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A key question prevails among all individuals today is how the disease, COVID-19 would propagate in an environment in which it is left unconstrained wherein, assertive efforts to mitigate the disease’s adverse effects are in headway. In the present study, the drilldown analysis of Covid-19 cases in India is presented and also discusses the prevention methods needed to break the chain of spread of virus.

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1. Introduction

In late December 2019, a cluster of pneumonia cases were reported in Wuhan, China and the origin of it were unknown. It caused an alarming signal among the health officials. Later on a notification was made to World Health Organization (WHO) about the virus spread. Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus. It spreads very quickly through human-to-human transmission and sometimes leads to death [1–3]. World Health Organization (WHO) has declared that COVID-19 as pandemic. The virus has now spread across the world and almost all countries are fighting against this deadly virus and everyone is working to curb the spread as much as possible. Most people infected with Covid-19 will have fever (87.9%) and cough (67.7%) as common symptoms. Diarrhea is uncommon [4]. Aged people with diabetes, chronic respiratory problems and cardiovascular disease are highly prone to this virus. When an infected person coughs or sneezes, COVID-19 virus spreads mainly by droplets of saliva or nose discharge, so it is very essential that everyone must follow respiratory etiquette.

By the first week of March 2020, several countries like China, Italy, Spain, Germany, Australia, US were battling with the pandemic. All countries announced nationwide lockdowns and confining off the area were infected patients residing to avoid community spread. India is a heavily populated country where the outbreak shall cause an irreversible damage. India should not be addressed as it authorities have to take stringent steps to “flatten the curve”. Realizing the vulnerable situation, the government of India announced a lockdown for 21 days and later extended it to 40 days (British Broadcasting Corporation, 2020).

Based on the number of Covid cases and the frequency of infection, certain areas were declared as hotspots. These include 13 states (Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, New Delhi, Orissa, Punjab, Rajasthan, Tamil Nadu, Telangana and Uttar Pradesh) and these areas may require longer lockdowns with vigorous monitoring and testing measures. These areas are prone to community spread. In this paper we will have a drill down analysis of Covid-19 in India so far and will discuss about the prevention methods which will break the chain.

2. Age wise breakup of Covid-19 patients in India

The chart (1) shows the breakup of Covid-19 patients across all age groups. From the chart it clearly demonstrates that 87.26% of the total patients fall in the age bracket 20–69 years. Another important observation is that patients in the age bracket 0–29 years constitute to 32.36%. They become the “Super Carriers” of this deadly virus which contributes to majority community spread. The age wise breakup of patients in India is presented in Fig. 1.

The Geo-temporal spread of COVID-19 in India through April 12, 2020. Fig. 2 shows the distribution of 31 states and union territories. The epidemiological curve shows the advancement of illness in the outbreak over time from January 30, 2020 to April 12, 2020. A total of 8447 cases are shown and confirmed cases (yellow)
where a total of 765 have recovered (blue) and a sum of 273 reported death (red). We can observe that the spread is more in Maharashtra, Delhi, Tamilnadu, Rajasthan, Telengana, Madhya Pradesh, Andhra Pradesh. Most of the areas in these states have been declared as hotspots and lockdown is further extended. In Fig. 3 epidemiological curve show the progression of the disease (Fig. 4).

3. Method of calculation

3.1. Regression function and forecasting

The following mathematical approach is established based on the data collected from sources and the details of data are presented in Appendix.

Let \( A \) be the number of people affected by COVID-19, \( t \) be the time duration in days and \( k \) is a constant.

As on 01 February 2020 the number counts as one (\( A = 1 \)). The generalized equation for estimating number of people affected is given as,

\[
\frac{dA}{dt} = kt
\]  

Then

\[
A = Ce^{kt}
\]  

where, \( C \) is a constant.

Considering 01-02-2020 as day zero, the number of affected people is 1. Such that,
Substituting $t = 0$ and $A = 1$ in eq. (2), we get $C = 1$.

For a period of 50 days, i.e. when $t = 50$, $A = 403$ (Refer Appendix Table 1).

Substituting $t = 50$ and $A = 403$ and $C = 1$ in eq. (2), we get,

$$403 = 1e^{0.1199 \times 50},$$

Then, $k = 0.1199$

Hence the generalized formula shall be established as,

$$A = 1xe^{0.1199t} \quad (3)$$

The correlation coefficient is calculated as 0.935. Likewise the number of people affected on a day to day basis shall be calculated (Fig. 5).

3.2. Error function

For a generalized equation of form,

$$Y = X\beta + e \quad (4)$$

Let $Y$ is response vector, $e$ is error vector. Where,

$$e = Y - X\beta \quad (5)$$

The sum of squared errors shall be computed as,

$$e^Txe = (Y - X\beta)^T(Y - X\beta) \quad (6)$$

The root mean squared error was calculated as 0.91

3.3. Limit transmission and break the chain

To limit the transmission of respiratory pathogens spread by droplet or by airborne routes, every individual must follow the basic hygiene/cough etiquettes.

- Primarily covid19 patients and individuals accompanying the patients must be quarantined and treated.
• Every individual must cover their mouth and nose while coughing or sneezing.
• Use tissues and throw them away.
• Wash hands or use a hand sanitizer every time you touch your mouth or nose.
• Provide tissues and no-touch receptacles for their disposal.
• Social Physical distancing of one meter from everyone is the best ways to break the chait

4. Conclusion

The present study demonstrates the analysis on trend of COVID-19 cases in the states of Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, New Delhi, Orissa, Punjab, Rajasthan, Tamil Nadu, Telangana and Uttar Pradesh as these states is identified as hotspots. It was observed that the spread of disease is high among elder people with other health issues and children of age less than 10 years. It can be concluded that personal hygiene is much more needed to reduce the spread of COVID-19.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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