International Journal of Community Medicine and Public Health
Barhate A et al. Int J Community Med Public Health. 2021 Apr;8(4):1817-1825
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20211240

Original Research Article

Epidemiological perspectives of COVID-19 in Telangana and India: a descriptive study design

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Received: 21 December 2020
Revised: 10 February 2021
Accepted: 12 February 2021

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ABSTRACT

Background: The COVID-19 pandemic has made the world to come to a standstill. What started as on 16th March 2020, as 114 confirmed cases of COVID-19 in the country has now reached worrisome figures. The latest world scenario as per WHO as on 30th November, 2020 is as under-World data: 62,509,444 cases, deaths: 1,458,782; USA: 13,082,877 cases, deaths: 263,946; India: 9,431,691 cases, deaths 137, 139. It is evident that worldwide India is number two in case load and there's no reason to prevent India from becoming number one unless appropriate corrective steps are taken.
Methods: The present study has looked into various data sources available in public domain. The study covered a period of almost nine months i.e., from March 2020 to November 2020. The study revealed a steady increase in the number of COVID-19 cases from March 2020 with peak of pandemic occurring in the mid of September and then a steady decline of cases from October.
Results: The data analysis shows that after peaking of cases in September, the epidemic will decline in a phased manner by the end of March 2021. Even though there is a decline seen from the month of October, spike of COVID-19 cases was seen in November in some of the states of India. Therefore, we can't deny the possibility of a second wave of pandemic to occur in the month of December 2020 and January 2021.
Conclusions: Hence appropriate and strict control measures have to be put in place for effective control of the Pandemic and its resurgence.

Keywords: COVID-19 cases, Testing rates, Epidemic trend, Telangana and India

INTRODUCTION

The COVID-19 pandemic has made the world to come to a stand-still. The world health organization (WHO) was informed of cases of pneumonia of unknown etiology detected in Wuhan city, Hubei province of China on December 31, 2019. A novel coronavirus (2019-nCoV) was identified as the causative virus by Chinese authorities on January 7. There was zoonotic transmission associated with the 2019-nCoV based on the available evidence on the 2019-nCoV virus and previous infections with other coronavirus (MERS-CoV and SARS-CoV) and other respiratory viruses (e.g., avian influenza).[1] The SARS-CoV-2 genome has a close resemblance with SARS (80%) than Middle East respiratory syndrome (MERS)-CoV (54%) virus.[2] Higher infectivity and extended duration of illness in the infected person with a mortality rate of approximately 2% distinguishes it from other coronaviruses (MERS-CoV and SARS-CoV) and seasonal flu virus.[3] The outbreak was declared a public health emergency of international concern on January 30, 2020. On February 11, 2020, the WHO announced an official name for the nCoV disease: COVID-19. As on

March 15, 2020, the initial outbreak in China had spread to 185 countries.[1]

In India, the first Corona virus case occurred in Kerala on 30th January 20, in a student, who returned from Wuhan University. Three positive cases were reported in Kerala till 7th February. All these cases had a travel history from Wuhan, China. By 7th March, 33 positive cases (including 16 Italian tourists) were reported in India. By 16th March, there were 114 confirmed cases of COVID-19 in the country.[4]

Virus transmission of COVID-19 mainly occurs through the respiratory route-aerosols, droplets, fomites, and close contacts.[2] Current evidence suggests that the incubation period for COVID-19 ranges from 2 to 14 days. It is possible that the virus may be detectable in the upper/lower respiratory tracts for many weeks after the beginning of the illness.[1] Higher proportion (50-78%) of asymptomatic infections has also been observed. Clinical manifestations vary widely from milder features to severe illnesses, primarily involving the respiratory system, but increasingly multisystem (cardiac, hepatic, neurological, vascular, and thromboembolism) involvement has been observed, several being immune mediated. The mortality rates range between 2.3 to 11% and more with patients aged >60 years and with underlying comorbidities.[2]

In the absence of any known drug treatment or vaccine, unclear transmission dynamics, possible pre-symptomatic transmission, and case fatality rate up to 2% has led to adoption of drastic nonpharmacological interventions (NPIs) by many countries to slow down the virus transmission. These interventions include active case-based surveillance, enhanced testing and isolation of cases, contact tracing, social distancing measures, and progressive travel restrictions leading to complete internal mobility restrictions (lockdown) to reduce the contact rates.[5]

The pattern of rise in incidence of COVID-19 confirmed cases was studied by spreading out the number of confirmed cases from nationwide and state-wise data along a timeline curve along with the testing done for India and Telangana state.

Objective of the study was to assess the epidemiological trend along a timeline of COVID-19 confirmed cases and testing pattern in the state of Telangana and India and its comparison with other states from March 2020 to November 2020.

METHODS

Confirmed COVID-19 case was defined as laboratory confirmation of COVID-19 infection in a person with reverse transcription-polymerase chain reaction (RTPCR) test.[5] This review study was approved by institutional ethics committee. Nation-wide data was collected from various research articles on COVID-19, websites of Government of India for Corona virus updates, ICMR official website, Telangana government portal.[6-8] Another good source of data has been found from 'covid19india.org'. This website provides daily COVID-19 cases updates by uploading the real time COVID-19 cases for each day at district and state level. It also provides good dataset on recovered cases, deaths and testing done for COVID-19 at district and state level in India. The numbers are similar and in co-relation with the government portal updates.[9] We recorded number of daily confirmed cases from March to November 2020 and the disease incidence was spread out on a time curve for India as well as Telangana state and the World. The cumulative number of confirmed COVID-19 cases and testing done from March to November 2020 of different states like Andhra Pradesh, Maharashtra, Karnataka, Kerala, Punjab, Tamil Nadu, Delhi and Uttar Pradesh were compared with Telangana state. Cases growth rates and testing growth rates were calculated month-wise for 4 states (geographically neighboring states to Telangana state) i.e., Andhra Pradesh, Karnataka, Maharashtra and Tamil Nadu.

Data analysis

The tables and graphs were prepared by using the SPSS statistical software and Microsoft excel sheet. Growth rates of cases and testing were calculated for each month.

RESULTS

The time distribution of confirmed COVID-19 cases showed a propagated source epidemic. Initially i.e., on 14th March, confirmed cases reported in India were 81 (Figure 2) and that of Telangana was only 1 confirmed case (Figure 1). Cases began to increase steadily after March 19. Towards the end of March, i.e., on 31st March confirmed cases in India rose to 309 and in Telangana it was 20 and it was about 60,000 in the world (Figure 3). Nation-wide lockdown measures were implemented from 25th March 2020 in India. As the epidemic propagated in India, the mean number of cases reported daily in April was 1107.70±472.811 for India and that of Telangana state was 31.37±20.94 whereas for world was 77907.60±6187.01. Similarly, the mean number of cases per day for May 2020 in India was 5025.13±1855.751 and that of Telangana was 53.55±45.87 whereas for the world was 91483.13±11663.78 (Table 1). The confirmed cases rose exponentially in the month of June and July for both India and Telangana after the lockdown measures were lifted by the government. There was peaking of cases in the mid of September with 97,860 cases on 16th September 2020. Decline of cases started from the end of September and still continuing to decline. In the month of November 2020, it was observed that the number of cases reported in India remained constant ranging from 40,000-50,000 per day (Figure 2) and that in Telangana it was 1000-1500 per day (Figure 1).

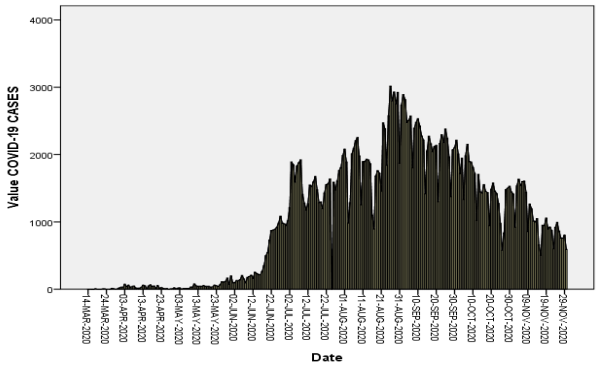

Figure 1: Daily rise of COVID-19 cases from March to November 2020 - Telanagana

The above bar diagram describes the no. of daily COVID-19 positive cases along with trend line over the period March 14th 2020 to 30th November 2020 in Telangana state.

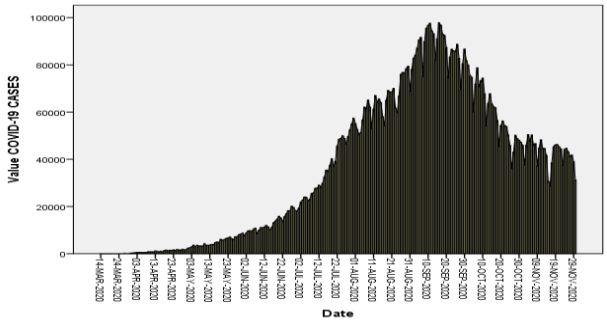

Figure 2: Daily rise of COVID-19 cases from March to November 2020 – India.

The above bar diagram describes the no. of daily COVID-19 positive cases along with trend line over the period March 14th 2020 to 30th November 2020 in India.

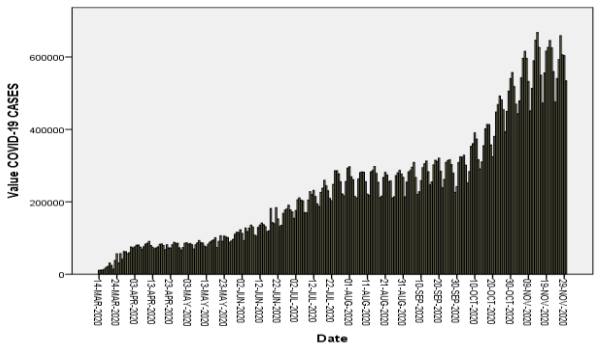

Figure 3: Daily rise of COVID-19 cases from March to November 2020 – World.

The above bar diagram describes the no. of daily COVID-19 positive cases along with trend line over the period March 14th 2020 to 30th November 2020 in the world.

State-wise analysis

If we compare the Telangana state statistics with other neighboring states:

Telangana: The rise in cases from March to April, considering the cumulative number of confirmed COVID-19 cases was from 97 to 1,038 with a growth rate (GR) of 870.10% with no testing in March and testing in April was 19,278. Considering April to May rise in cases, the GR was 76.41% (2,698) but the testing just increased marginally from 19,278 in April to 23,388 in May with a negative GR-78.68%. The GR of confirmed COVID-19 cases for May to June was 721.75% where cases increased to 16,339 as compared to May and that of testing was 1485.77% (88,563). Again, the cases GR decreased from June to July and further in August (239.89%, 34.29% respectively). Similarly, the testing GR also decreased for July (435.51%) and further in August (165.89%). August to September COVID-19 cases shows a 6.69% GR (1,91,386) while the testing GR has further decreased to 75.70% (29, 96,001). October and November show declining cases GR (-28.9 and -34% respectively) whereas testing GR to be -21.12% (42,81,991) in October and -8.9% (54,53,461) in November (Table 2 and 3; Figure 6).

Andhra Pradesh: While observed in the state of Andhra Pradesh, the cumulative cases increased from 44 in March to 1403 in April with growth rate (GR) of 2988.63% and the testing done in April was 94,558. The GR for confirmed COVID-19 cases for April to May decreased to 59.53% (3,571) while the testing GR in May was 66.01% (3,72,748). There was rapid increase in cumulative cases in June to 14,595 with GR of 408.49% and testing GR also increased to 86% (8,90,190). Similarly, like June cumulative cases increased in July (GR 1046.03%) and testing GR rose to 105.16%. Growth rate of cases (132.58%) and testing (66.84%) came down in August. The September data shows a GR of -11.95% (6,93,484) and testing GR of 17.64% (58,06,558). Further decline in the GR of cases can be seen in October and November (-49.8 and -65.5% respectively) with a decline in testing as well (Table 2 and 3; Figure 6).

Karnataka: Cases in the month of March were 101. It increased from 101 to 565 in April (GR 359.4%) while the testing was 60,156. Cases increased from 565 to 3221(GR 472.41%) and testing increased from 60,156 to 2, 93,575 (GR 288.023%) in the month of May. There was a drop-in growth rate of cases i.e., 352.6% (15,242) and testing 40.2% (6, 20,747) in the month of June but increased in the month of July with cases GR 805.70% and that of testing GR 123.14%. There was further decrease in cases growth rate (100.52%) and testing growth rates (111.63%) of August. There is much fall in the cases GR of September 18.8% (6, 01,767) and testing GR 29.8% (49,01,083). Similar decline in cases GR seen in October (-14.5%) and November (-72.2%) but the testing GR increased in October (49.84%) and decreased in November (6.35%) (Table 2 and 3; Figure 6).

Table 1: COVID-19 cases in Telangana state, India and world.

Month		Mean	SD	Std. Error	95% CI for Mean		Min	Max
					LB	UB		
March	TS state	5.39	5.031	1.186	2.89	7.89	1	20
	India	90.83	73.516	17.328	54.27	127.39	11	309
	World	34841.22	19858.317	4680.650	24965.91	44716.53	11076	63080
	Total	11645.81	20014.562	2723.637	6182.89	17108.74	1	63080
April	TS state	31.37	20.941	3.823	23.55	39.19	2	75
	India	1107.70	472.811	86.323	931.15	1284.25	424	1902
	World	77907.60	6187.013	1129.589	75597.33	80217.87	67209	90642
	Total	26348.89	36835.117	3882.762	18633.92	34063.85	2	90642
May	TS state	53.55	45.879	8.240	36.72	70.38	3	199
	India	5025.13	1855.751	333.303	4344.43	5705.82	2396	8789
	World	91483.13	11663.780	2094.877	87204.82	95761.44	70138	116458
	Total	32187.27	42740.592	4431.993	23384.95	40989.59	3	116458
June	TS state	454.70	357.553	65.280	321.19	588.21	92	1087
	India	13168.13	3658.781	667.999	11801.92	14534.34	7723	20142
	World	141174.53	26395.184	4819.079	131318.41	151030.66	93367	191046
	Total	51599.12	65693.346	6924.687	37839.92	65358.33	92	191046
July	TS state	1495.61	373.064	67.004	1358.77	1632.45	0	1986
	India	35847.52	11532.300	2071.262	31617.43	40077.60	19429	57486
	World	223636.74	35384.145	6355.180	210657.73	236615.75	154611	293232
	Total	86993.29	100437.498	10414.883	66308.43	107678.15	0	293232
August	TS state	1991.94	564.035	101.304	1785.05	2198.83	894	3018
	India	64204.84	8095.325	1453.963	61235.45	67174.23	50488	79461
	World	259198.10	28817.288	5175.738	248627.83	269768.36	210660	297794
	Total	108464.96	111481.274	11560.070	85505.66	131424.25	894	297794
September	TS state	2214.10	379.515	69.290	2072.39	2355.81	1302	2892
	India	87410.73	7240.122	1321.859	84707.23	90114.24	69668	97860
	World	278182.07	32733.420	5976.277	265959.21	290404.93	214154	321012
	Total	122602.30	117592.996	12395.390	97972.92	147231.68	1302	321012
October	TS state	1524.06	381.289	68.481	1384.21	1663.92	582	2214
	India	60423.55	12275.662	2204.774	55920.80	64926.30	36104	81785
	World	385874.29	79361.398	14253.728	356764.29	414984.29	252543	557268
	Total	149273.97	176015.702	18251.978	113023.96	185523.97	582	557268
November	TS state	1039.47	326.062	59.530	917.71	1161.22	502	1637
	India	42662.00	5496.810	1003.576	40609.46	44714.54	28609	50465
	World	565370.20	65470.158	11953.161	540923.24	589817.16	443611	667971
	Total	203023.89	260928.290	27504.257	148373.52	257674.26	502	667971

Source: http://health.telangana.gov.in/, https://www.mygov.in/covid-19/, https://covid19.who.int/.

Table 2: Confirmed COVID-19 cases (cumulative) from March to November 2020.

Months	March	April	May	June	July	August	September	October	November
Telangana	97	1038	2698	16339	62703	124963	191386	238632	269816
Andhra Pradesh	44	1403	3571	14595	140933	434771	693484	823348	868064
Delhi	Nil	3515	19844	87360	135598	174748	279715	386706	570374
Karnataka	101	565	3221	15242	124115	342423	601767	823412	884897
Kerala	241	498	1270	4443	23614	75386	196107	433106	602983
Maharashtra	302	10498	67655	174761	422118	792541	1384446	1678406	1823896
Punjab	42	480	2263	5568	16119	53992	113886	133658	152091
Tamil Nadu	124	2323	22333	90167	245859	428041	597602	724522	781915
Uttar Pradesh	104	2211	8075	23492	85461	230414	399082	481863	543888
India	1635	34867	190648	585792	1697054	3687940	6310267	8183394	9463254

Source: https://www.covid19india.org/

Table 3: Testing done (cumulative) from March to November 2020.

Months	March	April	May	June	July	August	September	October	November
Telangana	Nil	19278	23388	88563	437582	1365582	2996001	4281991	5453461
Andhra Pradesh	Nil	94558	372748	890190	1951766	3722912	5806558	8028905	10057854
Delhi	Nil	47225	212784	531752	1032785	1583485	3079965	4680695	6288065
Karnataka	Nil	60156	293575	620747	1350792	2895807	4901083	7905868	11101633
Kerala	Nil	27481	77508	231570	776268	1685203	2925776	4645049	6262476
Maharashtra	Nil	135694	463177	970161	2133720	4145123	6785205	8967403	10856384
Punjab	Nil	21205	87852	301830	582573	1062667	1841955	2604208	3193166
Tamil Nadu	Nil	119748	491962	1170683	2658138	4813147	7354050	9956210	12060001
Uttar Pradesh	Nil	78013	289892	727793	2325428	5490354	10098896	14863388	19322658
India	42788	902654	3837207	8826585	19358659	43324834	75619781	108796064	141349301

Source: https://www.covid19india.org/

Table 1 describes monthly mean, standard deviation of COVID-19 positive cases along with the std. error with respect to TS State, India and worldwide.

Table 2 shows cumulative number of confirmed COVID-19 cases from March 2020 to November 2020 for India, Telangana and other states.

Table 3 shows cumulative number of testing done from March 2020 to November 2020 for India, Telangana and other states.

Maharashtra: Confirmed COVID-19 cases exponentially increased from 302 in March to 10,498 in April (GR 3276.16%) while testing in April was 1,35,694. GR of cases decreased to 460.58% (67,655) in May and testing rate was 141.34% (4,63,177). Similarly, growth rate of cases drastically decreased to 87.39% (1,74,761) in June while testing rate decreased to 54.81% (9,70,161). There was a surge in cases for the month of July with a GR of 130.95% (4,22,118) for cases and testing GR being 129.51% (21,33,720). For the month of August and September GR decreased to 49.75% and 59.79% respectively while testing GR decreased to 72.87% and 31.25% respectively. There was a further decline in GR of cases in October and November with -50% GR for each. Testing also reduced for the month of October and November (Table 2 and 3; Figure 6).

Tamil Nadu: Cases increased from 2,323 in April to 22,333 in May (GR 809.96 %) whereas testing increased from 1,19,748 in April to 4,91,962 in May (GR 210.83%). Same as that of Maharashtra there was decrease in cases (GR 239%) and testing (GR 82.35%) in the month of June. Again, there was spike in cases in July with a GR of 129.52% (2, 45,859) for positive cases and GR of 119.16% for testing (26,58,138). There after a decreasing trend in GR of cases and testing was seen in August and September. Similar observations made in the month of October and November (Table 2 and 3; Figure 6).

India and world: According to WHO data, the global COVID-19 cases show increasing trend from March to July, but from August to September constant number of cases are seen.[10] The cases in the month of August and September ranged between 2-3 lakhs per day. Similarly, in India, August month showed a range of 50,000-70,000 cases per day and September showed a range of 90,000-95,000 cases per day. With the peak of pandemic occurring in mid of September, decline in the cases observed in the month of October and November (Table 1 and Figure 2, 3 and 5).

DISCUSSION

According to revised ICMR guidelines on 18th May 2020 (version 5), strategy for testing in India was 1) all symptomatic (*ILI symptoms) individuals with history of international travel in the last 14 days 2) all symptomatic (ILI symptoms) contacts of laboratory confirmed cases. 3) all symptomatic (ILI symptoms) health care workers/frontline workers involved in containment and mitigation of COVID-19. 4) all patients of Severe Acute Respiratory Infection (**SARI) 5) asymptomatic direct and high-risk contacts of a confirmed case to be tested once between day 5 and day 10 of coming into contact. (Initially it was 5 and 14 days after coming in contact). 6) all symptomatic ILI within hotspots/containment zones. 7) all hospitalized patients who develop ILI symptoms. 8) all symptomatic ILI among returnees and migrants within 7 days of illness 9) no emergency procedure (including deliveries) should be delayed for lack of test. However, sample can be sent for testing if indicated as above (1-8), simultaneously.[8]

*ILI case is defined as one with acute respiratory infection with fever ≥38◦C AND cough. **SARI case is defined as one with acute respiratory infection with fever ≥38◦C AND cough AND requiring hospitalization. All testing in the above categories is recommended by real time RT-PCR test only.

According to guidelines issued on 23rd June 2020, ICMR introduced rapid point-of-care (PoC) antigen detection test (for diagnosis along with RT-PCR).[8] Since the entire public health machinery is focused to test, track and treat COVID-19 patients, it is imperative to explore the existing antigen-based assays as point-of-care tests for early detection of SARS-CoV-2. Guidelines were issued to use antigen detection test in containment zones or hotspots and healthcare settings. Sero-survey by using IgG ELISA test was also introduced.

According to recent guidelines by ICMR dated 4th September 2020 (version 6):[8] A) Routine surveillance in containment zones and screening at points of entry: choice of test (in order of priority): i. Rapid antigen test (RAT), ii. RT-PCR or TrueNat or CBNAAT. B) Routine surveillance in non-containment areas: choice of test (in order of priority): i. RT-PCR or TrueNat or CBNAAT, ii. Rapid antigen test (RAT). C) In hospital settings: choice of test (in order of priority): i. RT-PCR or TrueNat or CBNAAT. ii. Rapid antigen test (RAT).

As observed in the nation-wide data collected, the time distribution of the confirmed cases in Telangana and India showed a propagated source epidemic. If we observe the graphs of COVID-19 cases plotted over time curve for India and Telangana, it shows an exponential rise in cases from March to July 2020. The actual number of cases reported in April and May were less in comparison to June and July due to lockdown measures with complete internal mobility restrictions implemented by the government (Figure 1, 2 and 4).[5] Similar conclusions were made by a comprehensive analysis study by Gupta et al.[11] A study by Ghosh et al failed to predict cases in the month of April and May for the states of Maharashtra, Delhi, Tamil Nadu, Telangana, Andhra Pradesh, Kerala, Karnataka, Punjab and Uttar Pradesh.[12]

A model based study by Mandal et al successfully predicted the cumulative number of cases for Maharashtra and Delhi in the month of May.[13] As the lockdown measures were lifted by government on 1st of June exponential rise in cases has been observed and community transmission set in. The rise in cases was also because of poor compliance of people with the use of masks, social distancing, hand hygiene and migration of workers and people to rural areas in lockdown period and post-lockdown period. As observed for the month of August and September, it shows a constant number of cases reported daily (Figure 1, 2 and 4).

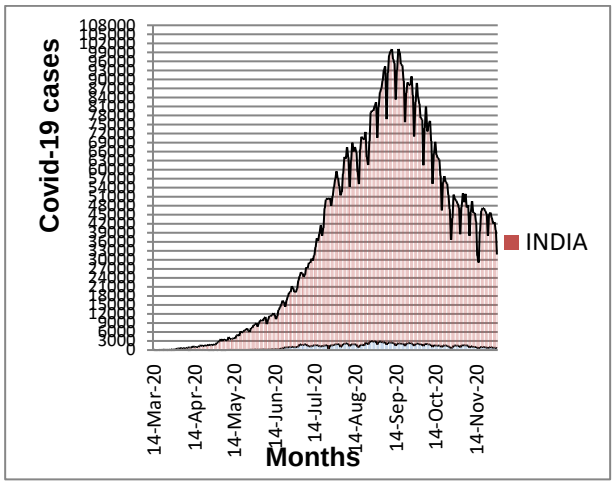

Figure 4: TS and India, daily rise in COVID-19 cases in Telangana and India.

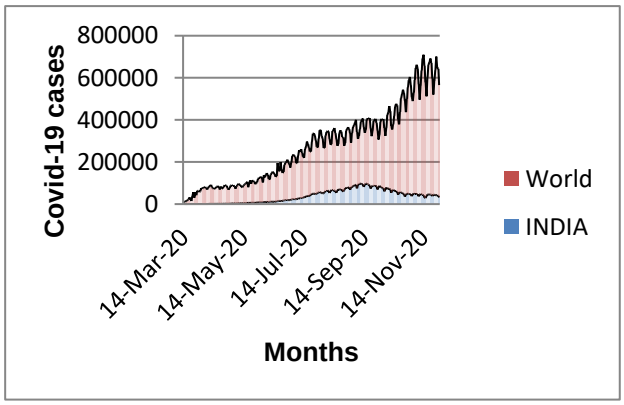

Figure 5: India and world, daily rise in COVID-19 cases in India and world.

Telangana: In the month of March 2020, Confirmed COVID-19 cases in India were 309 and that in Telangana was 20 with no testing for COVID-19 in Telangana state. Cases growth rate (GR %) increased in April as it was the start of epidemic. As steadily the cases started to rise daily in the month of April and May, the testing was started but marginally increased from April to May in Telangana state. Effects of lockdown measures implemented by the government can be seen on the GR% of cases in May and similarly the GR of testing of May was also less. Cases GR% rose from 76% in May to 721.75 % in June and the same was true for testing. This can be attributed to the uplifting of lockdown measures in the month of June and spreading of the infection in the community. But soon in the month of July, August and September, the cases as well as testing GR% has further decreased. This is mainly because of less testing and under reporting of cases in Telangana state.

Andhra Pradesh: There was a rise in COVID-19 cases from March to April in Andhra Pradesh as well and just like other states the cases GR% decreased in May due to lockdown measures. It was observed that consistently cases increased from May-June and June-July but decreased for the month of August and September. This can be attributed to consistent increase in number of testing by the state government of Andhra Pradesh.

Karnataka: Consistently cases GR increased from March to July with the exception of June whereas testing was less in June as compared to May and July. Cases and testing GR showed a decreasing trend in the months of August, September October and November.

Maharashtra: Since the beginning of the pandemic Maharashtra has a greater number of cases with enhanced testing. Maharashtra had increased GR in April which lowered in May and further decreased in June. Large number of cases in April and May can be due to large number of people dwelling in slum areas, people staying in closed group, no social distancing and no space for isolation. Lockdown measures had some effect on GR of May. Same was true for testing, increased GR in May which lowered in June. There was spike in GR of cases in the month of July which further decreased in August and September; the same is true for the testing.

Tamil Nadu: April cases was much greater as compared to March but decreased in the month of May and further decreased in June because of effect of lockdown and testing measures undertaken. But due to wide spread of cases in community there was a spike in GR seen in the month of July. This GR of cases declined in the month of August and September, the same being true for testing GR as well.

Comparing Telangana state cumulative cases and testing from April to November it was much less than Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu, Delhi, Kerala and Uttar Pradesh (Table 2 and 3, Figure 6).

A study by Blessy et al shows that the COVID-19 testing per million population in Andhra Pradesh was far better than Telangana and other southern states of India in the month of April. Strategies followed by AP government for COVID-19 were containment zone recognition, door to door survey to identify who has travelled to corona virus affected country, mobile testing centers which operated from buses and early closure of public places before the lockdown.[14] Similar observations were suggested by the study done by Bahinipati et al.[15]

The observations of the study by Laxminarayan et al.[16] suggests that cases might be under-counted in the early phase of the epidemic (i.e., April) in the states of Andhra Pradesh and Tamil Nadu, due to limitations in testing availability. Test positivity increased in Tamil Nadu after mid of April which can be seen with the exponential growth in new reported cases for April and May, but it remained low in Andhra Pradesh.

A study by Avhad et al observed that low temperature, high humidity, densely populated areas with lack of social distancing and isolation led to such increased spread and rise in number of COVID-19 cases in Maharashtra from the start of epidemic i.e., in the month of March, April and May.[17]

The first case of COVID-19 was seen in Kerala; still it has been successful in controlling the COVID-19 epidemic outbreak quite well since beginning. As on 30th September, it is at 9th position in terms of confirmed COVID-19 cases and has small number of deaths as compared to other states like Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu, Uttar Pradesh and Delhi. This is mainly due to strong government health system, previous learning experience from managing the Nipah outbreaks, effective prevention measures taken early, active involvement of local governments in public health in Kerala, all of these reasons have played an important role in controlling the epidemic. Active testing since beginning and transparency in information by the government of Kerala has taken people in confidence.[18]

India and world: According to WHO as on 30th November, 2020 worldwide COVID-19 confirmed cases were 62,509,444 and deaths were 1,458,782. USA tops the list with 13,082,877 confirmed cases and 263,946 deaths whereas India stands at second most position with 9,431,691 cases and 137, 139 deaths. Global Case fatality rate (CFR) around mid of November was 2.33%, CFR of USA was 2.02%[10] and Indian CFR was 1.54%.[19]

The total cases in India as on 30th November was 94,63,254 with 88,88,595 recoveries, 137,659 deaths and 14,13,49,301 individuals tested.[9] According to ICMR (Indian Council of Medical Research) 14th December 2020 data, the cumulative COVID-19 testing for India was 15,55,60,655.[7] In relation to 11th August 2020 news, India's testing rates were only 18,000 per 10 lakh population which was very low by global standards. Out of 20 countries with highest number of COVID-19 cases, only Pakistan, Mexico and Bangladesh had testing rates lower than India per 10 lakh population. UK topped the list with 2,70,000 testing per 10 lakh population whereas Russia and US had around 2 lakh testing per 10 lakh population.[20]

Observing the trend of state-wise positive COVID-19 cases and testing done in India, it shows that there is no consistent rise or decrease in cases in any state of India. The day testing is more, more number of cases is seen and the day testing is less, number of cases is less in number. Considering present figures of positive cases, testing dropped in the month of August and mid of September.

This is mainly because there was no consistency in testing done. Population as a denominator has not been considered or taken into account for testing anywhere. Therefore, it has become difficult for public health specialists to compare and co-relate the testing data with the number of positive COVID-19 cases.

India currently is in the dangerous period where there is doubtful transparency regarding data on cases and deaths. The epidemic has spread from urban cities to towns and villages where rural health infrastructure is sparse with equipment shortages, especially oxygen. Presenting too positive situation clouds reality and affects the health initiatives taken against the COVID-19 pandemic.[21]

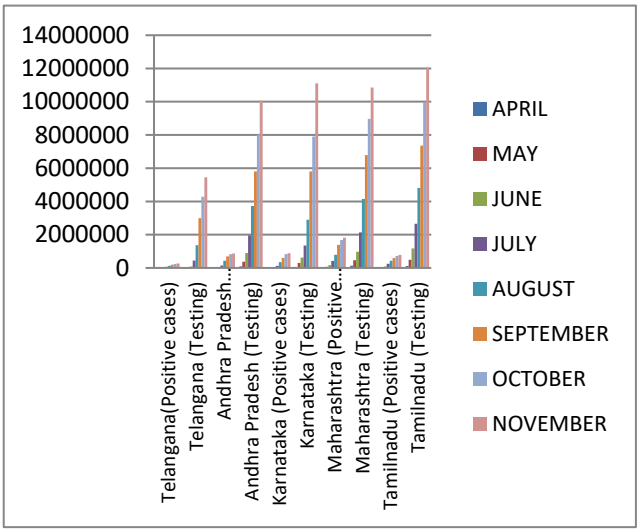

Figure 6: Comparing the cumulative COVID-19 cases and testing of Telangana with other states.

CONCLUSION

Under reporting and less testing led to smaller number of cases traced in Telangana as compared to other states. Testing has been done in a very inconsistent pattern.

Observing overall Indian data of COVID-19 positive cases and testing done, there was no regularity and systematic testing done in any of the state. Hence co-relating the confirmed positive COVID-19 cases with the testing statistics makes no sense. Timeline curve of COVID-19 cases for India suggests that as the epidemiological measures like social distancing, use of masks, complete internal immobility (during lockdown) were not taken seriously in the initial months of epidemic, community transmission started in the month of June. COVID-19 cases continued to rise exponentially till September with the epidemic curve peaking in the mid of September. The epidemic curve which has started

flattening from October will take another 6-7 months to decline. In near future, India may become the topmost country with maximum number of COVID-19 cases and deaths. Even though there is a decline seen from the month of October, spike of COVID-19 cases was seen in some of the states of India in the month of November. Therefore, we can't deny the possibility of a second wave of pandemic to occur in the month of December 2020 and January 2021.

According to international studies, the chances of COVID-19 vaccine coming before March 2021 are remote with its doubtful efficacy, it is very important for all of us to maintain social distancing, use of masks, personal hygiene (cough etiquettes, hand hygiene) limiting public gatherings and travel restrictions. The only tool available with the state governments is active testing of people, tracking and contact tracing, quarantine and isolation of cases, treatment and appropriate use of technology to flatten the curve of this pandemic. Transparency in the data and adopting a scientific evidence-based approach will only help to communicate public health messages seriously to the population.

ACKNOWLEDGEMENTS

The assistance provided by Mr. B. Prasad, Department of Community Medicine, Shadan Institute of Medical Sciences, Hyderabad for his technical support was greatly appreciated.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee No.069/SIMS/EC/2020

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Cite this article as: Barhate A, Bhatia P. Epidemiological perspectives of COVID-19 in Telangana and India: a descriptive study design. Int J Community Med Public Health 2021;8:1817-25.