

## Two waves of Covid 19: A comparative study at tertiary care center, central Maharashtra, India.

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### Abstract:

**Background:** The Covid 19 pandemic has been impacting the world since the beginning of 2020 and two waves of Covid 19 outbreak have hit many countries. Now a days India is in second wave of Covid 19 with second highest number of cases and third highest number of deaths in the world. Maharashtra, India's second most populous and wealthiest state, tops the list of most affected states in country on 22 April 2021.

**Materials and Methods** This hospital based descriptive study was conducted to understand the difference in epidemiological factors of cases and deaths in first and second waves of Covid 19. We considered first wave from 1<sup>st</sup> April 2020 to 31<sup>st</sup> January 2021 and second wave from 1<sup>st</sup> February 2021. Data is expressed as numbers and percentages, means, standard deviations, range etc. and analysed using the SPSS 26.0 trial version. Chi-square test was used for categorical variables. Total 4161 in first wave and 4278 in second wave hospitalized patients were enrolled in this study. During second wave large number of cases occurred within short period of time.

**Results:** In both waves mean age for cases was almost same i.e. 50.68 years in first wave and 52 years in second wave. There is no significant association between gender and Covid 19 infection in the both the waves ( $p=0.79$ ). During second wave statistically significant number of cases were referred from rural area ( $p=0.00$ ) and from another districts ( $p=0.00$ ) and significant number of cases were discharged within 10 days ( $p=0.00$ ). During first wave, 969 and during second wave, 1123 patients died. In second wave of Covid 19 deaths were significantly more common in below 40 years of age group ( $p=0.003$ ). During second wave more deaths occurred within 3 days of hospitalization ( $p=0.024$ ), more in patients without co-morbidity ( $p=0.00$ ) and those who were referred from rural area ( $p=0.00$ ) and other districts ( $p=0.00$ ).

**Key Word:** Covid19, First wave, Second wave

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### I. Introduction

On 31<sup>st</sup> December 2019, 27 cases of pneumonia of unknown aetiology were identified in Wuhan city of China. Causative agent was identified by nasal swab sample by Chinese Centre for Disease Control and Prevention (CCDC). 7<sup>th</sup> January 2020, it was named Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-2). On 20<sup>th</sup> January 2020, the WHO declared the Chinese outbreak of Covid 19 to be Public health Emergency of International Concern<sup>1</sup>. Two waves of Covid 19 outbreak have hit many countries<sup>2</sup>. The spread of Covid 19 reached alarming level in many countries.

In India, the first wave of COVID 19 begun in late March 2020. To check the spread of coronavirus outbreak Indian Government started strict lockdown policy from March to May 2020. After almost three months of strict lockdown, on 8<sup>th</sup> Jun 2020 first unlock was done by Indian Government. After that life of people had started to relative normal except for the compulsion for wearing of a face mask and maintaining social distance. In India first wave of Covid 19 slowed down till early January 2020. Unfortunately after that, the number the cases of Covid 19 began increasing from second week of February 21 and again India was hit by second wave of Covid 19. India has a nearly vertical coronavirus case growth curve. Till 29<sup>th</sup> April 2021 total 1,8368,331 are confirmed cases of Covid 19 in India. Out of this 1,50,78,573 have recovered and 2,04,812 died. In Maharashtra till 29<sup>th</sup> April 2021 there are total 44,73,394 confirmed cases of Covid 19, out of this 37,30,729 have recovered and 67,214 died. In Aurangabad city till 29<sup>th</sup> April 2021, confirmed cases are 1,22,112 of Covid 19, out of this 1,05,646 have recovered and 1,918 died<sup>3</sup>.

The similarities and differences between two waves of Covid 19 remain largely unknown. Population comparison is difficult because of technological capacity of the countries in detection and diagnosis of asymptomatic patients. It is assumed that the incidence of infection in early months of the pandemic was much higher than had been reported<sup>5</sup>. However, a more accurate comparison of the two waves is feasible through the study of the hospitalized patients for whom disease was confirmed by reverse transcription-polymerase chain reaction (RT-PCR) and severe symptoms. The empirical data suggest that this second wave

differed from first wave so this study is conducted to understand the difference in epidemiological factors of cases and deaths in first and second waves of Covid 19.

## II. Material And Methods

A hospital based descriptive study was carried out in cases of Covid 19 infection in Tertiary care hospital, Central Maharashtra, India. admitted in first and second waves of Covid 19. In order to separate the two wave periods in a consistent manner we considered that the first wave started in April 2020 which peaked in September 2020. After that progressive decrease in this number of cases was seen. The number of cases again started increasing in February 2021 and till there is a sharp increase in cases. So, for study purpose all patients admitted from 1<sup>st</sup> April 2020 to 31<sup>st</sup> Jan 2021 were considered to be in the first wave and all those admitted from 1<sup>st</sup> February 2021 till 30<sup>th</sup> April 21 in the second wave.

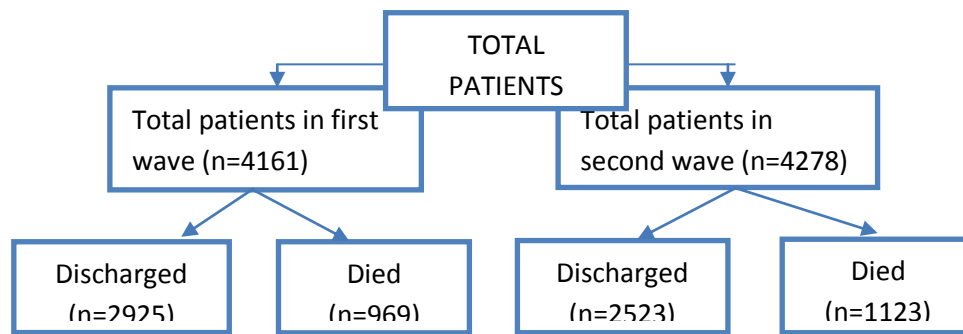
The only inclusion criterion was to be a hospitalized patient with confirmed diagnosis of Covid 19 by RT-PCR or Rapid Antigen test (RAT). Covid 19 infection was confirmed by RT-PCR using swab samples from the upper respiratory tract (nasopharyngeal/ oropharyngeal exudate). Tests were carried out with the MERIL COVID-19 One Step RT-PCR Kit and STANDARD Q COVID-19 Ag Test Kit at VRDL Lab. Flex machine used for the RNA extraction and for amplification. We have used Thermo as well as Bio rad machine for RT-PCR. This study was approved from the Institutional Ethics Committee.

### Statistical analysis

Data was fed in master chart by using MS excel. Data was expressed as numbers and percentages, means, standard deviations and range in tabular and graphical format. Statistical comparison between two groups was made using the Chi-square test (categorical variables). p-values are two tailed. Statistical significance was set at  $p \leq 0.05$  as statistically significant and  $p \leq 0.01$  statistically highly significant. All calculations were made using the SPSS 26.0 trial version.

## III. Result

During the study period total of 8439 patients were hospitalized for covid 19 infection. In first wave 4161 patients were hospitalized and in second wave 4278 patients were hospitalized. Out of total, 2925 patients were discharged and 969 patients died in first wave. 267 patients were still hospitalized on 31<sup>st</sup> January 2021. During second wave, a total of 1685 patients were discharged and 1123 patients died. On 30<sup>th</sup> April 2021, 632 patients were hospitalized. (Fig 1).



**Fig 1-** Flow chart showing distribution of hospitalized patients in two waves

During first wave highest number of cases were (830) found in August and during second wave till 30 April 21 highest number of cases were found in April (2106). Mean age was  $50.68 \pm 18$  in first wave and  $52 \pm 18$  in second wave. An important feature of second wave was the high number of cases between age group of 31-40 years ( $p=0.02$ ) and 61-70 years ( $p=0.0035$ ) of age group (Fig 2). There is no association between gender and Covid 19 infection ( $p=0.79$ ).

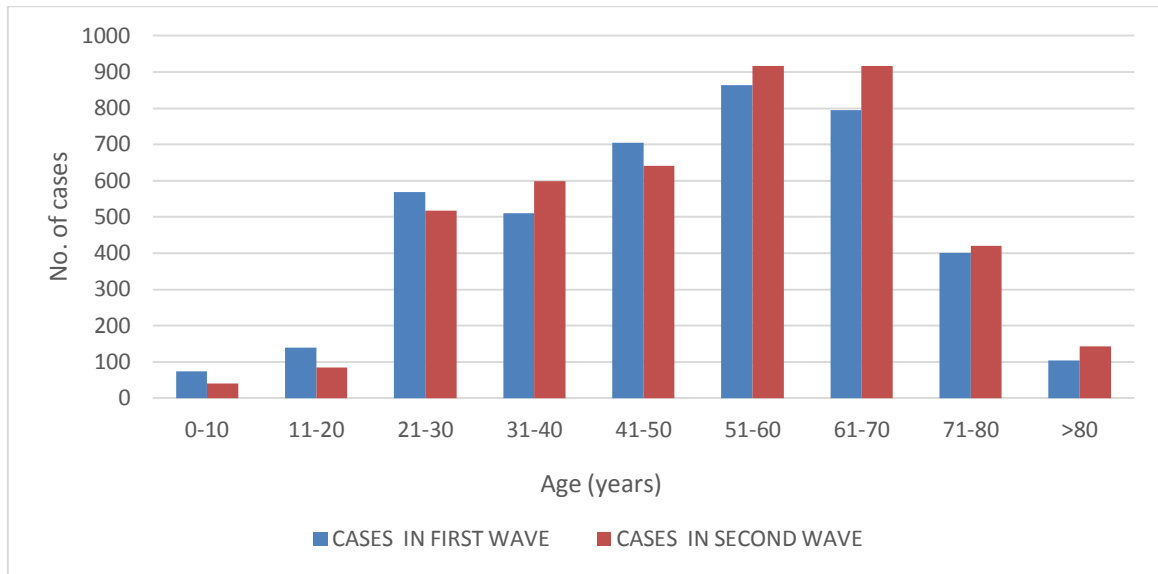


Fig 2 – Age wise distribution of cases in the first wave and second wave of Covid 19.

A noteworthy feature of second wave was high number of cases that were referred from rural area of same district and cases from another districts to the tertiary care hospital ( $p= 0.00$ ) (Fig 3A &3B).

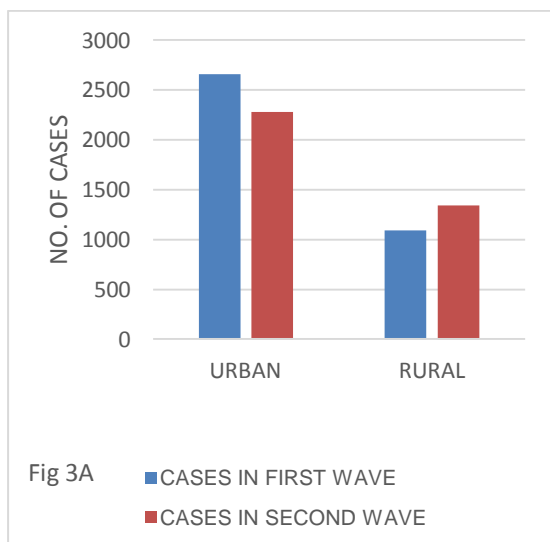


Fig 3A ■ CASES IN FIRST WAVE  
■ CASES IN SECOND WAVE

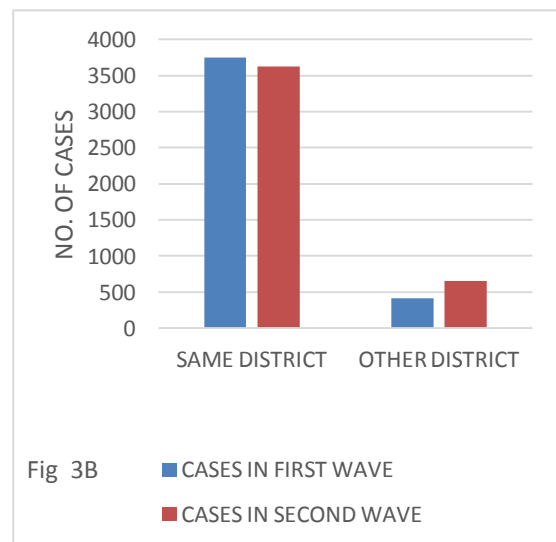


Fig 3B ■ CASES IN FIRST WAVE  
■ CASES IN SECOND WAVE

Fig 3A - Geographical distribution of cases from urban and rural in first and second wave of Covid 19

Fig 3B - Geographical distribution of cases from same district or other districts in first and second wave of Covid 19

Total patients discharged during first and second wave were 2954 and 2523 respectively. In second wave significantly more patients were discharged within 10 days of hospitalization ( $p = 0.00$ ). The mean days of hospitalization was 12 days (1- 95 days) in first wave and 9 days (1- 41 days) in second wave of Covid 19 (Fig 4).

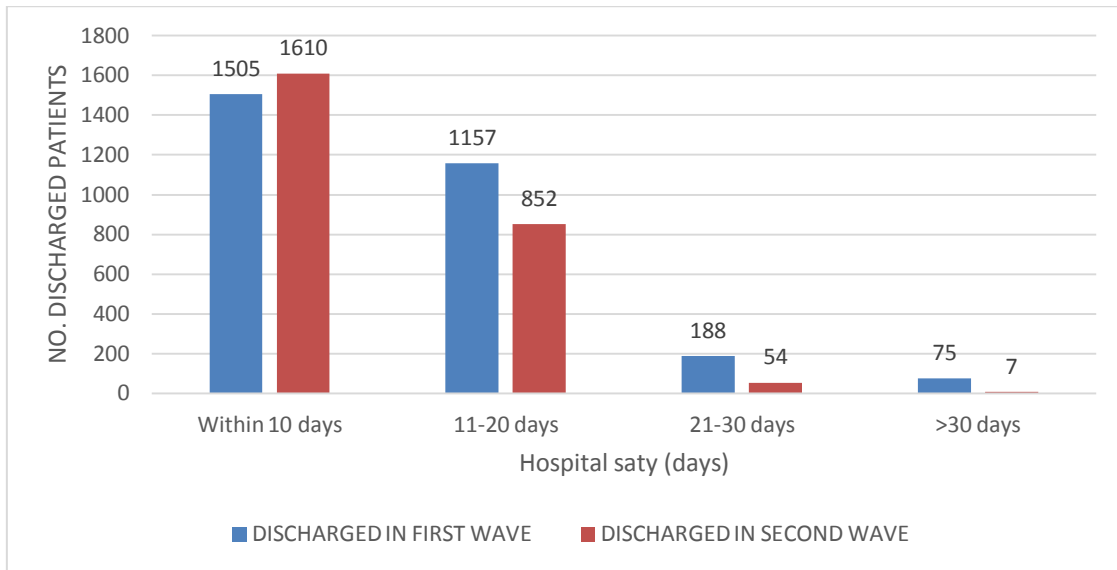


Fig 4 - Hospital stay wise distribution of discharged patients in first and second wave of Covid 19.

In first wave highest number of deaths occurred in September 2020 (200) and in second wave highest number of deaths occurred in April 2021 (746) (Fig 5).

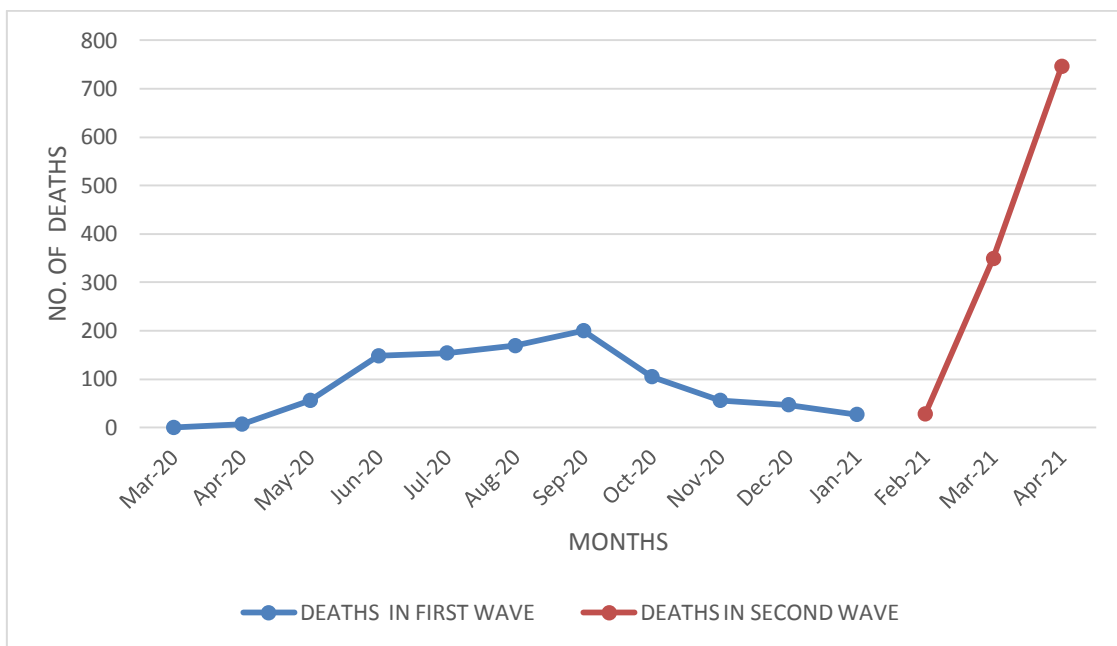


Fig 5 – Month wise distribution of deaths in first and second wave of Covid 19.

In second wave of Covid 19 significantly high number of deaths occurred in below 40 years ( $p = 0.003$ ) mainly in the age group of 31-40 yrs ( $p = 0.0007$ ). During first wave of Covid 19 significant number of deaths occurred in the age group of 41-50 yrs ( $p = 0.013$ ). In both waves deaths were more common in men (65.74 % in first wave & 63.4 % in second wave). Mean age of deceased was  $61 \pm 14.44$  and  $60 \pm 14.81$  in first and second waves respectively. There was no significant association between gender and death of hospitalized patients ( $p = 0.35$ ) (Fig 6)

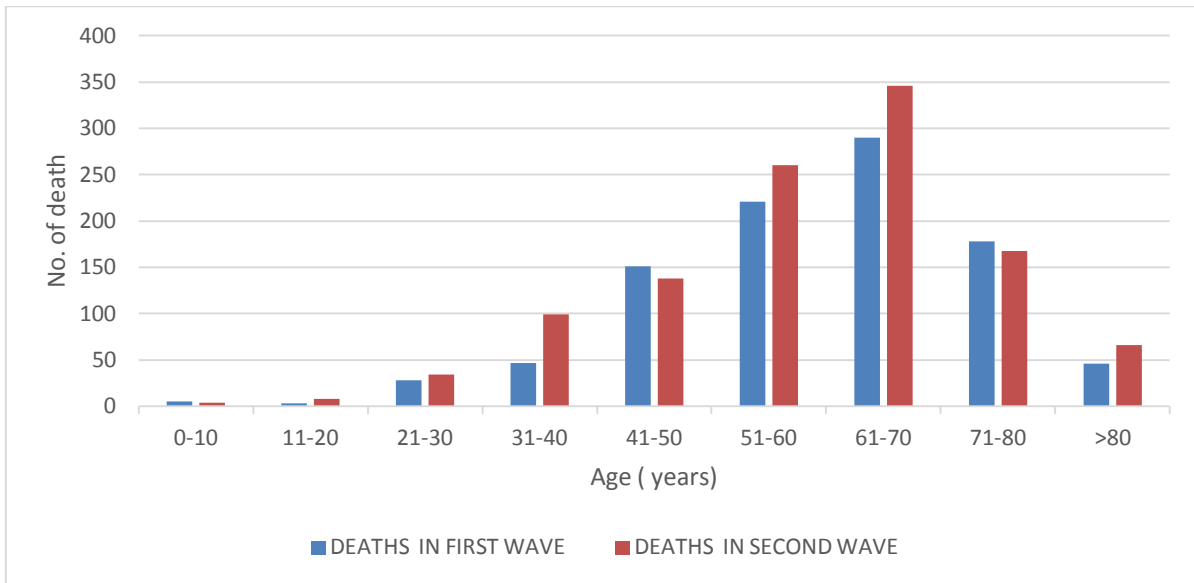


Fig 6 – Age wise distribution of deaths in first and second wave of Covid 19.

In the first wave of Covid 19, 969 patients died and in second wave 1123 patients died. During second wave of covid 19 significant number of deaths occurred within 3 days of hospitalization ( $p = 0.024$ ) and also number of deaths decreased after 10 days of hospitalization ( $p = 0.00$ ). Mean death interval in first wave was 7.5 days (0-61 days) and in second wave mean was 6 (0-40 days).

Five most common co-morbidities among deaths in first and second wave of Covid 19 were Hypertension, DM, IHD, COPD and Asthma. Most common co-morbidity was Hypertension followed by DM. In first wave of Covid 19 out of total deaths 62.1 % were with comorbidity while in second wave 47.28% were with comorbidity. As compared to first wave of Covid 19 in second wave deaths in people without underlying predisposing co-morbidity were significantly higher ( $p = 0.00$ ) (Fig 7)

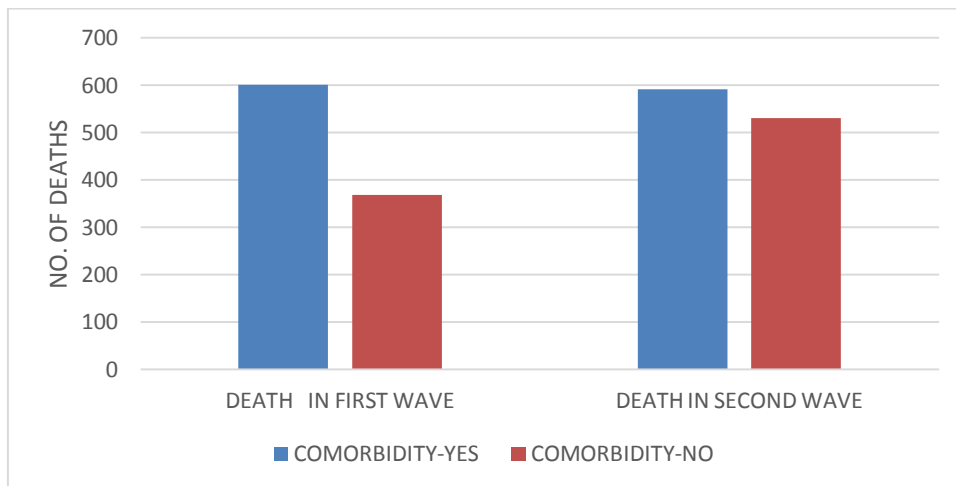


Fig 7 – Comparison of deaths associated with co-morbidity in two wave of Covid 19

In second wave, there was statistically highly significant rise in deaths of people referred from rural area of same district ( $p = 0.00$ ) and from other district ( $p = 0.00$ ) to this tertiary care center (Fig 8).

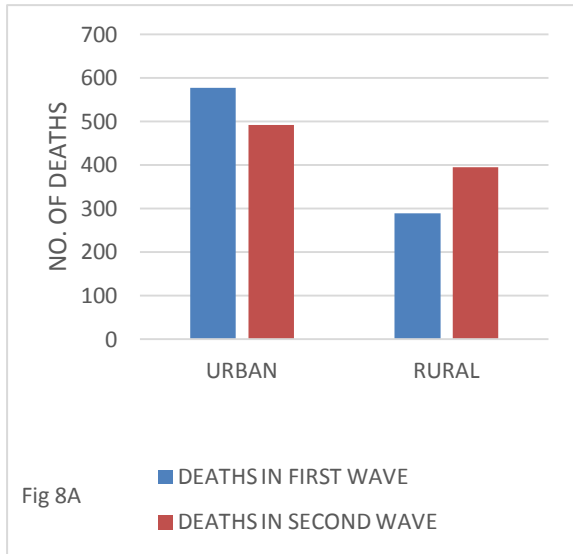


Fig 8A

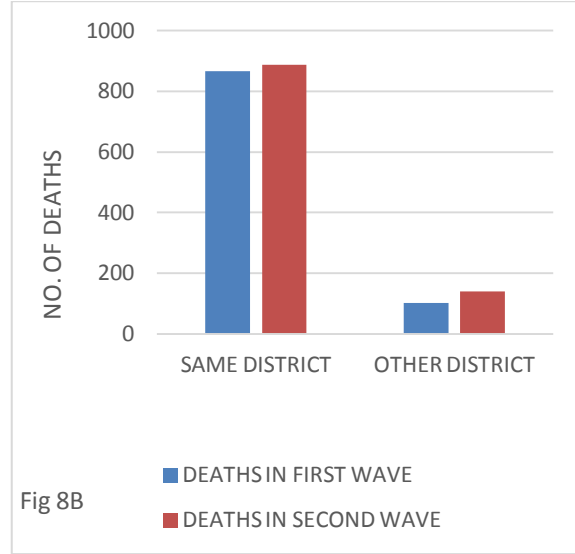


Fig 8B

Fig 8A – Geographical distribution of deaths from urban and rural in first and second wave of Covid 19

Fig 8B – Geographical distribution of deaths from same district or other districts in first and second wave of Covid 19

#### IV. Discussion

Now a days India is in second wave of Covid 19 with second highest number of cases and third highest number of deaths in the world. India has a nearly vertical coronavirus case growth curve<sup>4</sup>. Maharashtra, India's second most populous and wealthiest state, tops the list of most affected states in country on 22 April 2021<sup>5</sup>. In this study we compared sociodemographic factors i.e. age, gender, hospital stay, geographical distribution and associated co-morbid conditions among admitted patients in first and second wave of Covid 19. This comparison offers a powerful method for identifying and explaining similarities and differences among two waves of Covid 19. Significant number of patients admitted in second wave were younger and from rural area of same district and referred cases from other districts. Similar findings are noted in previous studies in several countries<sup>2,3,6</sup>. Reason behind this can be lack of awareness and reluctance to testing and treatment. Also most of the people migrating from urban to rural area would be responsible to make rural population more susceptible to Covid 19. There was no significant association between gender and Covid 19 infection. Early studies of Lombardy, the most affected regions of Italy, show a strong prevalence of hospitalization in ICUs among men<sup>7</sup>.

During second wave most of the admitted patients were discharged within 10 days of hospitalization. Reason for this can be early diagnosis, early hospitalization, proper patients placements and improvement in the quality of treatment. Herd immunity by vaccination can also be important reason to decrease the severity of disease leading to decrease in the hospital stay.

We observed deaths in below 40 years of age group. John P.A. Ioannidis et al. noted the age distribution of Covid 19 deaths did not change much within the examined high-income countries between the first and second waves<sup>8</sup>. The young population is at risk of higher chance of getting infected because of their mobility to workplace and another possibility can be lack of self-protection, increased incidence of noncommunicable disease. Covid19 with such non-communicable diseases make task to treat the patients tough. In second wave more deaths were found in people without co-morbidity. This might be because of increased infectivity of virus and new variants of a virus. Most of the deaths were in cases referred from rural area of same district and from other districts. In first wave mortality is more common in older age group. Similar observations was also reported in other studies<sup>9,10</sup>. Problem compounded by the fact that most of the medical infrastructure, especially the tertiary centres are located in the cities, where serious patients from villages are referred lead to late hospitalization. Most common associated condition among patients who died is cardiovascular followed by respiratory followed by renal in both waves of Covid 19, similar to as reported in another study<sup>11</sup>.

#### V. Recommendation

Strong strategies from State and Central Government are needed to stop the second wave of Covid19 from sweeping the rural area, where the bulk of the population lives. The reasons for difference between two waves are not known yet. Although it has been suggested that a new variant of SARS- CoV-2 emerged in India. To confirm this more studies are required.

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