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Invasion of novel corona virus (COVID-19) in Indian territory

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**A R T I C L E   I N F O**

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**A B S T R A C T**

Coronavirus (COVID-19) started its invasion as an epidemic from Wuhan, China and propagated to become the scary pandemic that reached more than 200 countries all over the world. High number of infected people and unfortunately high mortality are the result of this invasion. The Indian scenario is no exception to this deadly infection attack, though it started a bit late. The first case in India came into notice in January and the number of cases showed an enormous growth in mid March and still continue to grow. This timely report focuses on the current invasion scenario in India as of 11th May 2020; with total cases of 67,152, active cases of 44,029, deaths totaling to 2206 and over-all recoveries of ~20,917 patients.

1. Introduction

SARS-CoV-2 is a single standard RNA genome with multiple protein spikes at the envelope (outer structure) [1]. This virus has caused numerous infections and mortalities across the world including India. The first case in India came into notice on 30th January 2020 and the number of cases increased enormously in mid March. Numerous new cases of COVID-19 infections across the country are reported everyday and the figures are continuously rising [2]. The effective control and prevention of the spread of this lethal virus is currently the biggest challenge. The districts in the country were earlier divided into green, orange and red zone on the basis of cumulative cases in addition to the doubling rate. But now, the division is broadly based on incidence of cases, doubling rate, in addition to degree of testing and surveillance response [3].

At this juncture, Indian governments (central and state level) are jointly working hard to minimize the effects day in and day out to combat this war involving public, medical fraternity, nurses, NGOs, police forces, including paramilitary to fight against this invisible war. The control and treatment of pandemic has been only possible owing to the earnest efforts of all the frontline workers especially medical doctors, nurses, other healthcare staffs, sanitation workers and police personnel. There is an urgent need to handle this battle at a scientifically advanced level to treat this COVID-19 infection. There is no vaccine or any particular antiviral medication for the treatment of this virus and on a fast-track basis too, at least 1.5–2 years would be needed for the developing vaccination [2].

This timely report may create some awareness about this pandemic to the world scenario.

2. Infection of Covid-19 among Indians

Every day in India, increasing numbers of active patients of Covid-19 are reported, depending on population density, and testing mechanism. Covid-19 spreads by means of droplets produced after coughing/sneezing/exhaling of an infected individual. The disease network is reported to spread via close interaction with the infected person or touching contaminated surfaces and later touching nose, mouth, or eyes [2]. The lack of awareness and negligency in common public can be a bottleneck and it is imperative to educate people to understand about the control mechanism. The active infections reported until 11th May 2020 in...
different parts of India are tabulated in Table 1 [2]. The increasing trend of cases can be seen in Fig. 1 [4]. This deadly infection is growing with an exponential rate in India with a total of 67,152 cases as of 11th May 2020 [2]. Over-all 16,73,688 samples were tested till 11th May 2020, 9 a.m. IST [5] The reproduction number (R0) between the interval of 19th April to 3rd May 2020 is reported to be 1.27 [6]. Multiple cases of the frontline workers being infected are also reported [7,8]. About 96 doctors in addition to 156 nurses were reported to test positive for COVID-19 as of 22nd April 2020 [8].

In India, there are multifold approaches of ramification that can depend on cultural, economical and health infrastructures in different parts. The mitigation protocols in different parts of India can effectively break the human to human link via disconnecting the infected individual from community to reduce the spreading of its infection. At the state-level network, there are some specific modes for recognizing the location of node detection and at the initial level, this infected network in different states can be used as the initial node network with the benefit of the actual number of cases or even susceptible people, found by using population density of that state. The chances of COVID-19 infection are found in high density due to more interaction at the social or physical level leading to high speed of spread in susceptible individuals. Those with a few numbers have now grown to few hundred, then in a thousand and in millions of Covid-19 infections. It is forecasted that the rise of these trends will continue until the next month [6].

The infected people may feel terrified and anxious because of the stigma attached with the disease and fear of social rejection and avoidance. This creates a major problem to locate them to understand the actual statistics of spreading of the disease. Enhancement of health literacy among people by proper counseling and awareness is imperative thereby [9].

3. Preventive and control mechanisms in India

- Conservative preventive strategies such as lockdown is implemented till 17th May 2020 for containment of spread besides the identification of the hotspot, extensive screening and contact tracing at a community level.
- Classical epidemiological model applied for the estimation of the reproduction number (R0) of COVID-19 cases.
- This model helps to determine the intensity of COVID-19 outbreak with the average number of infected individuals in India.
- Advanced modeling techniques applied for building-up a network-based forecaster approach for predicting the number of infected cases over a months in specific geographical
- National-level network across India helped in estimation of infected COVID-19 patients and many effective nodes, spreading of COVID-19 infection among many peoples in any geographical locations with latitude and longitude differences.
- Network-based susceptible-infected removal model can determine the rate of reproduction number among infected individual in the future periods in India.
- Aarogya Setu mobile application (NIC-eGov Mobile Apps) that can be simply downloaded by smart-phone using people provides notification regarding any possibility of COVID-19 infection and if one has crossed paths with any infected person [10].
- The Indian government and several state governments have already taken mitigation steps for this crisis by providing packages to support the poor as well as with the financial stimulus. However, the GDP has fallen by 1.9% in the country and could further witness a slip to 2.1% if lockdown continues further than mid May 2020 [11].
- Real-time PCR throat/nasal swab test is recommended by Indian Council of Medical Research (ICMR) for early diagnosis. The rapid antibody tests are recommended to be used only for surveillance purpose. Pool testing is done in many states of the country [12].
- The clinical trials of plasma therapy have been commenced by ICMR [13].

Kerala, particularly, has gathered attention because of the preparedness to deal with this pandemic. The curve has flattened with a high recovery rate and minimum deaths. The state utilized the experience gained after dealing with Nipah virus. Large investments in social and health sectors have made the state technically equipped and strong. The state could efficaciously isolate the infected individuals, while simultaneously dealing with the matters of in-migrant labors because of community participation. This model underlines the prerequisite for sustained advancement policies for tackling such unprecedented situations in a better way [14,15].

4. Conclusions

In India, complete lockdown was first imposed before entering into the second phase of infection on 24th March 2020 which is set to end on 17th May 2020 (after getting extended twice). Even today, the cases are increasing at a steady rate with significant number of deaths and many recoveries. It is, therefore, critical to control the disease using advanced technology of detection, diagnosis approaches and effective treatment facility. The participation and co-operation of public with the administration is imperative at this time. Proper hygiene etiquettes, sanitization of oneself and surroundings as well as social distancing must now be incorporated in public lifestyles. Also, helping the under-privileged
people that are hit the worst because of pandemic must be everyone's priority.

Declaration of competing interest

The authors declare no intellectual or financial conflicts of interest.

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Fig. 1. COVID-19 infections with six different analysis profile (such as, (A) total COVID-19, cases and active patients, (B) Daily new cases of COVID and total death cases from COVID, (C) daily new death and new recovery cases from Covid-19) in Indian population from February to 23rd April 2020 [4].