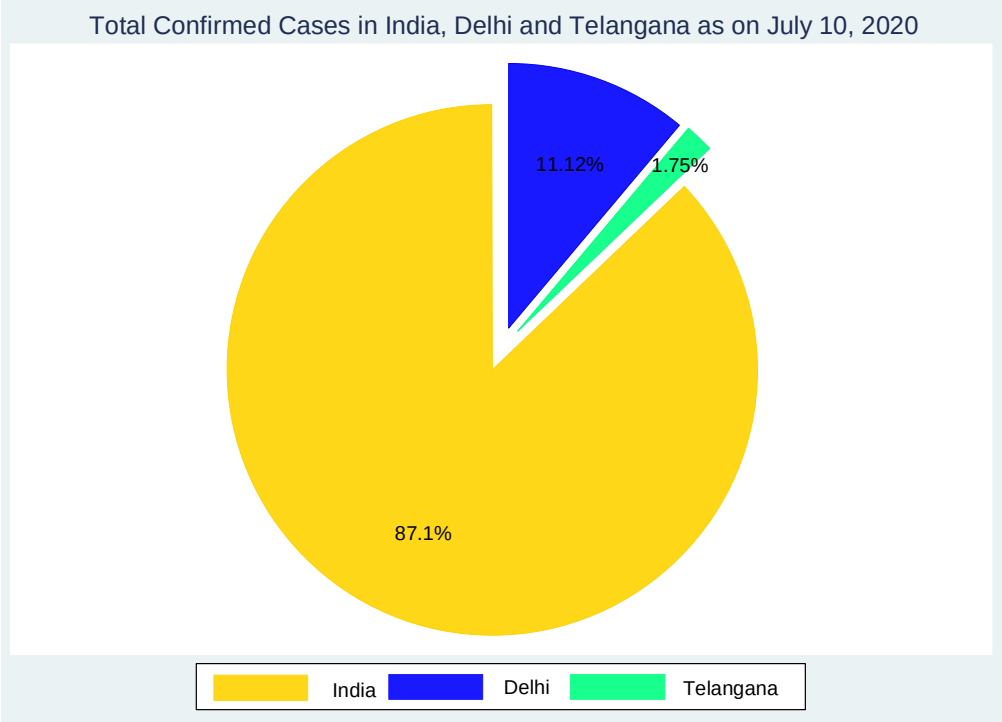

Fig 6. *Confirmed cases in two states in according to cases of India Source: www.mohfw.gov.in*

Telangana graph in figure 5 shows the curve which is increasing day by day, with the positive rate increase of 21.91% as on July 8, 2020.Total confirmed cases are shown (figure 6) for two states in according to India (87.1%), Delhi (11.12%) and Telangana (1.75%).

2.4 Mobility Trends in India, Delhi and Telangana

Figure 7 depicts the mobility trends for places where the public movement can be found to be dropped in several public areas in India from March 1, 2020 upto July 5, 2020. The movements were as follows for retail and recreation was -68%, supermarket (-23%), parks (-57%), transport (-48%), workplace (-20%) and residential (+14%).

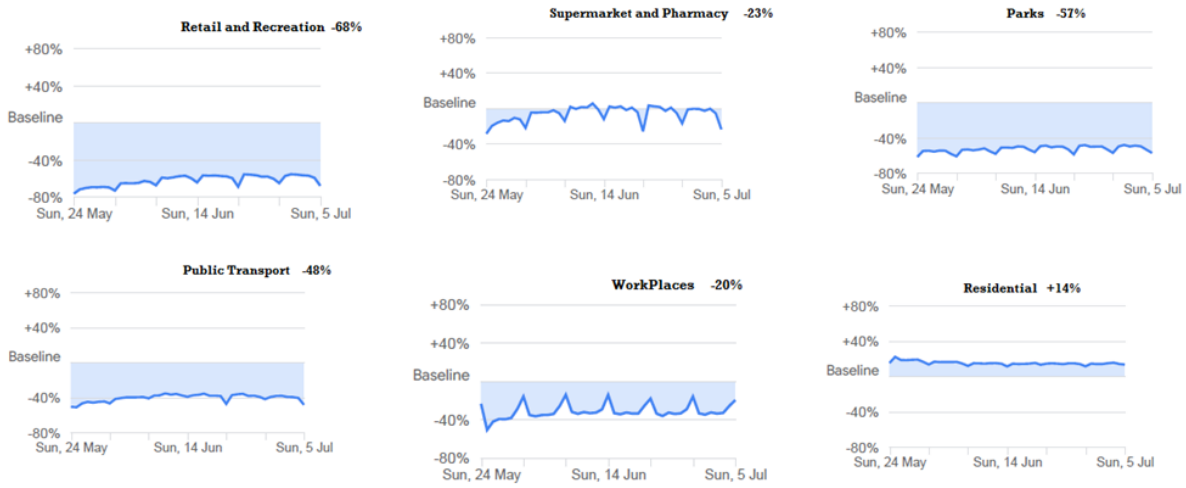

Fig 7. All India Covid -19 Community Mobility Trends Source: https://www.google.com/covid19/mobility/

From the figure 8 graph of number of visitors in all India from the beginning of the pandemic (March 1, 2020) till July 10, 2020 shows residential were 18%, grocery and pharmacy (2%), workplace (-32%), transit stations (-35%) this includes hubs such as subway, bus, and train stations, parks (-51%) and retail & recreation (-58%). The recreation includes places like restaurants, cafes, shopping malls, parks, museums, libraries, and movie theatre. The baseline day represents a normal value for that day of the week.

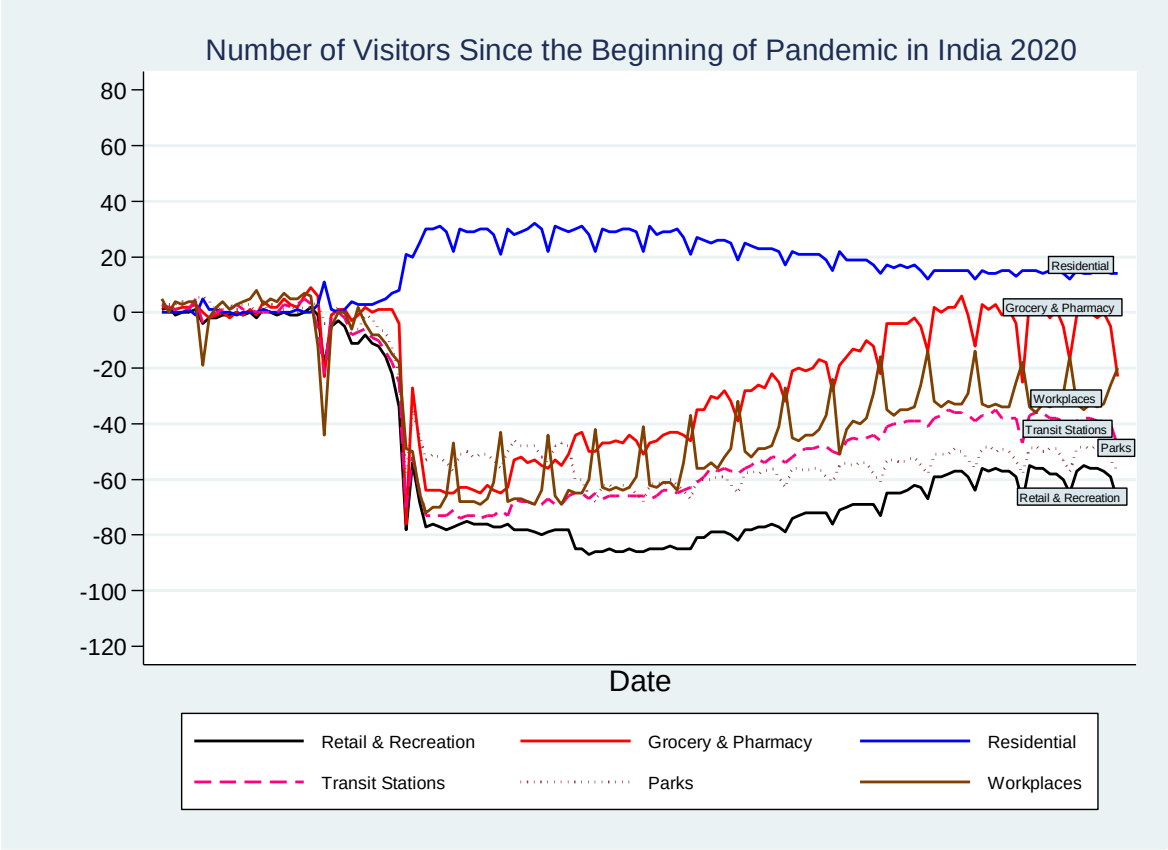

Fig 8. The number of visitor at various public places in India during Covid-19

In Delhi, the public movement was found as follows for retail and recreation (-62%), supermarket (-30%), parks (-86%), public transport (-55%), workplaces (-28%) and residential (+13%) during the Covid-19 period of May 24, 2020 to July 5, 2020 shown in figure 9. With the baseline days represent a normal value of day of the week, given as median value over the five-week period.

TS mobility trends is shown in figure 10 where public movement in retail and recreation (-66%), supermarket and pharmacy (-18%), parks (-62%), public transport (-42%), workplace (-16%) and finally residential (+13%) was observed.

Fig 9. Delhi Mobility Trends during Covid-19 Source: https://www.google.com/covid19/mobility/

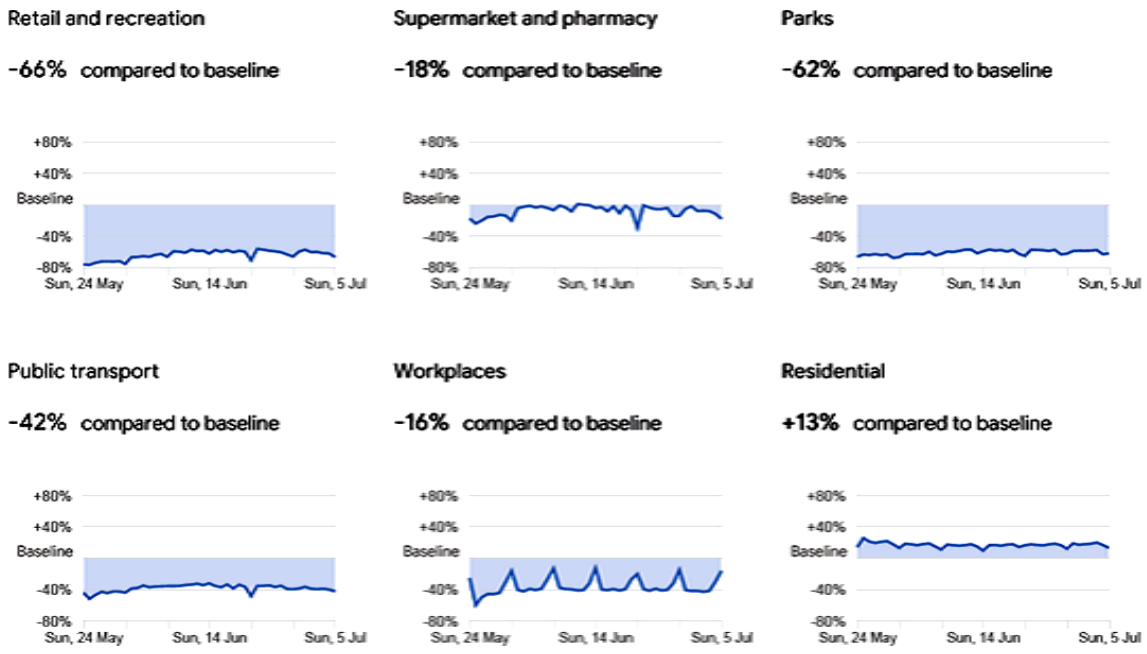

Fig 10. Telangana Mobility Trends during Covid-19 Source: https://www.google.com/covid19/mobility/

2.5 Spatial Distribution of Delhi and Telangana District Covid -19 Data

The maps were mapped using ARCGIS with confirmed cases on all the district data as on July 10, 2020. Figure 11a shows the confirmed cases as on July 10, 2020 with highest district in central Delhi (184) and south east Delhi (130) (Source: https://www.covid19india.org/). Hence, it concludes that the cases have reduced

in Delhi with flattened curve as in figure 4. And more number of testing samples were indicated after unlock (2.0). The people movements in Delhi during unlock (2.0) for the essential and fun time is shown in figure 9. From the figure 11b, Hyderabad has highest 24,710 cases and followed by Ranga Reddy (2,112) and Medchal (1,275). TS showed more number of cases (30946) after the unlock (2.0).

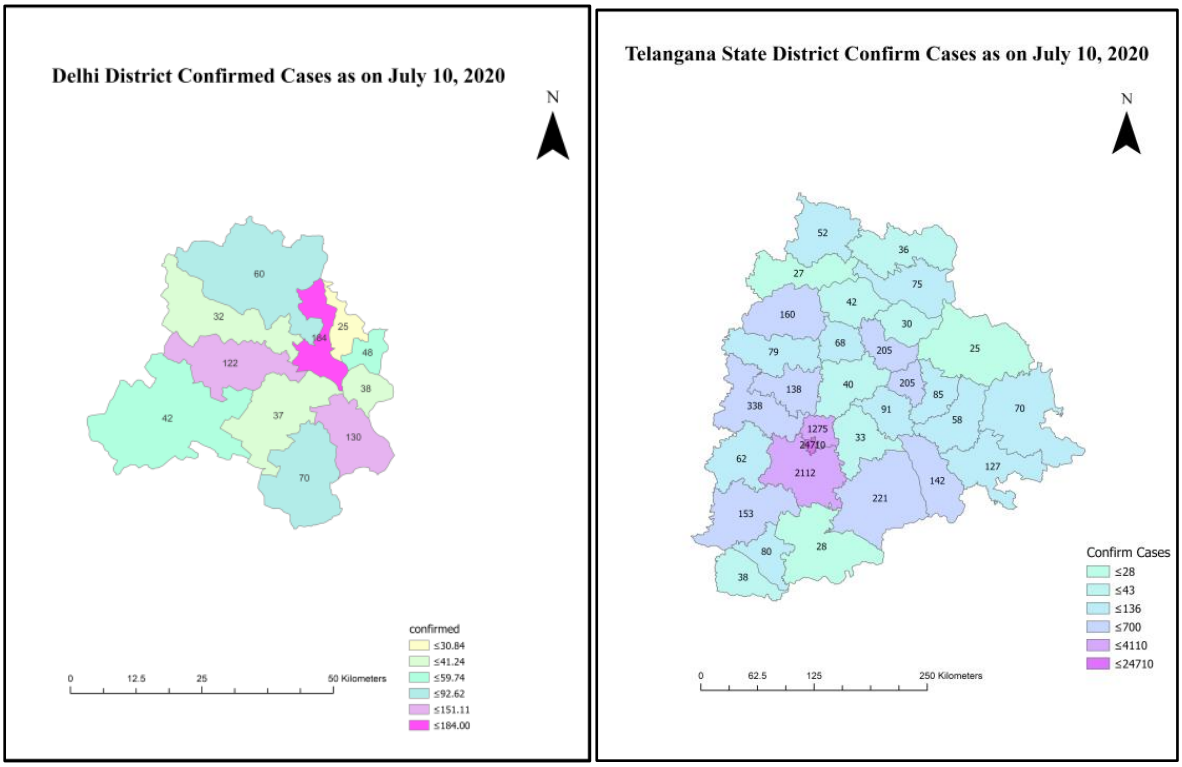

Fig 11a.Delhi and b. Telangana Districts confirm cases as on July 10, 2020

2.6 Distribution of Covid-19 Cases by Age Group

Covid-19 effect is seen more in the age group of 31-40 years (22.91%) followed by the age group of 21-30 years (21.93%), 41-50 years (16.34%), 51-60 years (13.05%), 11-20 years (9.73%), 61-70 years (8.70%) and very less in 0-10 years with 4.18%. As this age group will be within indoors and few affected cases may be due to other reasons that include members of family are affected by Covid-19 and so on.

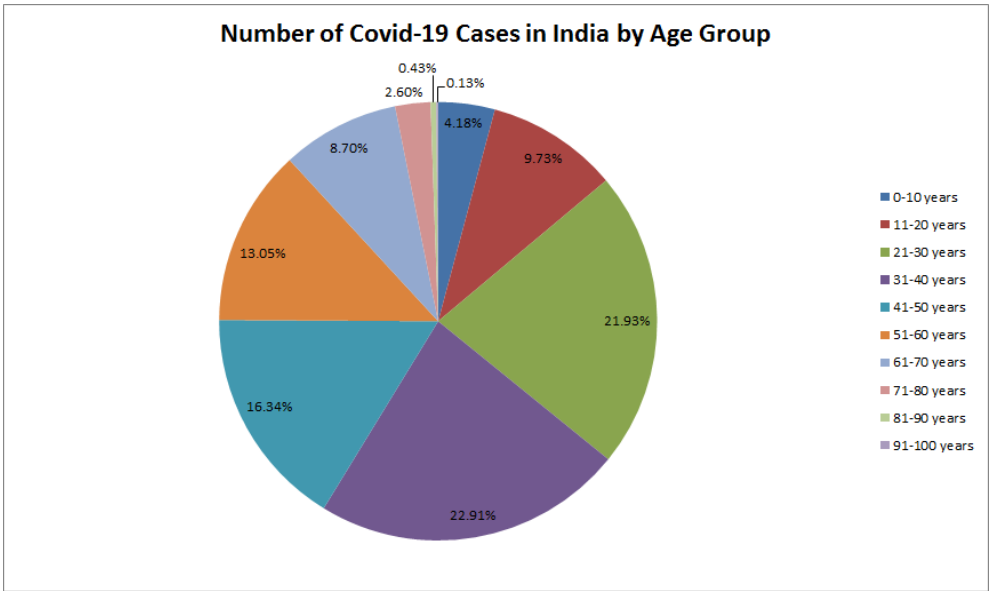

Fig 12. Covid-19 cases by age group in India

III. CONCLUSION

The unlock (2.0) has proved that the positive cases in Delhi have reduced as much as possible with the more number of testing samples. The trend shows pretty good sign in Delhi state inspite of its third high state in India. However, people maintained themselves indoors and understood that coming out unnecessarily would affect themselves and their families. Whereas Telangana curve shows that the increase in state is dreadful and increasing cases daily especially in Hyderabad. More number of cases was found in the age group of 31- 40 years all over India.

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