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A Study on Mortality Related to Covid 19 in Tertiary Care Teaching Hospital And Impact of Comorbidities on Covid 19 Deaths

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Abstract
Background: India's COVID-19 crisis hit hard, with over 43 million cases and more than 524,000 deaths by late 2021. This really underscored the urgency to dig into what drove mortality in busy tertiary care teaching hospitals. Our prospective observational study looked closely at COVID-19 deaths from 2020-2021 and how comorbidities played a role.
Aims: We set out to gauge mortality rates, break down the impact of comorbidities, and figure specific death rates for inpatients.
Methods: We reviewed records from 435 COVID-19 patients who sadly passed away in our tertiary hospital during 2020-2021, using convenient sampling. Key details included admission and death dates, demographics, comorbidities like hypertension, diabetes, IHD, and CKD, plus total discharges. We crunched the numbers with simple graphs, percentages, and specific death rates (deaths per 100 discharges, including deaths).
Results: Out of 435 deaths, 191 happened in 2020 and 244 in 2021. Men made up 299 (69%), women 136 (31%). Deaths peaked in October 2020 (52) and May 2021 (78). The 60-80 age group saw the most tragedies (192, or 44%). Two-thirds (66%, 286 patients) had comorbidities—diabetes topped the list (44), followed by hypertension (43), CKD (7), and IHD (6). Specific death rates held steady at 10.3% in 2020 and 10.1% in 2021, with 1844 discharges in 2020 and 2414 in 2021.
Conclusion: We found higher death rates among men, older adults (60-80 years), and those with comorbidities—especially diabetes and hypertension. These patterns mirrored India's national waves, highlighting how vulnerable comorbid patients were. This points to the need for targeted strategies to protect them in tertiary settings.

INTRODUCTION

The COVID-19 pandemic in India is a part of the worldwide
pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). As of 31 Dec 2021, according to official figures, India has the second-highest number of confirmed cases in the world (after the United States of America) with
43,138,393 reported cases of COVID-19 infection and the third-highest number of COVID-19 deaths (after the United States and Brazil) at 524,459 deaths

The first cases of COVID-19 in India were reported on 30 January 2020 in three towns of Kerala, among three Indian medical students who had returned
from Wuhan, the epicenter of the pandemic. Lockdowns were announced in Kerala on 23 March 2020, and in the rest of the country on 25 March 2020. On 10TH of June, India's recoveries exceeded active cases for the first time.
Infection rates started to drop in September, along with the number of new and active cases. Daily cases peaked mid-September with over 90,000 cases reported per-day, dropping to below 15,000 in January 2021. A second wave beginning in March 2021 was much more devastating than the first, with shortages of vaccines, hospital beds, oxygen cylinders and other medical supplies in parts of the country. By late April, India led the world in new and active cases. On 30th of April 2021, it became the first country to report over 400,000 new cases in a 24-hour period. Experts stated that the virus *may* reach an endemic stage in India rather than completely disappear; in late August 2021, Soumya Swaminathan said India may be in some stage of endemicity where the country learns to live with the virus. By March 2022, India had just 22,487 cases across the country. With 58.8% population fully vaccinated and 70% having

received at least one dose opening up post pandemic has been steady
The COVID-19 pandemic is a global challenge that impacted 200+ countries. India ranks in the second and third positions in terms of number of reported cases and deaths. Being a populous country with densely packed cities, SARS- CoV-2 spread exponentially. India sequenced ≈0.14% isolates from confirmed cases for pandemic surveillance and contributed ≈1.58% of complete genomes sequenced globally. This study was designed to map the circulating lineage diversity and to understand the evolution of SARS-CoV-2 in India using comparative genomics and population genetics approaches.
The Case Fatality Ratio (CFR) is a measure of the severity of the condition as it corresponds to the proportion of the population with a certain condition who die from that condition during the reference period (Nishiura, 2010, Aguiar and Stollenwerk, 2020). But the measurement is crude in sense that it does not account for the changes in the demography of positive cases and deaths during the different stages of an epidemic (Vigod et al., 2012, Barouki et al., 2021).
Considering the lacuna, the CFR can be used as a basis for estimating and monitoring the number of infected individuals in a population, which may be subsequently used to inform policy decisions relating to public health interventions and lockdown strategies (Russell et al., 2020, Roques et al., 2020). In epidemiology, the ratio stands for finding the proportion of the people who die from specific diseases among all the individuals diagnosed with the diseases over a while. As many cases of previous covid-19 were asymptomatic, generalised data on the true number of persons infected lack in India. Mortality rates, therefore, are calculated from confirmed cases, which overestimate the Case Fatality Ratio (CFR). The ratio can also be used to evaluate the effect of new treatments (Tian, 2013). It is conventionally expressed as a percentage and represents a measure of disease's severity. The calculation comprises the proportion of deaths among all infected individuals.

The CFR clustering pattern has been cross checked with the dot density mapping considering the deaths on the selected dates. It tells us about the spread of the severity of the infection in the country.
Specific death rate, means the number of deaths due to specific disease during a given period of time.
No of deaths in a ward during given period *100
Total discharges including deaths during same period

AIMS & OBJECTIVES

1. To assess the mortality related to COVID 19 for the year 2020 and 2021
2. To analyse the impact of comorbidity on the COVID 19 mortality
3. To find out the COVID 19 related specific death rate

METHOD AND METHODOLOGY

Prospective descriptive observational study Sample size 435
Sampling technique convenient sampling Study design:
Data to be collected date of admission, date of death, chief complaint of the patient including past history to find comorbidities. Graphs and charts to be prepared for the comparison.
Inclusion criteria: All COVID 19 patients admitted to the hospital Exclusion criteria:
All COVID 19 outpatients visiting to the hospital.

REVIEW OF LITERATURE

COVID-19 pandemic has been impacting the life and economy across the globe since December 2019 and has caused major disruptions (Walker et al. 2020).
The COVID-19 pandemic has resurfaced in India in the form of a hard-hitting second wave. The COVID-19 has brought a threatening challenge to Indian society and the economy (Sarkar and Chouhan, 2021). India's devastating second wave of COVID-19 has overwhelmed its health system and the country (Ranjan, 2020, Ghosh et al., 2020). The second wave of COVID-19, caused by severe acute respiratory syndrome (SARS-CoV-2), has struck India severely, with a significant case fatality rate (Tomar and Gupta, 2020). The situation in India is more critical as it has a huge population, poor medical infrastructure and complex socio-economic structure, where self-isolation, social distancing and quality treatment are the key controlling factors to neutralise the impact of the disease (Kaliya-Perumal et al., 2020, Bhuyan, 2021).

The growth of towns and the consequent need for more supplies have damaged the delicate environment of India, where there are high levels of smog, fine dust, and water pollution. Sulfur dioxide (SO2), Nitrogen dioxide (NO2), and particulate
matter (PM) contribute in part to the toxins causing environmental contamination (Sarkar and Chouhan, 2020, Huang and
Brown, 2021, Bherwani et al., 2021). Many Indian urban communities, including Mumbai, Kolkata, and Pune, are at the risk of air contamination (Conibear et al., 2018).One out of eight (about 12.5%) deaths in 2017 in the country were attributable to high rates of respiratory disease, stroke, heart disease, diabetes, and lung cancer, all conditions for which a certain percentage of cases result from severe air pollution (Gurjar et al., 2016). Some relevant scientific literature highlights that exposure to air pollution may be relevant to virus infection spread, and more recent literature focuses on COVID-19 diffusion (Cheng et al., 2020, Report et al., 2020, Saha and
Chouhan, 2021). On January 30 2020, the Director-General WHO declared that the outbreak of novel coronavirus (2019-nCoV) constitutes a Public Health Emergency of International Concern (PHEIC) as per the advice of the International Health Regulations (IHR) Emergency Committee (Black et al., 2020). In the first surge in 2020, COVID-19 has infected nearly 20 million people across the globe, with 90 countries in the community transmission stage (Bherwani et al., 2021). The daily reported confirmed cases started to rise from February 2021 in India (Sengupta et al., 2021). The mid of April 2021, registered sudden hike over thousands of daily death was observed around the country (Khanna, 2020). Multiple factors are involved in driving the second wave of COVID-19 in India, such as the complex interplay of mutant strains,
violation of COVID appropriate behaviour, and government and public complacency on initiation of the vaccination drive (Kar et al., 2021). The situation turned into a bleak one when the country witnessed the daily deaths of over three thousand at the end of April 2021. On April 26, 2021, India saw the highest daily tally of new SARS-CoV-2 infections ever recorded globally, 360 960, taking its pandemic total to 16 million cases, second only to the USA with more than 200000 deaths (Thiagarajan, 2021). As of May 18, India had reported more than 26.4 million confirmeded cases and over 274000 deaths from COVID-19 (Balsari et al., 2021). 29.27 million cases have been reported in India during the pandemic, with a case fatality rate of 1.24% (363,079 deaths) up to June 11, 2021 (Kar et al., 2021). At the beginning of the second wave, the country's Case Fatality Ratio (CFR) has hovered around 1.35% to 1.40%. At the onset of the COVID-19 pandemic, India imposed the world's strictest nationwide lockdown beginning from March 25, 2020 (The Lancet, 2021). But, the situation during the onset of the second wave was aweary in the whole country. WHO confirmed 15,510 new cases in India on March 1, 2021, and the peak had been formed with 414188 confirmed cases on May 7 (Saha and Chouhan, 2021). The curve of new cases indicated a sharp rise from April onwards in India. Surprisingly, the present peak pandemic situation addresses a difference of 3,14,692 new confirmed cases than the previous peak (September 18, 2020) (Nishiura, 2010). It indicates the severity of the second outbreak in India. On April 17, 2021, the country peaked, considering confirmed cases that accounted for 10.6% of the country's total population. On May 11, 2021, the WHO reported about 16,411 confirmed cases and 178 deaths per million (COVID-19 : STATUS ACROSS STATES 2021). On the same day, the country's CFR was 1.09%. The spread of the infection is more belligerent in the states of North-East India. From the beginning of the second wave, the outbreak was centred around the megacities of India, especially in NCT of Delhi, Mumbai and Bengaluru urban (The Lancet, 2021). On January 4, 2021, a total of 7.57% people of the country were infected by the coronavirus (Adviser et al., 2021). But, by May 11, the figure reached up to 16.67%
(Thakur et al., 2012). At this stage, the main challenge is to organise the basic life saving treatment facilities at the grass-root level and especially assure the supply of oxygen and vaccines (Ioannidis, 2021). In addition to this, the legislative assembly election in Assam, West Bengal, Tamil Nadu and Kerala with mass political gatherings and rallies has made the situation out of control. India is the largest democratic country globally; however, looking at the current COVID-19 situation, the state elections (Assam, Puducherry, Kerala, Tamil Nadu, and West Bengal) could have been postponed till normality (Samarasekera, 2021). Many states did not go for the full lockdown this time and relied on night curfew to keep the local economy alive. As well the largest
vaccine drive in the world was started in India in 1st week of April. At the same time, 6.06% of the total

population was vaccinated (1st and 2nd). On May 11, roughly 13.3% people have got vaccinated (COVID-19 : STATUS ACROSS STATES 2021). The increase is not so promising for such a country with a billion-plus population. The changing nature of the virus and countrywide high oxygen demand worsened (Timilsina et al., 2020). A rapid increase in the daily incidence of serious cases creates a shortage of medical instruments, oxygen, hospital beds and lifesaving drugs (Gupta et al., 2021). In a knee jerk reaction, the central government and its expert team started constructing the badly needed medical facilities to overcome the shortages. However, this frenetic activity of augmenting facilities comes in the middle of an ongoing and exponential rise in cases. In contrast, it should have started way ahead of these doldrums, say experts (Black et al., 2020). The country's average CFR falls significantly down from 1.45 % (in January 2021) to 1.09% (in the first week of May) (Grech and Cuschieri, 2020). Considering the second outbreak, the study incorporates a new angle to find out the district wise spatial pattern of the concentration of COVID-19 confirmed cases and Case Fatality Ratio (CFR) in India (Dhillon et al., 2020).

Coronavirus or novel coronavirus which is taxonomically termed as SARS-CoV-2 and named by World Health organization (WHO) as COVID-19 which emerged from Wuhan city, Hubei Province of China by the end of 2019 has caused unprecedented panic across the world. The rapid transmission of this virus from human to human made the World Health Organization (WHO) to declare this as the public health emergency of international concern and called it as global pandemic [1]. As on May 14, 2020, globally 4248389 COVID-19 cases have been reported and caused 292046 deaths. Highest human casualty reported from USA with 109121 deaths

India's national COVID death totals remain undetermined. Using an independent nationally representative survey of 0.14 million (M) adults, we compared COVID mortality during the 2020 and2021 viral waves to expected all-cause mortality. COVID constituted 29% (95% confidence interval, 28 to31%) of deaths from June 2020 to July 2021, corresponding to 3.2 M (3.1 to 3.4) deaths, of which 2.7 M(2.6 to 2.9) occurred in April to July 2021 (when COVID doubled all-cause mortality). A sub survey of57,000 adults showed similar temporal increases in mortality, with COVID and non-COVID death speaking similarly. Two government data sources found that, when compared to prepandemic periods, all-cause mortality was 27% (23 to 32%) higher in 0.2 M health facilities and 26% (21 to 31%) higher in civil registration deaths in 10 states; both increases occurred mostly in 2021. The analyses find that India'sc umulative COVID deaths by September 2021 were six to seven times higher than reported officially.

Both the 2020 and 2021 viral waves were characterized by widespread (and, for 2021,mostly uncontrolled) multigenerational trans-mission of the virus within households, with high levels of antibodies detected (17).

India'snotablyhigherCOVIDdeathratein2021,compared to the lower than expected deathrate in 2020, requires further research. The spread of infection to rural areas in 2021 is one factor, but there might also be differences in the pathogenicity between the original virus(Wuhan) in 2020 and the mix of Alpha and Delta variants accounting for most of the 2021viral wave (26), or other biological predictors of severe infection that changed between these two waves. Similarly, tracking death rates will be essential to understanding the effects of the Omicron wave currently underway in India, or future viral variants.

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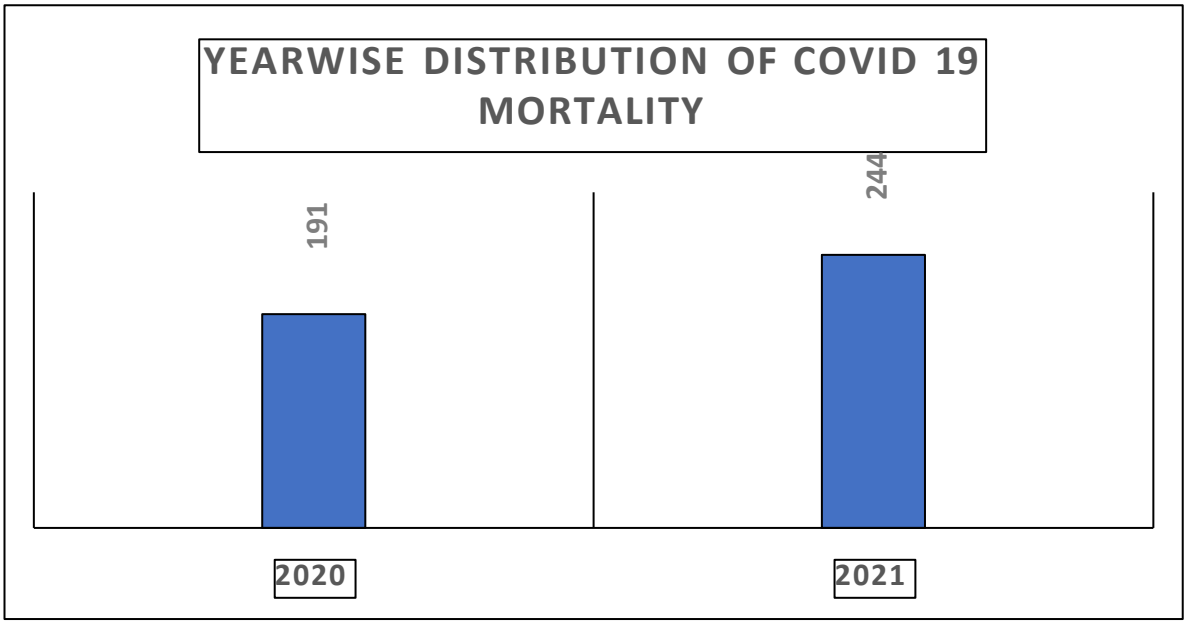
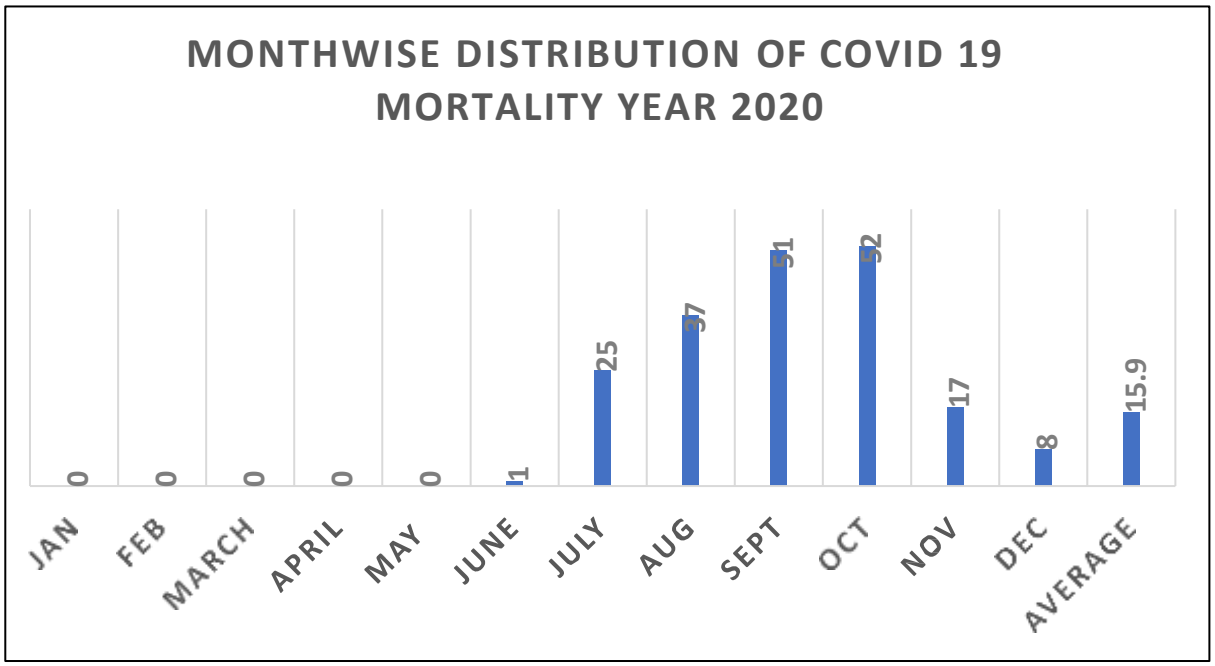
RESULTS AND DISCUSSION



There was total 191 death related to covid 19 in the year 2020 and 244 in the year 2021
The total death in the year 2020 and 2021 is 435.



When distributed month wise in the year 2020 the highest number of death was reported in the month of October which is 52 followed by September 51 deaths. The average death will be 16 deaths per month. The first death reported from hospital was in the month of June. Number of death peaked during the months July to October which is 165 in 4 months.

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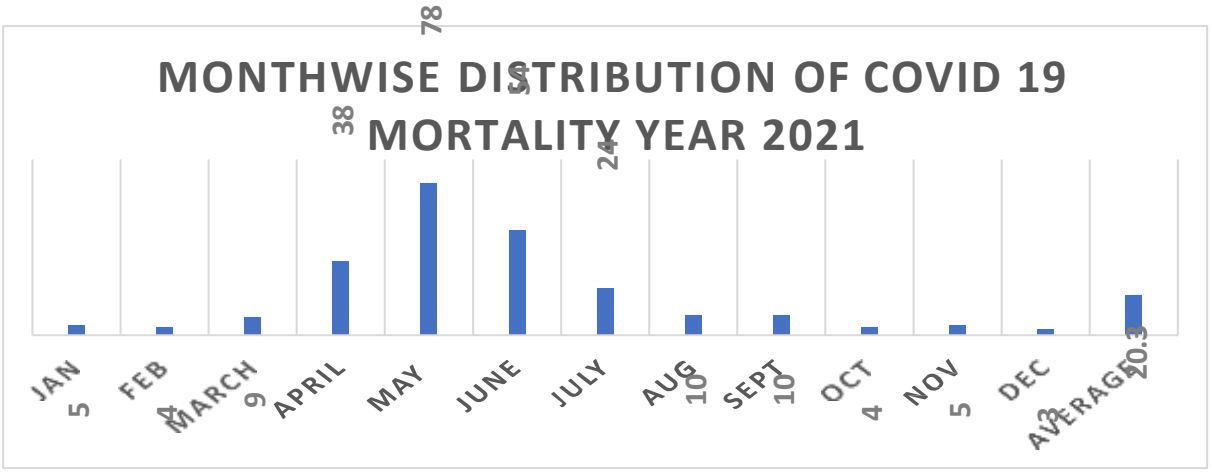
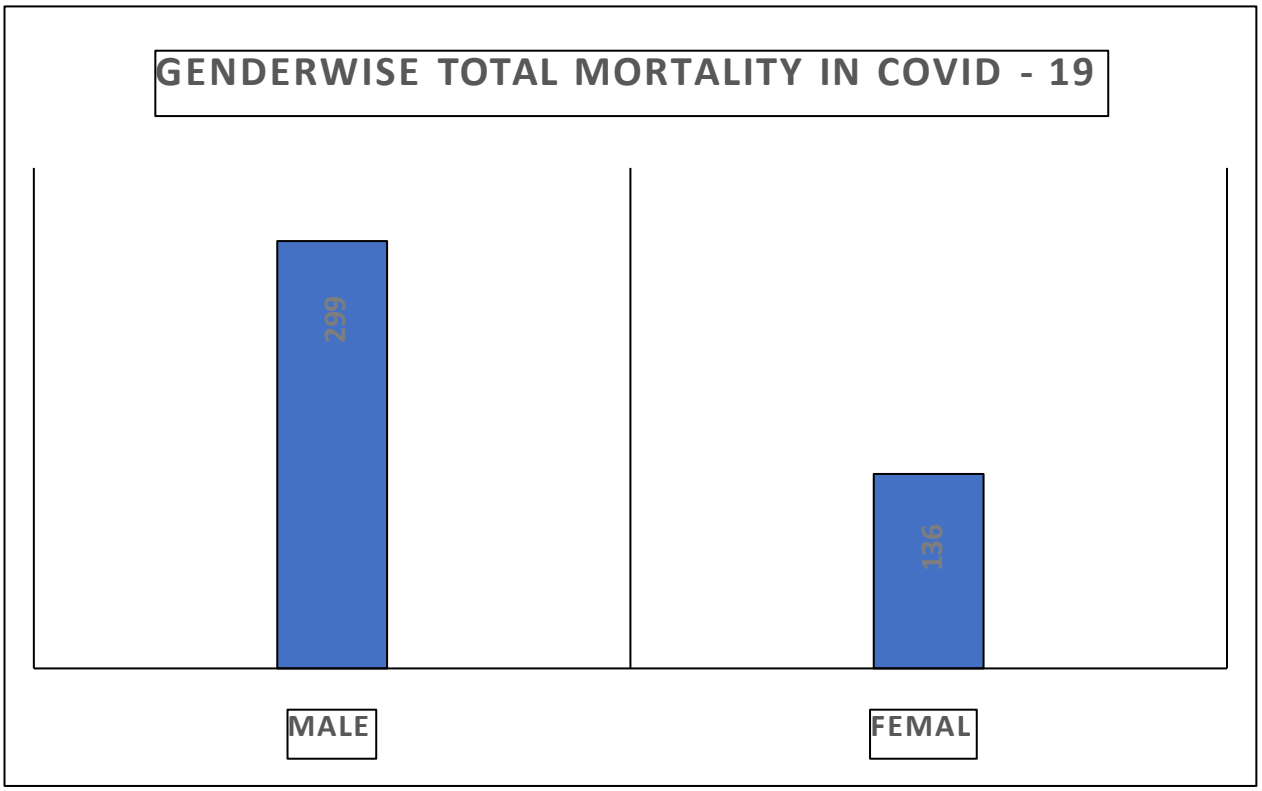


When distributed month wise in the year 2020 the highest number of death was reported in the month of May which is 78. The average is 20 deaths per month. The lowest death was observed in the month of December which is 3. Number of death peaked during the months April to July which is 196 in 4 months.



Out of 435 total deaths, 299 was male and 136 were female. Which clearly indicates that deaths are more common amongst male.

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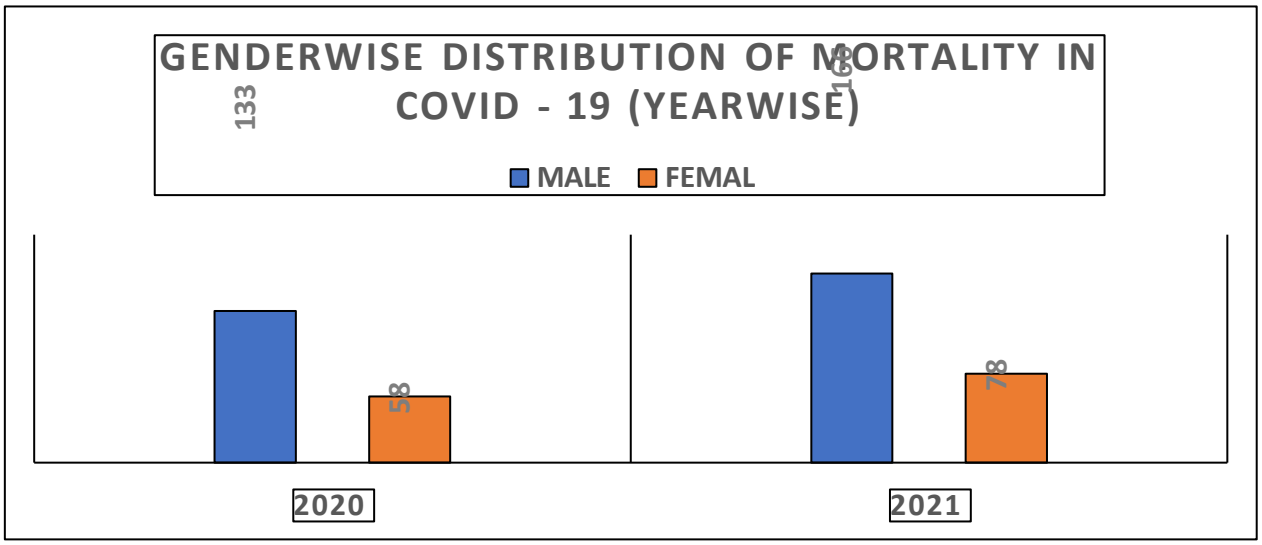
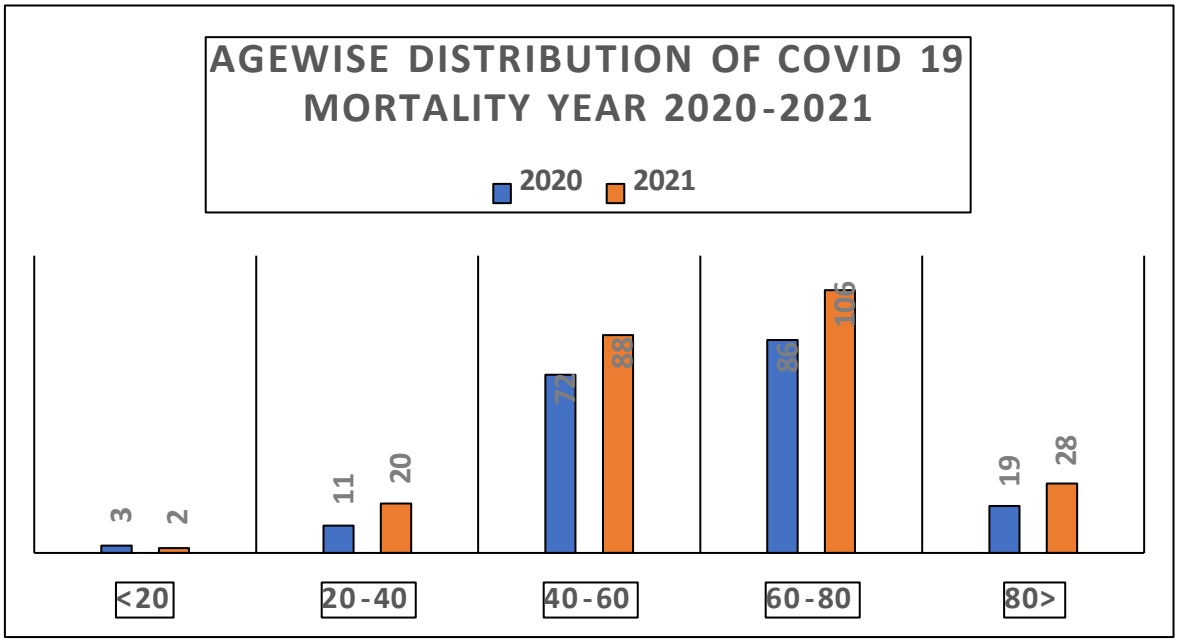


In the year 2020 out of 191 deaths, 133 were males and 58 were females. In the year 2021 out of 244 deaths, 166 were males and 78 were females.



Most number of deaths have been observed in 60 to 80 years in both the years (2020-2021). 86 deaths in the year 2020 and 106 in the year 2021. Followed by deaths in the age group of 40-60 years which is 72 in the year 2020 and 88 in the year 2021.

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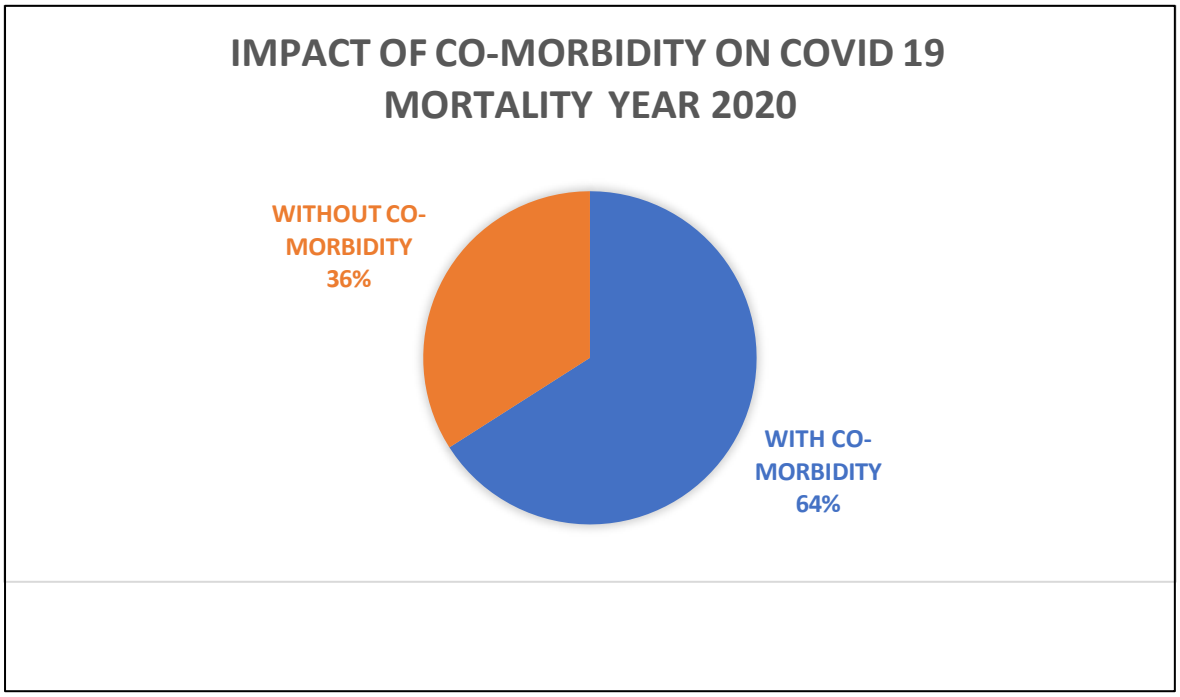
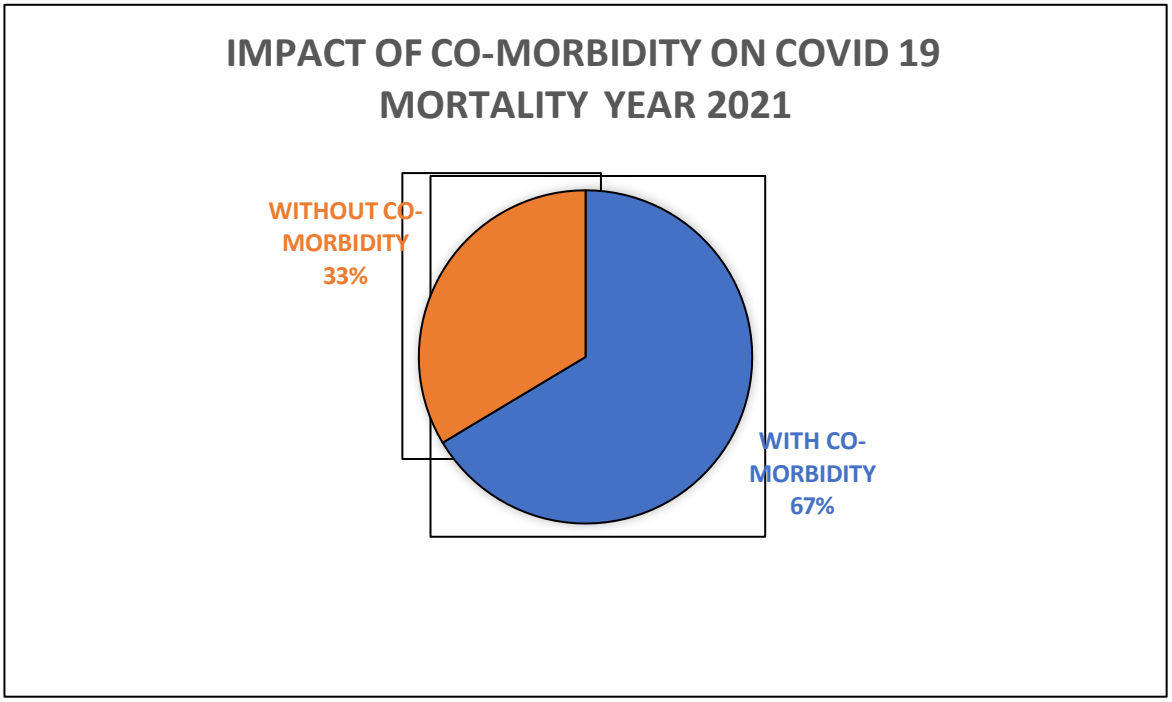


Out of 191 deaths in the year 2020, 66% of patients who died, had comorbidities like, Hypertension, Diabetes mellites, ischemic heart disease, chronic kidney disease etc. at the time of admission



Out of 244 deaths in the year 2021, 67% of patients who died, had comorbidities like, Hypertension, Diabetes mellites, ischemic heart disease, chronic kidney disease etc. at the time of admission

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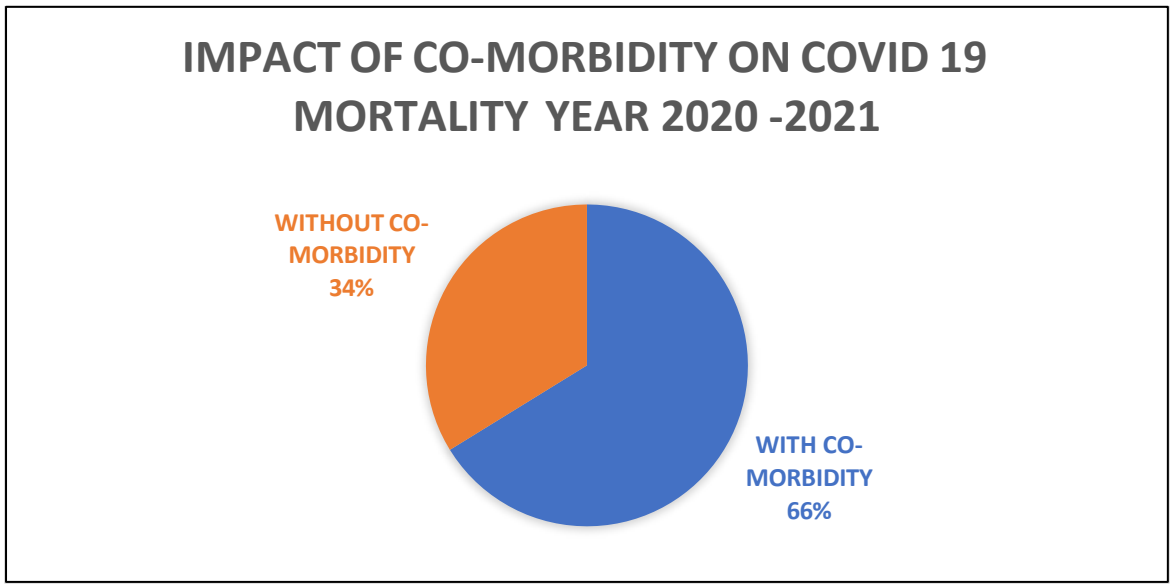
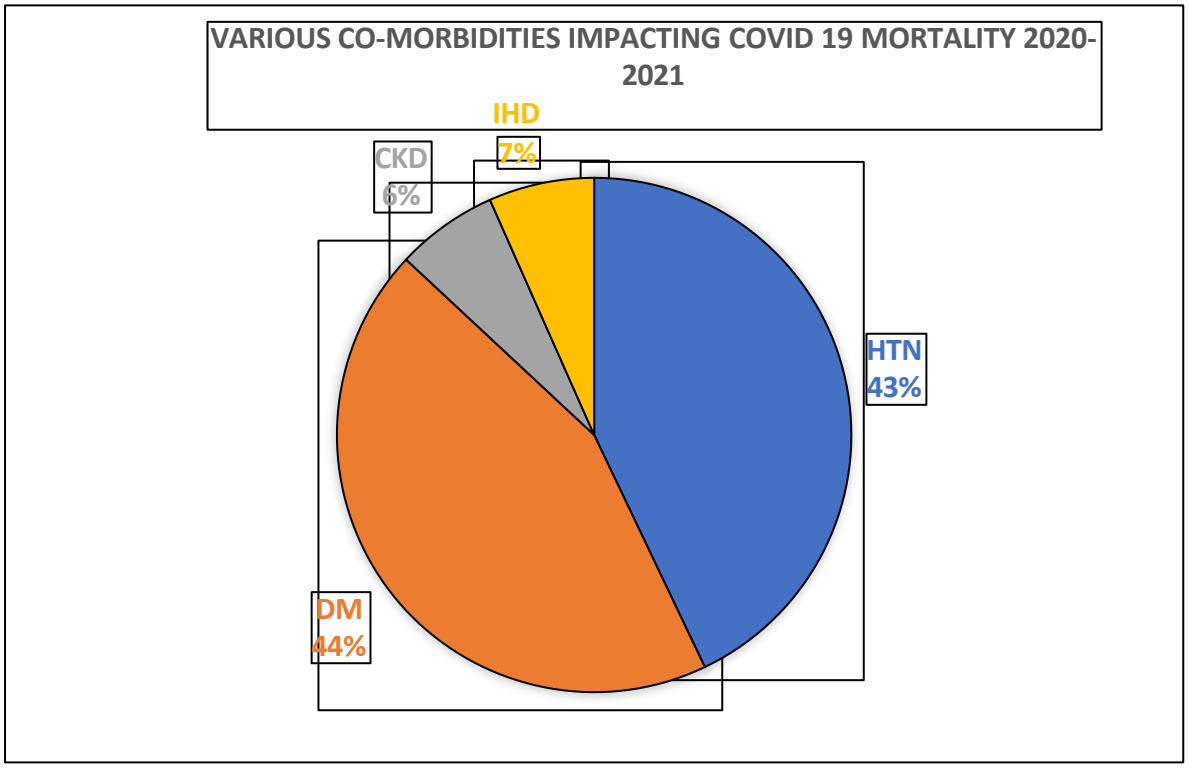
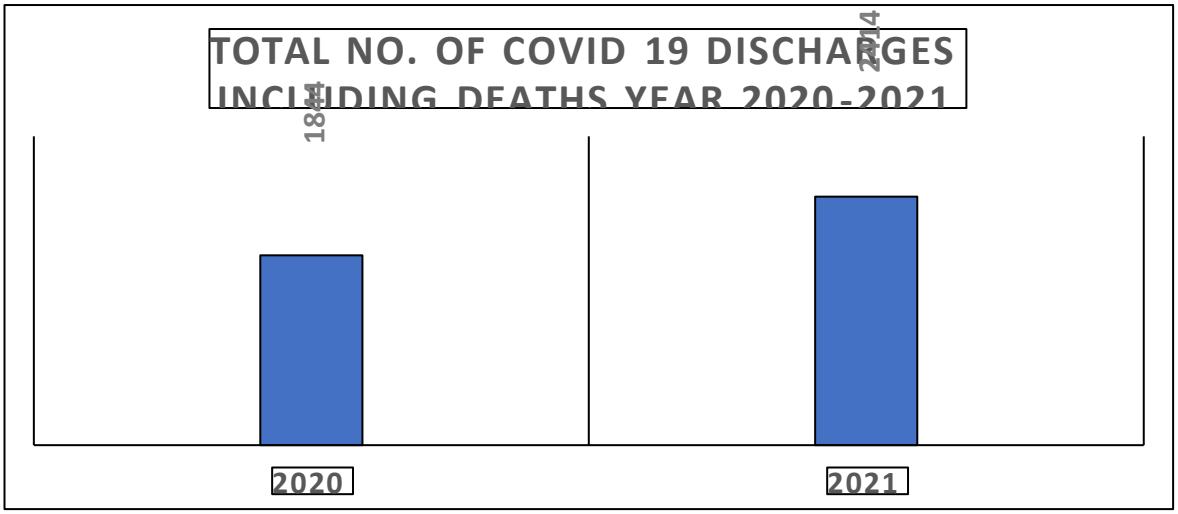


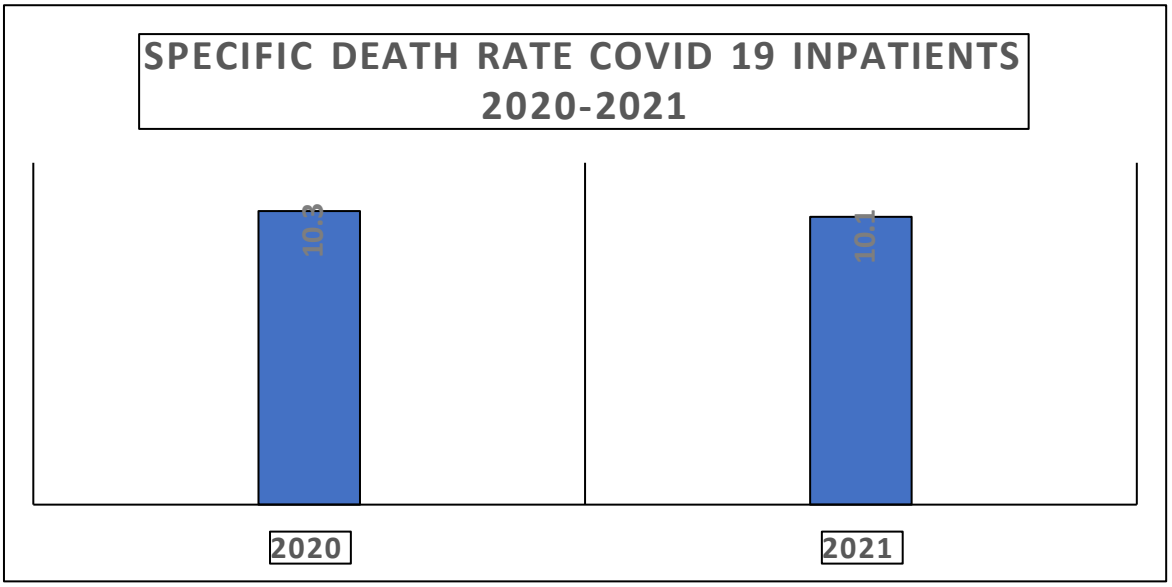
Out of 435 deaths in the year2020 and 2021, 66% of patients who died, had comorbidities like, Hypertension, Diabetes mellites, ischemic heart disease, chronic kidney disease etc. at the time of admission. Which clearly suggest that deaths were more common with the patients having comorbidities than without comorbidities.



Most common comorbidities seen were , Hypertension, Diabetes mellites, ischemic heart disease, chronic kidney disease 43%, 44%, 7%, 6% respectively.
Many patients had more than one comorbidity.



In the year 2020 there were totally 1844 covid 19 patients were discharged(including death) in the hospital and 2414 in the year 2021



Specific death rate if COVID 19 in the hospital was 10.3% in the year 2020 and 10.1% in the year 2021.

CONCLUSION

The study concludes that deaths were more common amongst male in comparison to female. The most common death were occurred in the age group between to 80 years.

Deaths were more common amongst the patients who has a history of comorbidities at the time of admission. Diabetes and Hypertension were the major comorbidities associated with COVID 19 deaths.

There were more number of deaths occurred in the year 2021 with 244 deaths when compared to deaths in the year 2020 with 191 deaths.

Deaths were peaked in the month of July to October in the year 2020 and from month of April to July in the year 2021.

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