Review Article

Mysterious Covid 2nd Wave in India

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Abstract

India, which has second –largest population in the world is suffering severely from COVID-19 disease. The 2nd wave of COVID-19 is affecting most of the world. In India 2nd wave wreaks havoc, where daily count on April 15, 2021 itself was double of the first peak[1]. In this paper, we characterize that this wave is proving to be more infectious and deadlier than first wave. A few studies taken here from different countries forcomparison of characteristics between 1st and 2nd wave of COVID-19.[2]As the country's healthcare system is crumbling amid the surge in cases- doctors say it's hard for them to "see the light at the end of tunnel this time".

Keywords*:COIVD-19, isolation, havoc*

Introduction

Covid-19 is a disease caused by a virus which belongs to a family coronaviridae,severe acute respiratory syndrome is root cause behind covid-19 disease.It has become a global pandemic giving rise to a serious health threat globally.[3]

1st outbreak of covid-19, occurred in Wuhan, in early December 2019. On 30th January 2020, WHO declared it an outbreak and on 11th march 2020 it was declared as a pandemic.[1]

India is 2nd largest population in world having a rural based and growing urban developing economy suffering severely from covid-19. In India, first case was reported on 30th January in Kerala. India reached its first 1lakh infection mark on 18th may 2020 and as on 11th July 2020it crossed 8.5lakhs mark.[4]

To control the spread, the ministry of health and family welfare issued travel advisory restrictions as self-quarantine rules for 14 days to all international travelers entering the country.(2) Additionally travel visas were restricted later on. India enforced 68 days of four phased strict lockdown from 24th march -31st may 2020.This lockdown,social distancing,adequate isolation reduced the transmission of the virus.There is, as of now, no approved treatment for COVID -19. Treatment is essentially supportive and symptomatic.[5]

In order to respond quickly and effectively to covid-19 pandemic,India has launched one of world's largest COVID -19 vaccination drive on 16th January 2021.(4) Now vaccine available all over the world are Covishield,Covaxin, Moderna, Pfizer-BioNtech and recently added Sputnik-v. Initially government ensured that vaccine prioritization within country was for frontline workers, people with comorbidities,and old age.With all the supportive treatment,social distancing,vaccination and other precautions there was a point of time in early February 2021where number of cases declined to all time low.

With a spike in cases after months of decline India observed 2nd wave of COVID- 19.In Maharashtra, despite of constant fall in daily cases of 652 on Feb 11, 2021 there was a sharp surge of cases to more

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than 65000 in mid April, 2021 .[5]This exponential growth was also observed in other states .The Bengal election rally's,religious gathering ,farmers protest were potential superspreader events which threatened to spread COVID-19 infection to India's villages as well .The health infrastructure in rural reaches of the country is not adequately equipped to deal with rising number of cases[6] .

Many countries have seen two wave pattern in reported COVID 19 cases during pandemic.[6] Data collected from various studies done in various countries shows thatthecharacteristics of effects of virus do vary [7].

Current strain in India

Current mutant in India is double & triple mutant inaddition to UK variant, South African and Brazil variant.

As of now till April 2021, in India 8.73% have tested positive for variants of concern in India. These include UK variant (B.1.1.7), South African (B.1.351) and Brazil (P1) variant.[7] These variant have high transmissibility. [8]

Why transmission is high?

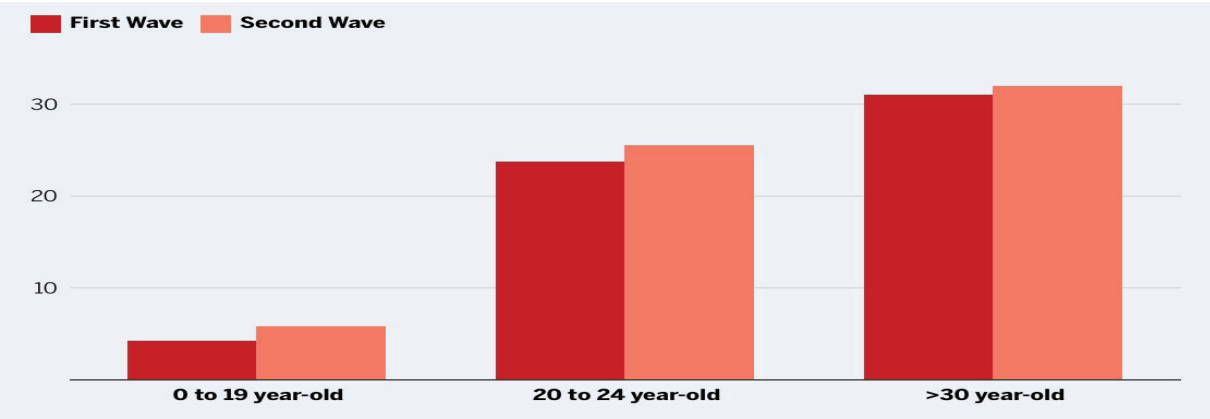
Disease is most transmissible 1 day prior and 3-4 days after the onset of 1st symptom.

A study was done by Vasanthi Avadhanula, Erin G. Nicholson,in Houston, Texas, published on 15/2/21. The study shows that extremely high viral load was observed in majority of patients and the patient with extremely high viral load show median duration of viral shedding which varies from 25-28days .Viral load is based on RT-PCR CT value :extremely high <16, high:16-21,medium:21-31,low:40

This data supports that individual with high viral load are potential superspreaders for SARS COV-2 and major drivers of pandemic waves.[9]

More and more families,with all or most of the family members, were getting infected. The exponential increase in cases in 2nd wave is attributed to high transmissibility of virus.During the first wave, infected population was upto 50% from urban areas, the 2nd wave seem to be spreading more to rural areas..[9] A combination of a large asymptomatic population and the presence of more infectious variants of virus and decreased strictness along with lesser monitoring in the containment zones as compared to last year, virus got transmitted even to those who were staying indoors and also because the asymptomatic people did not isolate themselves in a home setting .

AGE SHIFTING PATTERN



Younger people are more affected with age group between 18-45yrs during 2nd wave of COVID -19 because of their increased outdoor mobility and also probably they were not vaccinated.

As in above image, which was based on ICMR's analysis suggest that young age group between 18-45yrs were more affected during 2nd wave of COVID-19 as compared with 1st wave.(10)

A comparative study in hospitalized patients in Spain done by Iftimie S, Lopez Azcona which was published on 31st march 2021,study shows that hospitalized patients in 2nd wave were younger age group (30-45yrs of age) required hospitalization and treatment is more effective and less intensive.A new and remarkable characteristic of 2nd wave, the higher incidence of covid-19 in children, adolescents, pregnant female but majority of these patients did not present with serious symptoms, so did not require hospitalization for more than 4 days. (11)India the current scenario was different, despite of allEffective treatment mortality is higher as compared to the first wave.Indian medical association (IMA) said that country lost 594 doctors in 2nd wave of COVID-19.(12) According to state-wide data released by medical body that deaths of medical practitioner were 107 from Delhi, 96 from Bihar, followed by 67 from Uttar Pradesh, 32 from Andhra Pradesh, while during first wave 748 doctors succumbed to disease. This probably may be due to vaccination exercise as a tool to protect the most vulnerable population in the country from COVID-19.[10]

Clinical Features

Majority of symptoms were similar in both the waves,the higher incidence of gastrointestinal symptoms such as loose motion,nausea,vomiting,pain abdomen were more incidental in 2nd wave.(13)

	FIRST WAVE	SECOND WAVE
CAUSATIVE ORGANISM	SARS-COV-2 virus	several mutants of SARS-COV-2 VIRUS
POSITIVITY RATED	lower	higher
PRESENTATION	less severe	more severe
AGE PROFILE OF PATIENTS	More older population	more younger population
COMORBIDITIES	patients with combidities more affected	less
OXYGEN REQUIREMENT	less	more
DISEASE SPREAD	slower	much faster
BED CAPACITY	limited	limited initially,later enhanced
REQUIREMENT OF MECHANICAL VENTILATION	less	more
DRUG AVAILABILITY	acute shortage	acute shortage and black marketing
DEATH RATE	lower	higher

Pulmonary damage occurring earlier and rapid worsening of pulmonary phase wasobserved. Happy hypoxia state is more common,patient maintaining normal oxygen saturation with more than 30-40% lung is affected on CT scan. This necessitated the increased use and consumption of medical oxygen.(14) The rise in stroke cases among COVID-19 patients was observed during 2nd wave.

Apart from GI symptoms, many new symptoms including only headache, only bodyache,only weakness, hearing problem,conjunctivitis or in combination were

observed.

Complications in wave 2

Early Thrombotic complications

A study done by F.H.J. kaptein,M.A.M stals, published on march 1,2021,study shows that there is High incidence of thrombotic complications in 2nd wave. More frequent subsegmental pulmonary embolism and to a less extent stroke were observed. Several mechanism involving hypercoagulability and inflammation interact resulting in thrombotic phenomena both in the microvasculature and in the larger,mostly pulmonary blood vessels.[15]

This also is likely due to lower threshold of early diagnostic testing during 1st wave as compared to number of diagnostic test which are doubled in 2nd wave.

Cardiovascular complications

Deadly 2nd wave of COVID -19 disease is fatally affecting a large number of young people with no pre-existing heart ailments. Cardiovascular manifestations of COVIDinfection can range from mild elevation of troponin & BNP levels to fulminant myocarditis, life threatening cardiac arrhythmias,myocardial injury, and acute coronary syndrome.[16] Most of the patients complained of chest pain but in some cases,the attacks are so quick & acute that cannot be revived. Alarming instances where young patient develop pulmonary edema –leading to breathing difficulty and eventually respiratory failure and almost 70% of them get acute myocarditis.

A study was done by Bishnu P. Dhakal, Nancy K. Sweitzer, Julia H. Indik, et al. it was observed that in covid -19 patients there was cardiomyocyte hypertrophy,degeneration and necrosis of cardiomyocytes,interstitial oedema along with infiltration oflypmhocytes,monocytes and neutrophils but no virus component was found in myocardial tissue.[17]

Post COVIDfibrosis

Interstitial pneumonia is common feature of COVID -19 disease which can be complicated by ARDS. Pulmonary fibrosis is recognized sequel of ARDS. During inflammatory phase of ARDS , dysregulated release of matrix metalloproteins cause epithelial and endothelial injury with fibroproliferations of TFG-beta, TNF-beta and various growth factors are some key mediators involved in fibrotic process.[18][19]

Post COVID Mucormycosis

Mucormycosis is a fungal infection with high mortality and rising incidence associated with COVID -19 disease in affected or recovered patients. It was declared as epidemic disease in various states like Haryana, Rajasthan ,Tamil Nadu .It is frequently seen in conditions where immune system is suppressed such as uncontrolled diabetes ,corticosteroids therapy, immunosuppressive therapy and malignancy, high risk group such as drug addict, taken steroid for a long time, tap water used in oxygen humidifier and use of industrial oxygen.[20] India is 2nd largest diabetic population globally with nearly 70% of cases of uncontrolled diabetes.It is observed in patients with mild to moderate SARS COV-2 infections .The strongest predisposing factor appear to be hyperglycemia in undiagnosed or uncontrolled diabetes as immune is suppressed in diabetes and use of steroids add fuel to the fire.

The immune dysregulation in COVID -19 associated with reduced number of T-lymphocytes ,CD4+,CD8+ cells , may alter innate immunity .Hyperglycemia leads to increased expression of endothelial receptors GRP78, resulting in polymorphonuclear dysfunction ,impaired chemotaxis and defective intracellular killing . Steroids themselves causing impairment in neutrophil migration, ingestion & phagolysome fusion.[21]

Most common clinical picture associated with rhino-orbital-cerebral (ROCM) involvement. Hallmark is tissue necrosis,black discharge from nasal or oral cavity.

BY PASSING RT-PCR

RT-PCR detect E-gene,orf-1 and RdRP,if mutation appear in these target gene sequence than test may no longer be able to detect virus ,mutation like HV69/70 may go undetectable.

HOW TO DIAGNOSE CASES WITH NEGATIVE RT-PCR?

Based on clinical features,serum markers and CT chest should be done in such cases.

Rapid antigen – It target nucleocapsid protein known as N gene, which is more stable and less likely to mutate. So, if antigen is negative and later RT-PCR positive than there is high index of suspicion of variant strain.[22]

India witnessing downswing in 2nd wave COVID-19 cases

The rate of decline of cases from first wave was slow, active cases began to decline only from September last year, a trend which continued till the beginning of 2nd wave in middle February.[23] The decline may be faster in 2nd wave as is predicted by various epidemiological models. Dr. Mukherjee(biostatician, data scientist& researcher) said that herepidemiological Models indicated cases would come down to between 150,000-200,000 by end of May and by end of July cases may return to where they were in February.The test positivity rate has also come down from peak of approximately from 30% to 6% in first week of June. [24]SUTRA (Susceptile, undetected, tested(positive)& Removed Approach model),a mathematical model that helps to project the trajectory of COVID-19 has been formed by govt. of India . M. Vidhyasagar, a scientist involved in Sutra Model, predicted that daily average of new cases would fall to 15,520 by June .[25]

SUTRA model also predicted that if vaccination drive against corona virus is not ramped up and COVID-19 appropriate behavior is not maintained, there is possibility of 3rd wave of pandemic in next 6-8 months. Usually as the number of people who have been infected with the disease increases, the successive waves of infection are milder in comparison to the initial waves. Witnessing a large number of cases and an increase in number of deaths during the second wave, many are predicting that the third Covid-19 wave will be even more lethal in the country. A possible "third wave" of the pandemic,which is speculated to particularly affect children. However the eventual shape of Covid-19 third wave, as and when it approaches, remains uncertain as a lot more people in the second wave have been infected and comparatively less population will remain susceptible to the virus during the third wave. Also, the country has started vaccination and in the coming few months plan to vaccinate a sizable population which will further leave less population susceptible to the virus.[26]

Conclusion

The study show that 2nd wave of COVID-19 vary dramatically from 1st wave. In 2nd wave of COVID- 19 young generation is more affected, pulmonary damage occurring earlier and rapid worsening of pulmonary phase among these patients .This necessitateduse of medical oxygen as more patients got hospitalized and consumption of medical oxygen doubled. Fever was higher and that's the sign of inflammatory response this is observed in more number of patients in 2nd wave. Majority of symptoms were similar in both waves but fever,myalgia and GI symptoms were more incidental in 2nd wave. Extremely high viral load was found in covid-19 positive patients during 2nd wave which cause longer duration of viral shedding and these patients are potential superspreaders of 2nd wave of pandemic. Mortality among frontline workers were low during 2nd wave of COVID-19 as compared to first wave despite of more cases and severity during 2nd wave, this is probably due vaccination among healthcare workers. All patients recovered from COVID should undergo long-term monitoring for evaluation of fibrosis. Higher incidence of mortality among the patients suffering from mucormycosis so, we need to be very careful with steroids use as it is a double edged sword.

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Conflict of Interest – Nil

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