Original Research Article

A Cross Sectional Analytical Study of Deaths Due to COVID-19 in Eastern India

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Abstract

Introduction: The present study is an epidemiological study of the fatal cases of COVID-19 positive by Reverse Transcriptase Polymerase Chain Reaction in a tertiary care centre in West Bengal. The trace, track and treat mode of investigation has helped in the control and timely intervention in the disease pathogenesis

Objective: to analyse the epidemiological characteristics of COVID-19 related deaths in tertiary centre in Eastern India and comprehended the pattern of deaths due to COVID-19. This will help in understanding the gaps between infection and deaths.

Methods: It was a cross sectional analytical study. The Medical certification of cause of death was studied and data was tabulated. We collected deaths due to COVID-19 in a tertiary set up in Eastern India from March'2020 to September'2020.

Results: A total of sixty-one deaths were studied. Among the deaths with COVID-19, mild type accounted for the most followed by the severe type. The median age was 65 years50% of the deaths were distributed in 60-80 years age group. Additionally, the male to female ratio was 3:1. % of patients had underlying comorbidities. It was noted more amongst males. Most of the underlying diseases were hypertension, Diabetes Mellitus, cardiovascular diseases.

Conclusion: COVID-19 posed a greater threat to the elderly people and men with fatal consequences.

Keywords: COVID-19, deaths, co-morbidities, cause of death

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Introduction

India has a population of 140 crores. Since the outbreak of COVID-19 pandemic, India in its three waves has witnessed5 lakhs deaths[1.]

The first reported death in India due to COVID-19 was that of a 76 years old male, a known case of hypertension, Diabetes Mellitus and Bronchial Asthma with a travel history to a Middle east country. The second known death was that of a 69 years old female, whose son had a travel history and shared a common household. After that there were series of death in similar age group and known co-morbidities. The third death was that of a 64 years old male with multiple known co-morbidities and had a travel history to Dubai.[2]

The mortality rate due to COVID-19 has often been defined as excess mortality[3].

SARS CoV2, responsible for Coronavirus Disease (COVID)-19 was isolated from cases of pneumonia of unknown origin. The test, track and treat helped reduce the mortality of the otherwise infectious disease and thus iad in decreasing the mortality[4].

Themortality rate of the disease was 1.28% in India in 2021[5]. The mortality rate in USA and Europe is 1.5%[6].Systemic involvement in COVID-19 was varied. It affected Cardiovascular system in few, in others respiratory system was affected. The variable factors included gender, Angiotensin Converting enzyme expression, existing co-morbidities and the genetic predisposition affected the outcome. We undertook this study to understand the systemic involvement and the affected system.

Methodology

Our study is a cross-sectional analytical study. We pursued all the records of cases which were Reverse Transcriptase Polymerase Chain Reaction cases of COVID19 which tested positive between March 2020 to September 2020 which were given a cause of death. We did not include cases where cause of death was ill defined like found dead or sudden cardiac arrest. Sample size: we included the deaths that occurred in the hospital in patients who had COVID-19 or who recovered and died due to its complications. Our sample size was 61.

Method

In our study, we included all the cases who were admitted to a Tertiary Hospital in southern part of West Bengal, India and were diagnosed as a case of COVID-19 by Reverse Transcriptase Polymerase Chain Reaction. The Medical certification of cause of Death was used to collect the data which had been duly filled and signed by a Registered Medical Practitioner. The data was collected for demographics, co-morbidities and cause of death as filled in MCCD.

Understanding the immediate cause of death is critical in addressing any potential gaps in care and improving outcomes in patients with COVID-19. This is the only study to the best of our knowledge talking about immediate cause of death in this region.

Results

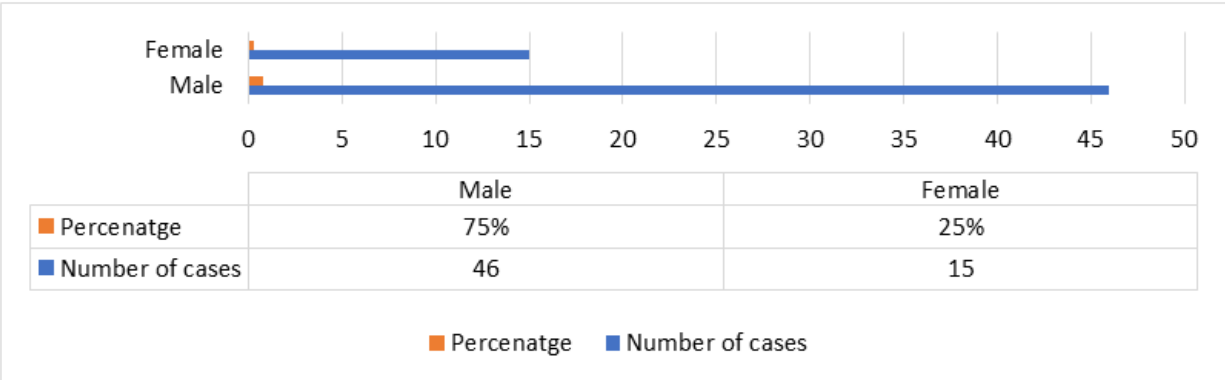

Fig 1: Gender distribution of the study population

75%(n=46) of our sample size were male and 25% (n=15) were female. The male: female ratio was 3 : 1

Table 1: Age distribution of the study population

Mean	30.5
Std dev	21.92031
Confidence Interval	5.60885
Ratio	3 : 1

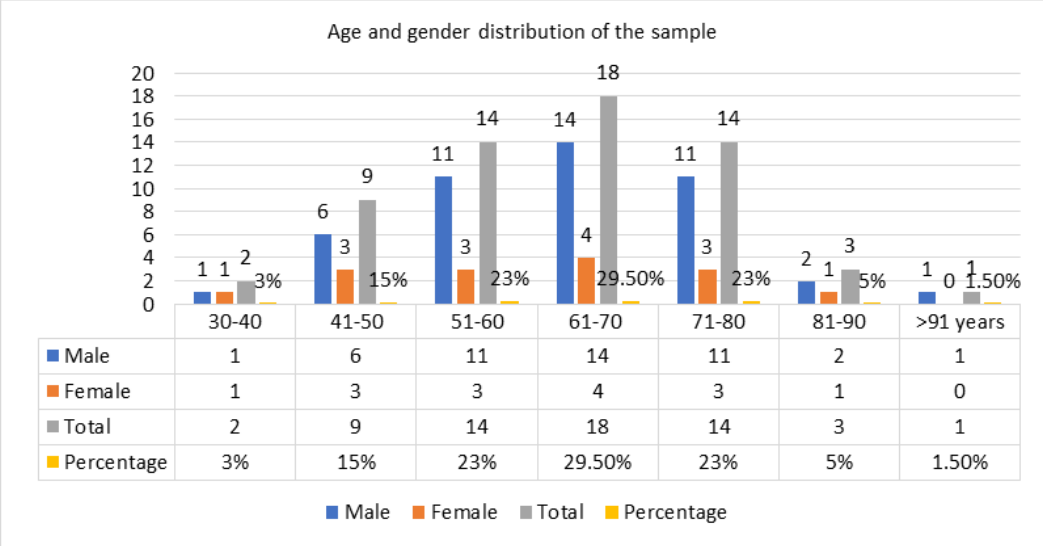

Fig 2: Age and Gender distribution of sample

Around 30% of fatalities were in the 61-70 years (n=18, M:14, F:4) age group followed by 71-80 years which was 23% (n=14, M: 11, F:3) and 51-60 years (n=14, M:11, F:3). 41-50 years (n=9, M:6, F:3) were 15% of the total sample size and 5% was in 81-90 years age group (n=3, M:2, F:1)

Mean	8.714286
StdDvn	6.824326
Confidence Interval	1.747784
Median age	65 years

Table 2: Co-morbidities present in the study population

Co-morbidities	Number	Total	Percentage
Endocrine			
Diabetes mellitus	27	30	20%
Hypothyroid	3		
Cardiovascular			
CAD	8		
Hypertension	32		
DCM	34		
MI	1		
Corpulmonale	1	81	55%
Complete heart block	1		
Congestive heart failure	3		
Sudden cardiac death	1		
CAD LV dysfunction	1		
Cardiogenic shock	1		

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Psychiatry		*1*	
Schizophrenia	*1*		
CNS			
CVA	*3*		
Multi system atrophy	*1*	*5*	
Parkinson's	*1*		
Haematological			
Anaemia	*2*	*5*	
Leukaemia	*2*		
Metabolic acidosis	*1*		
Nephrology			
AKI	*3*	*16*	*11%*
CKD	*13*		
GIT		*1*	
Portal hypertension	*1*		
Respiratory		*5*	
LRTI	*1*		
COPD	*3*		
Tb	*1*		
Death after recovery of COVID-19	*2*	*2*	

Out of the co-morbidities, 55% of the co-morbidities were cardiovascular like coronary artery disease, hypertension, dilated cardiomyopathy, myocardial infarction, congestive heart failure. Endocrine causes like diabetes mellitus and hypothyroid were around 20% of the co-morbidities and 11% were renal causes like acute kidney injury and chronic kidney diseases.

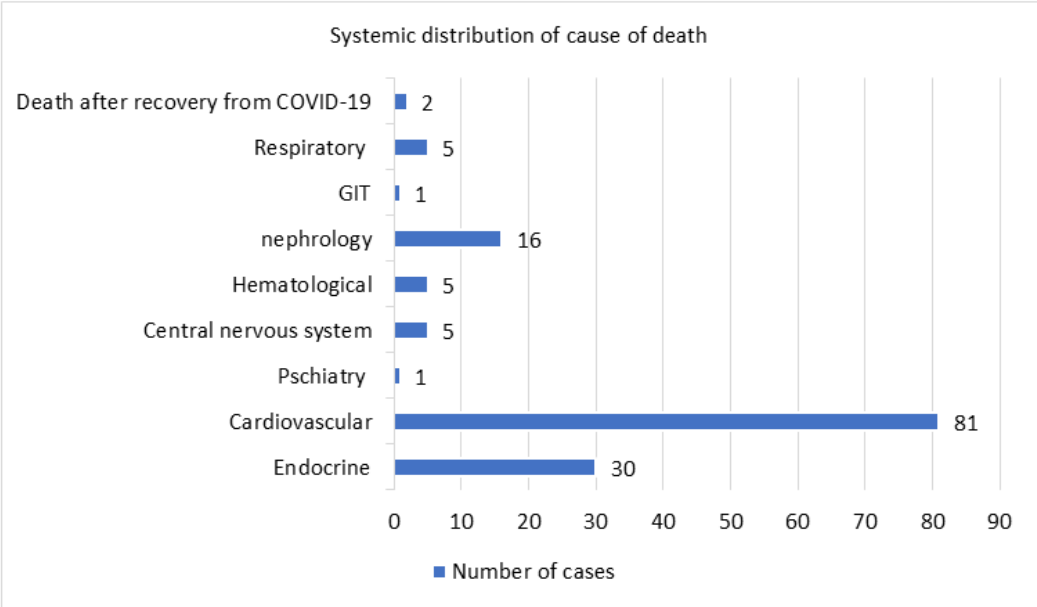

Figure 3: Depicting the systemic distribution of cause of death

Table 3: Immediate Cause of death of the study population

Immediate cause of death	Number	Total	Percentage
Head injury		5	8%
Acute on chronic Subdural hematoma	1		
Head injury and intracerebral haemorrhage	2		
Cerebral Vascular Accident	2		
Respiratory causes		39	64%
Acute exacerbation of Chronic Obstructive Pulmonary Disease	1		
Acute Respiratory Distress Syndrome	4		
Bilateral pneumonia	7		
LRTI	1		
URTI	1		
Pulmonary oedema	1		
Shortness of breath	3		
Aspiration pneumonia with sepsis	1		
Atypical pneumonia	1		
CoVID pneumonia and complications	18		
Disseminated tuberculosis	1		
Renal disorders		4	7%
Acute Kidney Injury on Chronic Kidney Disease	2		
Chronic Kidney Disease stage V	2		
Gastrointestinal		2	3.2%
Upper Gastro Intestinal bleed	1		
Decompensated cirrhosis of liver	1		
Neoplasia		5	8%
Disseminated malignancy	3		
Tumour lysis syndrome	1		
Recurrent glioblastoma multiforme	1		
Necrotising soft tissue infection	1	1	1.8%
MutliOrganDysfunction Syndrome and Sepsis	5	5	8%

64% of the deaths were due to respiratory cause as the immediate cause of death. it was followed by 8% cases of immediate deaths in head injury. Multi-organ dysfunction syndrome and neoplasia each. Renal disorders were 7%. Gastrointestinal causes were 3% and necrotising infection were seen as immediate cause of death in 1.8%

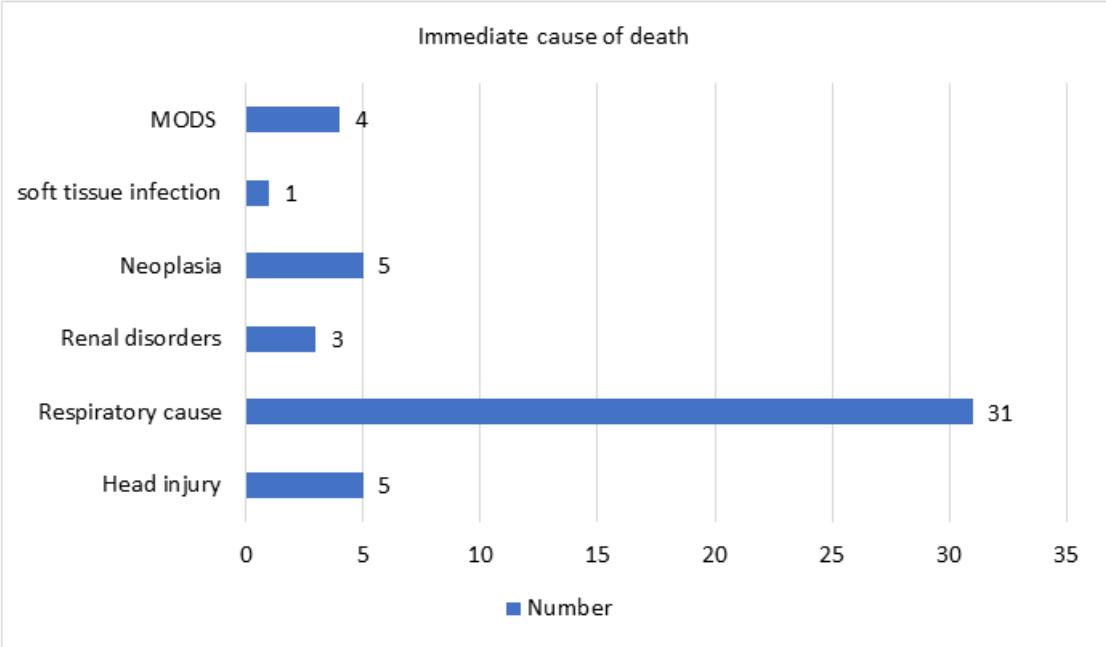

Fig 4 depicting immediate cause of death

Discussion

COVID-19 had the world at tenterhooks as the aetiology was not known, treatment was not specific. However, due to diligent interplay of the medical, biotechnology and people themselves the fight against the infection succeeded. However, the need to learn and evolve is essential to know the gaps that existed between the disease, cure and the existing co-morbidities. This played an essential role in understanding the gaps between treatment and the results achieved.

SARS-CoV2 virus was identified as the aetiology of the disease. Interestingly it enters the body through Angiotensin Converting enzyme 2. This has a varied expression all over the body and it also is dependent on sex hormones. Differences in the expression of ACE2 caused by sex hormones may help in explaining the sex disparities in COVID-19 infection, severity, and fatality. This may explain the varied infectivity and mortality pattern not just amongst gender but also amongst individuals[7].

The male: female ratio in our study was 3:1 for mortality. Few studies have found same susceptibility to male and female in terms of patients testing positive[8,9]. However, the mortality rate was more in males as compared to females [10]. Hospitalization was also found to be 1.5 times in males as compared to females [11]. The reasons enlisted for less fatality in females are often said to be due to enhanced immune response[7,12,]

Female COVID-19 patients may also experience lower severity and fatality rates than male patients due to their enhanced immune responses, different sex hormone causing varied response of ACE2 receptors on cells[7,12,] .

Varied expression of ACE2 on cells cause it to act on multiple organs like endocrine organs, cardiovascular system, respiratory system, gastrointestinal system, hepatobiliary system[13.] In our study, out of all the co-morbidities, 55% of the co-morbidities were cardiovascular like coronary artery disease, hypertension, dilated cardiomyopathy, myocardial infarction, congestive heart failure.

Endocrine causes like diabetes mellitus and hypothyroid were around 20% of the co-morbidities and 11% were renal causes like acute kidney injury and chronic kidney diseases.

Median age in our study was 65 years. Median age have ranged from 44 years to 75 years[14]

Though COVID-19 is largely understood to be a respiratory disease, emerging evidence has shown that it can directly affect other organs in the body. Data suggest that a higher expression and activity of ACE2 may increase vulnerability to COVID-19 infection and fatality. For example, increased ACE2 expression was high in the lungs of patients with comorbidities associated with higher risk to COVID-19 infection

Comorbidity :atleast one co-morbidity was reported in many studies [15]. 22% of the cases of Stokes et al had an underlying co-morbidity[16]. Cardiovascular diseases, diabetes and chronic lung disease were the most frequent underlying disease[17]. Majority of the patients with fatality had atleast one existing co-morbidity [15].

In our study, out of the co-morbidities, 55% of the co-morbidities were cardiovascular like coronary artery disease, hypertension, dilated cardiomyopathy, myocardial infarction, congestive heart failure. Hypertension, obesity and diabetes were the most common pre-existing co-morbidities.[14, 15 16,17]

Endocrine causes like diabetes mellitus and hypothyroid were around 20% of the co-morbidities. COVID-19 is often exacerbated due to underlying and co-existent endocrine disorder. Additionaly, the infection casues an alteration in the normal physiological process of underlying organs. This leads to an altered response of the body to the stress leading to harmful results. A.19

11% were renal causes like acute kidney injury and chronic kidney diseases.

In our study,64% (n=39)of the deaths had immediate cause of death as Respiratory infections. In most of the studies, peripheral blood have shown an increased number of neutrophils. They are known to be a major source of chemokine and cytokine leading to cytokine storm. This is often understood to be the reason for Acute respiratory distress syndrome [20].

Particularly, one study regarding postmortem COVID-19 patients found SARS-CoV-2 antigens in the tubular epithelial cells of the kidneys, suggesting that SARS-CoV-2 can directly infect the kidney[21].7% of our cases (n=4) had renal cause of death like acute kidney injury or Chrnoic kidney disease stage V.

Furthermore, another study found that SARS-CoV-2 infected human induced pluripotent stem cell-derived cardiomyocytes, displaying the direct effects of SARS-CoV-2 on the heart cells [22]. Arrhythmia have been frequently quoted as a common cause of death in COVID-19 patients. Out of the arrhythmia, supraventricular tachycardia is the most frequent [23]. It is said it is due to Ferroptosis which is caused due to accumulation of lipid ROS in cells, resulting in fatal lipid peroxidation [24.]

Accurate determination of the immediate causes of death in patients with COVID-19 is important for optimal care and mitigation strategies. 64% of the deaths were due to respiratory cause as the immediate cause of death.Oud et al [25] found nearly five-fold rise in ARDS-related deaths 2020. COVID-19 as a cause of death was present in over 80% of all ARDS-related deaths that year.

It was followed by 8% cases of immediate deaths in head injury. Other studies have also noted an increase in head injury due to domestic violence, falls and decreased reporting to hospital due to lockdown. [26]

Understanding the immediate cause of death is critical in addressing any potential gaps in care and improving outcomes in patients with COVID-19.

Limitations of the Study: the sample size was limited. The sample was also regional in distribution and may not represent the entire sample.

Conclusion: the expression of the innate mechanism of immunity, ACE2 on organs of every individual made him uniquely predisposed to the complications of CoVID-19 Infection. Male and female were diagnosed equally. However, the mortality rate in male to female was 3:1. The age group of 60-80 years was severely affected. The respiratory casue of death like Acute respiratory distress syndrome, pneumonia and complications were commonly encountered as cause of death. cardiovascular co-morbidities were the majority of the pre-existent co-morbidities.

Ethical Statement: Ethical Clearance taken. IEC/CHKol/2021/Apr/011 dt 12 Apr 2021

Conflict of Interest: Nil

Source of Funding: Nil

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