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Comorbidities as a Risk Factor for Severe Disease and Mortality in Hospitalized COVID-19 Patients

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Background:The high mortality rate in Coronavirus Disease (COVID-19) patients is concomitant with theircomorbid conditions. Consequently, it is imperative to pinpoint risk factors associated with poor outcomes among COVID-19 patients. The aims of this study were to find out the comorbidities in case of death and deterioration due to COVID-19. *Methods:* The design of this study was a retrospective descriptive method with a confirmed COVID-19 patient on hospitalized at …… Hospital from March to September 2020. Ethical approval was obtained. *Results:* A total of 454 patients were involved in this study. 78 (17.18%) patients' death due to COVID-19, consisting of 52 (66.67%) male and 26 (33.33%) female. Range of ages between 18 and 85 years. The highest mortality rate occurred in the age group 60 years (35; 51.47%), followed by the age group of 45–59 years (33; 48.53%), and the age group of <45 years (10; 12%). The prevalent comorbidity was hypertension (42.31%), cardiovascular disease (30.77%), diabetes (28.21%), chronic kidney disease (23.08%), malignancy (15.38%), obesity (15.38%), chronic liver disease (7.69%),

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chronic respiratory disease (6.41%), immune related disease (3.85%), and non-traumatic cerebral infarction (3.85%). 41 (52.56%) patients reported having two or more comorbidities, and 37 (47.44%) only has one comorbidity. Elevated neutrophil-to lymphocyte ratio (NLR) _3.13 was seen in the majority of patients (68; 87.18%). The mean value of NLR was 20.94. *Conclusions:* Hypertension, cardiovascular disease, and diabetes were the most common comorbidity in patients' death due to COVID-19. More than half of the patients had two or more comorbidities.

Introduction

On March 11, 2020, the World Health Organization declared the COVID 19 outbreak a pandemic (**Huang et al.,2020**).Saudi Arabia fatality rate is assessed at about 0.9% of the more severely infected. The likely fatality rate including mild and asymptomatic cases is assessed at about 0.2%; this is four times larger than the death rate for influenza and pneumonia foe Saudi Arabia(**Boretti., 2020**).Data from China have indicated that older adults, particularly those with serious underlying health conditions, are at higher risk for severe COVID-19-associated illness and death than are younger persons. Although the majority of reported COVID-19 cases in China were mild (81%), approximately 80% of deaths occurred among adults aged _60 years (**Hua et al.,2020**).This first preliminary description of outcomes among patients with COVID- 19 in the United States indicates that fatality was highest in persons aged _85, ranging from 10% to 27%, followed by 3% to 11% among persons aged 65–84 years (**Covid, C. D. C., Team., 2019**).

Over 180 countries have been affected by COVID-19, resulting in mass death worldwide. As cases evolve globally, it has been noted that persons with underlying chronic illnesses are more likely to contract the virus and become severely ill. Due to SARS CoV-2 being a relatively new virus, the data available is limited.However, patients with comorbidities have more deteriorating outcomes compared with patients without. COVID-19 patients with history of hypertension, obesity, chronic lung disease, diabetes, and cardiovascular disease have the worst prognosis and most often end up with deteriorating outcomes such as ARDS and pneumonia. Also, elderly patients in long-term care facilities, chronic kidney disease patients, and cancer patients are not only at risk for contracting the virus, but there is a significantly increased risk of death among these groups of patients (**Sanyaolu et al., 2020**).The high mortality rate in COVID-19 patients is associated with their comorbid conditions. Therefore, it is important to identify riskfactors associated with poor

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outcomes among COVID-19 patients.The aims of this study were to find out the comorbidities in case of deterioration and death due to COVID-19.

Methods

The design of this study was a retrospective descriptive method with the sampling technique in this study was carried out purposively on COVID-19 patients who entered and were treated at the Hospital from the period March to September 2020, total of 454 patients were included of this study. One tool was used to collect data including information about patients' biosociodemographic characteristics (**Sanyaolu et al., 2020**)Ethical approval from ethics committeeof Patients' data were secured. Data was statistically analyzed using SPSS 21 version

Results:

A total of 454 patients were included of this study, consisting of 225 (49.56%) male and 229 (50.44%) females. Among 78 (17.18%) patients had been reported death due to COVID-19 (Fig. 1). Two-thirds of them are male. Range of ages between 18 and 85 years with average 57 years. The highest mortality rate occurred in the age group _60 years (35; 51.47%), followed by the age group of 45–59 years (33; 48.53%), and the age group of <45 years (10; 12%). The most comorbidity was hypertension (42.31%), cardiovascular disease (30.77%), and diabetes (28.21%) (Fig. 2). Elevated NLR _3.13 was seen in the majority of patients (68; 87.18%) with the mean value of NLR was 20.94. Characteristic of patient is available in Table 1.

Table I: characteristics of deteriorated patients and covid 19 deaths:

Characteristics	Total (n = 78)	Percentage (%)
Sex		
Male	51	66.7
Female	27	33.34
Age		
Less than 45	8	11.82
45-59	33	48.53
60 and more	37	52.47
Comorbidities:		

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Hypertension	33	42.31
Cardiovascular diseases	24	30.77
Diabetes	22	28.21
Chronic kidney disease	18	23.08
Malignancy	12	15.38
Obesity	12	15.38
Chronic liver disease	6	7.69
Chronic respiratory disease	5	6.41
Immune related diseases	3	3.85
Cerebrovascular stroke	3	3.85
Number of comorbidities		
1 comorbid	37	47.44
2 and more comorbidities	41	52.56
NLR		
Less than 3.13	10	12.82
Equal or more than 3.13	68	87.18

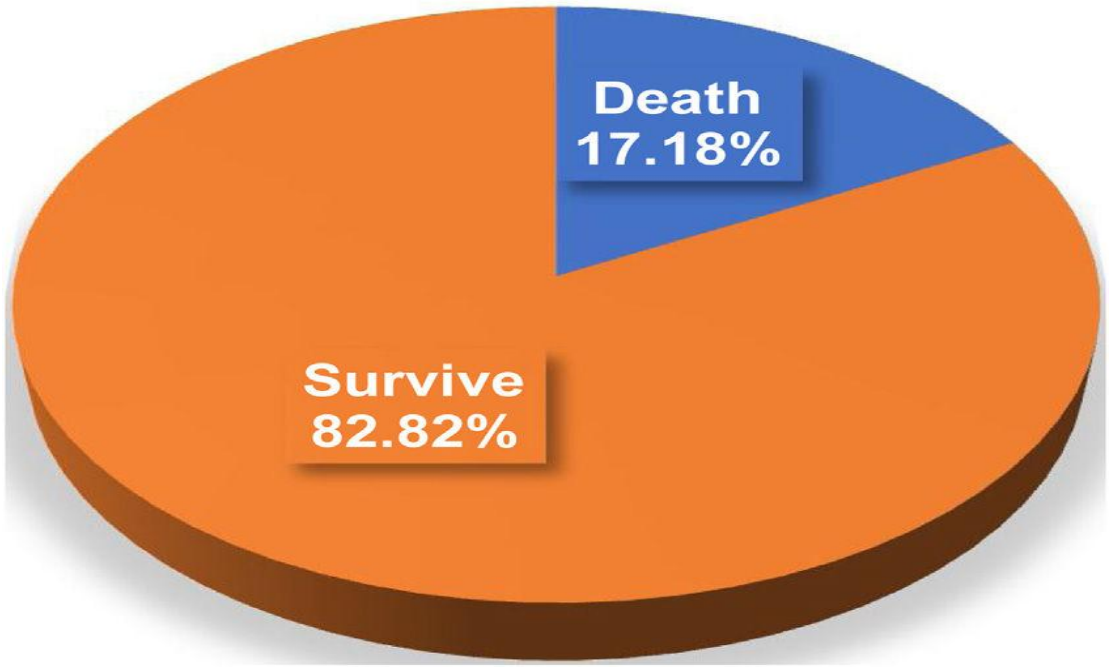


Figure I: outcome of confirmed Covid 19 patients

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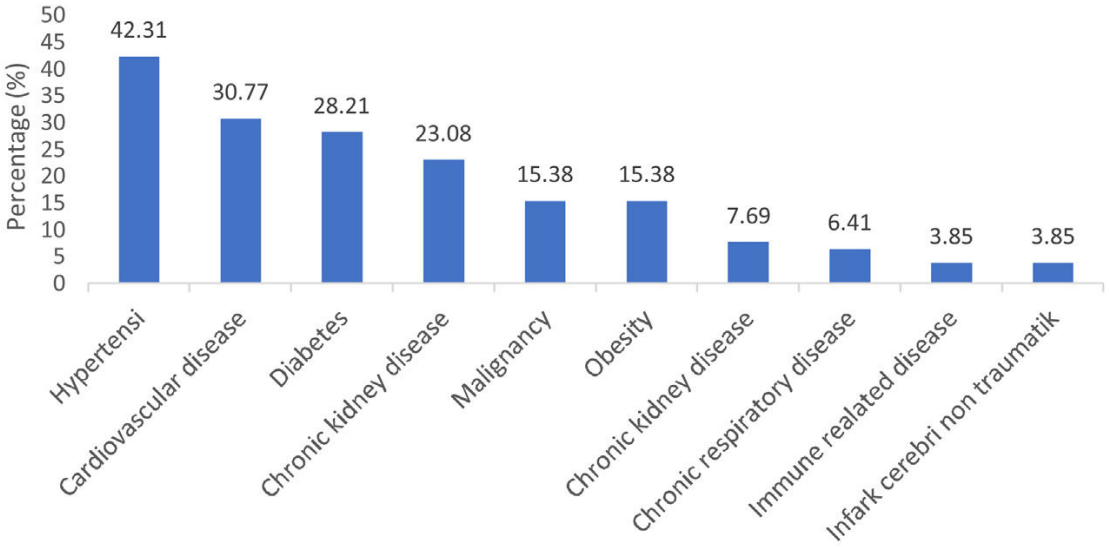


Figure2: comorbidities of deteriorated patients and deaths due to Covid 19

Discussion

In this study, the mortality rate was quite large, 17.18%. The high mortality rate indicates the severity of the disease and the presence of comorbid conditions. A high mortality rate was also reported in US. The study includes the first large case series of sequentially hospitalized patients with confirmed COVID-19 in the US. There were 21% of patients died, among patients who were discharged or died (*n*: 2634) (**Richardson et al.,2020**).In a retrospective cohort study from China, hospitalized patients were predominantly men with a median age of 56 years; 26% required intensive care unit (ICU) care, and there was a 28% mortality rate (**Zhou et al., 2020**).

The men's mortality rate was higher than for women (66.67%vs. 33.33%). The systematic literature review and meta-analysis by Ortolan et al., data pooling resulted in a significant association between male sex and mortality (OR = 1.81; 95% CI 1.25–2.62) (**Ortolan et al., 2020**).Emerging evidence has suggested that ACE2 is a co-receptor for SARS-CoV-2 viral entry into the human cell that plays a significant role in the pathogenesis of this virus (**Zhou et al.,2020**).A study has suggested that ACE2 expression was higher in Asian males (**Zhou et al.,2020**).Other explanationsto why men were associated with severe outcomes compared with women in response to COVID-19 infection may involve differences in immunologic reaction and the lack of protective effect of estrogen signaling seen in females (**Channappanavar., 2017**).We found the highest mortality rate occurred in the age group 60 years (35; 51.47%). The condition of geriatric patients also increases the likelihood of a cytokine storm when exposed to COVID-19 because geriatrics have an immunosenescence

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condition (decreased immunity in old age) (**Channappanavar., 2017**).

The presence of immunosenesscences in the elderly causes susceptibility to respiratory tract infections. This can occur due to reduced mucosal barrier, mucociliary clearance, immune response and the presence of respiratory inflammation against pathogenic microorganisms**(Wasityastuti et al., 2020)**.Mucociliary clearance is reduced due to a decrease in the number and activity of cilia in the upper respiratory tract. It can also reduce the ability of the respiratory system to neutralize viral infections**(Abbas &Lichtman., 2016).**Immune systemdysfunction such as in the case of immunosenessence can causesusceptibility and severity of clinical manifestations of COVID-19 inthe elderly population. This is caused by uncontrolled infection dueto a weak immune system resulting in multi-organ failure, especiallyin organs or systems that have a lot of ACE2 such as therespiratory, cardiovascular, hepatic, and renal systems**(Patel & Verma., 2020)**.

Karyono and Wicaksana., 2020 reported on their research thatthe mortality rate was higher among elderly patients with COVID- 19 and COVID-19 patients with hypertension, diabetes, and other cardiovascular diseases.Leading comorbidities among COVID-19 deaths in NY, USA were hypertension (55.4%), diabetes (37.3%), hyperlipidemia (18.5%) (**Sanyaolu et al., 2020**).A total of 5700 patients were included, the most common comorbidities were hypertension (3026, 56.6%), obesity (1737, 41.7%), and diabetes (1808, 33.8%) (**Richardson et al.,2020**).In this study, the most comorbidities were hypertension (42.31%), cardiovasculardisease (30.77%) and diabetes (28.21%).

More than half of patients (52.56%) death due to COVID-19 had _2 comorbids and the rest had only one comorbid. **Guan WJ et al 2020**. analyzed data from 1590 laboratory confirmed hospitalized patients from 575 hospitals in 31 provinces China. This study analyzed the composite end-points, which consisted of admission to an Intensive Care unit, invasive ventilation or death. Among laboratory confirmed cases of COVID-19, patients with any comorbidity yielded poorer clinical outcomes than those without. After adjusting for age and smoking status, COPD (HR (95% CI) 2.681 (1.424–5.048)), diabetes (1.59 (1.03–2.45)), hypertension (1.58 (1.07–2.32)) and malignancy (3.50 (1.60–7.64)) were risk factors of reaching the composite end-points. A greater number of comorbidities also correlated with poorer clinical outcomes. The hazard ratio (95% CI) was 1.79 (1.16–2.77) among patients with at least one comorbidity and 2.59 (1.61–4.17) among patients with two or more comorbidities.

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The data of 61 patients with confirmed COVID-19 were analyzed, the baseline characteristics of patients in the mild and severe groups were described and compared, and the dynamic changes of laboratory indexes and imaging were demonstrated. The independent risk factors affecting incidence of severe illness were screened. The results showed that NLR was the most significant factor affecting the severe illness incidence, and it had significant predictive value. Furthermore, according to the NLR and age stratification, the incidence of severe ill ones with NLR _3.13 and aged _50 years old was 50%, and 9.1% in age _50 and NLR < 3.13 patients (**Liu et al., 2020**).

Conclusion

The mortality rate for hospitalized COVID-19 patients is 17.18%. Hypertension, cardiovascular disease, and diabetes were the most common comorbidity in patients' death due to COVID-19. More thanhalf of the patients had two or more comorbidities.

Conflicts of interest

The authors declare no conflict of interest.

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