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Comorbidity and Its Impact on Patients with COVID-19

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Abstract **Original Research Article**

The coronavirus disease may have an impact on the health of infected individuals depending on their pre-existing comorbidities. An overview of the association between comorbidities and disease aggravation in COVID-19 patients that might result in poor clinical outcomes or death, is provided here. Additionally, general medical issues are discussed, including the symptoms that individuals infected with SARS-CoV-2 may exhibit. Persons with COVID-19 who also have concomitant comorbidities like diabetes mellitus or hypertension are at a higher risk of experiencing a more severe course and progression of the illness. Additionally, older patients with comorbidities particularly those 65 years of age and older, had a higher rate of ICU admissions and COVID-19 disease mortality. A total of 355 hospitalized COVID-19 patients were identified from four dedicated COVID hospitals. Total death among the hospitalized COVID-19 patients was 8.7%, among them 83.8% was >65 years old and 80.6% had comorbidities. Comorbid patients typically have the worst prognosis, thus they should take every care to prevent contracting SARS CoV-2.

Keywords: Comorbidity, COVID-19.

INTRODUCTION

The new Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) that caused the coronavirus disease outbreak was started in China in 2019 (COVID-19) and then spread worldwide, and it created a significant threat globally. The symptoms of COVID-19 can range from extremely severe to asymptomatic. According to statistics, the virus causes minor symptoms in 80% of persons, however this varies greatly depending on the age and strain of SARS-CoV-2. Fever, headache, sore throat, cough, diarrhea, vomiting, loss of taste and smell, and muscle soreness are mild symptoms. Some patients experience more severe symptom, such as dyspnea and may have more severe diseases such as bronchitis, pneumonia, severe acute respiratory distress syndrome (ARDS), multi-organ failure, and even death. Cells in the lower respiratory tract are more frequently targeted by the virus than those in the upper respiratory tract. According to patient's respiratory rates, oxygen saturation and percentage of lung infiltrates, patients are divided into four categories. The most serious category is critical illness, which includes septic shock, respiratory failure, and/or multiple organ dysfunction [1-5]. Age and preexisting medical illnesses (such as hypertension, diabetes and others) have an impact on the severity of COVID-19. The clinical features and outcomes of elderly and young patients may be different [6]. Elderly people may experience severe illnesses and are more likely to be admitted to the ICU and have proportionally higher mortality rates than younger people. The elderly population's age-related changes may be brought on by muscle atrophy and changes in lung structure, which alter physiologic function and reduce lung reserve, airway clearance, and defense barrier function. Among those who survive, might suffer from long-lasting deficiencies. Nonetheless, mortality in vulnerable populations continues to be high [5-7]. Patients with diabetes are more likely to be hospitalized and admitted to intensive care units (ICUs),

and their rates of morbidity and mortality are higher. Individuals who suffer from respiratory conditions, such as chronic obstructive pulmonary disease (COPD), are also more susceptible to severe COVID-19 sickness. Patients with COPD have a four-fold increased chance of catching COVID-19 compared to those without the disease [5]. The purpose of this paper is to review these comorbidities in COVID-19 disease, progression of disease and outcome.

METHODOLOGY

This multi-center observational study was done from July 2020 to September 2020 by the non-probability purposive sampling technique. A total of 355 hospitalized subjects with COVID-19 were included for this study from four dedicated COVID hospitals in Dhaka and outside of Dhaka. Along with all routing investigations, we have done HRCT scans of the chest for study subjects. All the information about the study participants has been kept confidential to the principal investigator and was applicable only for the research purpose. The study participant had also been assured that their personal information would not be handed over to the third at any time.

Procedures of Data Collection

Though it is an observational study and the potential risk was minimum for routine investigation, we took informed written consent from every single subject. In the case of unconscious patient in the ICU, informed written consent was obtained from the legal guardian. We did not collect any retrospective data. Before going for data collection, institutional permission was taken from appropriate authority after ethical clearance from BMRC (Bangladesh Medical Research Council). Data collection included bedside interviews and on admission investigation results collection on the spot. The data were analyzed by using the SPSS version 23 software program.

RESULTS

The total number of hospitalized COVID-19 patients was 355 and they were from four hospitals in Bangladesh.

Table 1: Participants (n:355)

Participants	**n (%)**
Institute	
Dhaka Medical College Hospital	74 (20.8)
Enam Medical College Hospital, Saver, Dhaka	22 (6.2)
Sador Hospital, Jashor	24 (6.8)
Sharkari Kormochary Hospital, Dhaka	148 (41.7)
Total	**355 (100.0)**

Among 355 COVID-19 patients, 254 were male and 101 were female. The mean age of the patients in this study was 51±13 years. Among 355 patients, 92 (26%) were managed in the ICU and 263 (74%) were managed in the general ward. Of 263 (74%) patients in the general ward, 186 (52%) were male and 77 (22%) were female. Of 92 (26%) patients in the ICU, 71 (20%) were male and 21 (6%) were female. Male patients were predominant in both the general ward and the ICU. The median hospital stay in the general ward was 14 days and in the ICU was 5 days.

Table 2: Socio-demographic characteristics, Co-morbidity, hospital stay and death cases (n:355)

Demographics	**Result**
Age in year, mean±SD	51±13
Gender, n (%)	
Female	101 (28.6)
Male	666 (71.4)
Co-morbidity, n (%)	241 (69.7)
ICU admission, n(%) Total	92(26)
Female 21(6) Male 71(20)	
General Ward admission, n(%) Total	263(74)
Female 77(22) Male 186(52)	
Median Hospital Stay in days with range	14 (1-41)
Median ICU Stay in days with range	5 (1-30)
Total death, *n(%)*	31 (8.7)

n: Number, %: Percentage, SD: standard deviation

241 (69.7%) patients had comorbidity. Among them, 45.1% were diabetic, 41.7% were hypertensive, 14.4% had ischemic heart disease, 8.5% had chronic kidney disease, 7% had bronchial asthma or COPD, 0.6% had liver disease and 0.6% had malignancy.

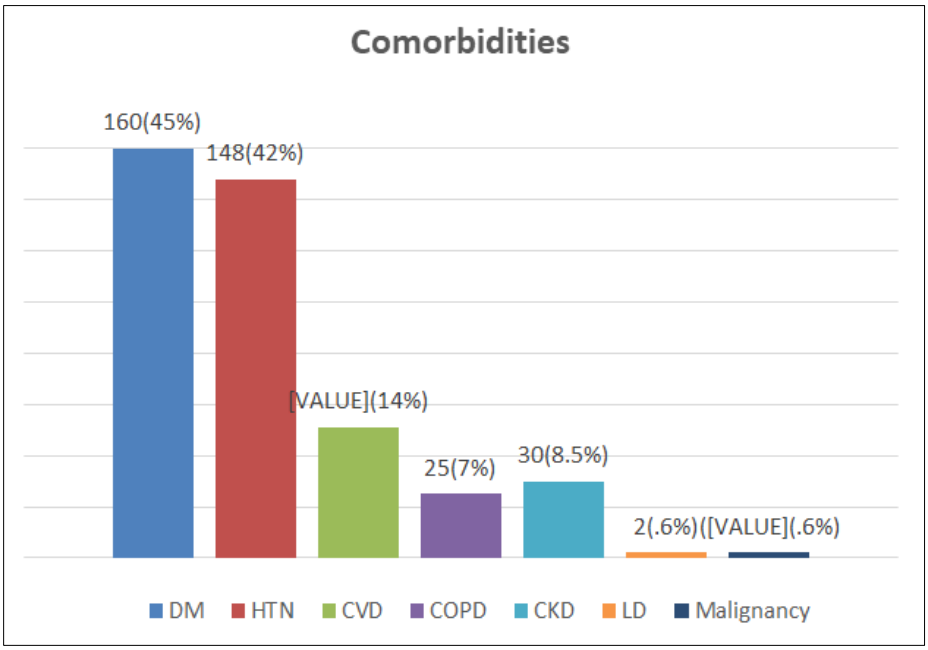

Figure 1: Comorbidities of Study subject's (n: 355)

Patients were divided into four groups based on the clinical criteria for case management according to the vitals of patients. A maximum (61.4%) of patients had mild disease, 24.5% of patients were in the moderate group, 12.1% of patients had severe disease and 2% of patients were critical.

Table 3: Distribution of study subjects Clinical criteria for case management according to Vitals (n:355)

	n (%) ***n=355***	**Res.R /min**	**Pulse /min**	**SBP (mm of Hg)**	**DBP (mm of Hg)**	**SpO_2 (%)**
		mean±SD	**mean±SD**	**mean±SD**	**mean±SD**	**mean±SD**
Clinical criteria for case management						
Mild	218 (61.4)	17±02	87±12	122±18	76±10	97±02
Moderate	87 (24.5)	23±06	89±14	119±22	77±11	93±07
Sever	43 (12.1)	29±10	96±19	118±18	78±13	88±09
Critical	7 (2.0)	30±11	98±19	139±13	75±07	95±05
Total	**355 (100.0)**	**23±08**	**89±14**	**120±20**	**77±11**	**93±07**
P-Value		**<0.001**	**0.152**	**0.466**	**0.937**	**<0.001**

n: Number, %: Percentage, SBP: systolic blood pressure, DBP: diastolic blood pressure, SD: standard deviation

Total deaths were 31(8.7%); of them, 26 (83.8%) were >65-year-old and 25 (80.6%) had comorbidities. Among the death cases, the more common comorbidities were diabetes mellitus (15 cases), hypertension (12 cases) and cardiovascular disease (5 cases); less common were COPD (3 cases), chronic kidney disease (2 cases) and cancer (1 case). Of the death cases, 22.6% of patients were critical and 77.4% had severe disease based on clinical criteria of case management according to vitals.

Table 4: Death of all cases according to age, comorbidity, clinical criteria of case management (n:355)

Total death, *n(%)*	31 (8.7)
Age >65 years	**26 (83.8)**
	25 (80.6)
Comorbidity	15(48.39)
DM	12(38.71)
HTN	5(16.13)
CVD	3 (9.68)
COPD	2 (6.45)

CKD	1 (3.22)
Malignancy	7 (22.6)
Clinical criteria of case management	24 (77.4)
Critical	
Severe disease	

n: Number, %: Percentage

Among 355 patients, 36.9% had fever, 27.9% had cough, 19.7% had dyspnea, 9% had myalgia and 7.3% had diarrhea.

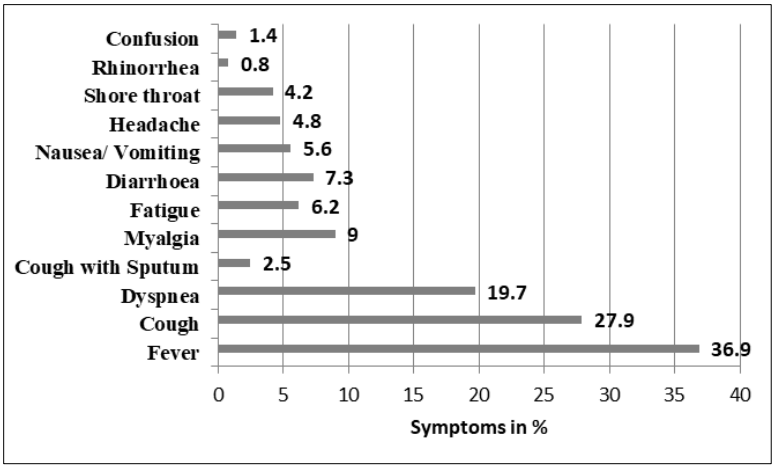

Figure 2: COVID-19 symptoms of all cases. (n:355)

According to clinical presentation, 61% of patients had mild illness, 24% of patients had pneumonia, 13% of patient had severe pneumonia, 0.3% of patients had ARDS and 1.4% of patients had sepsis.

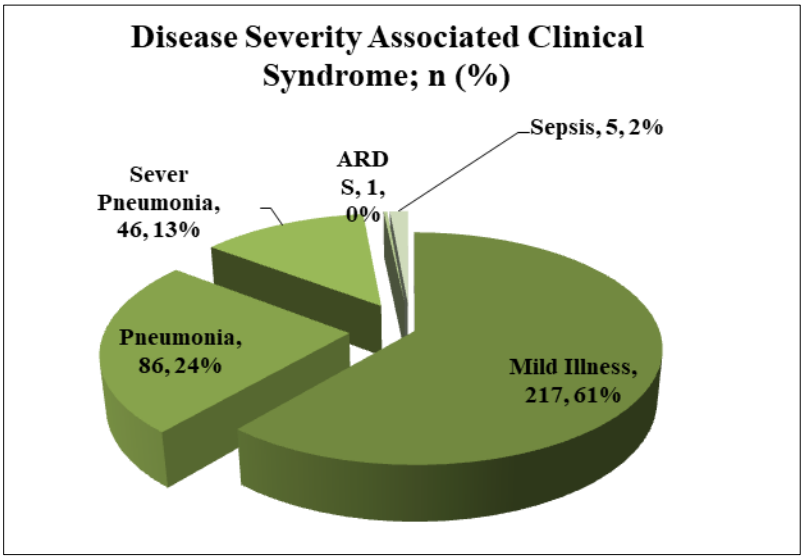

Figure 3: Category of Study subject's according to disease severity (n:355)

DISCUSSION

Multiple comorbidities are associated with the severity of COVID-19 disease progression [8]. Particularly in older adults with comorbidities, COVID-19 can cause severe illness that might result in admission in the intensive care unit and possibly death [9]. The mean age of the patients in this study was 51±13 years and the majority of patients were male (71.5%), whereas the proportion of female patients was just 28.5% (shown in table 2). In another study, the median age of the COVID-19 patients was 56·0 years, ranging from 18 years to 87 years and male patients were predominant (62% [10], and 58.1% [11]) than female patients in other studies.

In this study, 26% of patients were managed in the ICU and 74% of patients were managed in the general ward. Male patients were predominant in both the general ward and the ICU (shown in table 2). ICU admission among all COVID-19 patients was 10% in a

study [5], and among hospitalized COVID-19 patients was 39% in another study [12]. The median hospital stay in the general ward was 14 days and in the ICU was 5 days, in this study (shown in table 2). In one study, the median hospital stay in the intensive care unit was 7 days for non-survivors [13].

In this study, based on the clinical criteria for case management (according to Vitals) 61.4% patients had mild disease, 24.5% patients were in the moderate group, 12.1% patients had severe disease, 2% patients were critical and P value was statistically significant in case of respiratory rate and SpO2 (shown in table 3). In the study of Zhou *et al*., 38% patients were non-severe, 35% patients had severe disease, and 28% patients were critical [10]. Among 355 patients, 36.9% patients had fever, 27.9% had cough, 19.7% had dyspnea and 9% had myalgia in this study (shown in figure 2). Like this study, fever was also the most common clinical complaint reported by hospitalized COVID-19 patients, followed by cough, fatigue and dyspnea, in the study of Dixon *et al*., [4]. In other studies, the most common symptoms were fever, followed by cough and sputum [6-14].

According to clinical presentation, 61% patients had mild illness, 24% patients had pneumonia, 13% patient had severe pneumonia, 0.3% patients had ARDS and 1.4% patients had sepsis, in this study (shown in figure3). In the study of Huang *et al*., of the 41 hospitalized COVID-19 patients, 29% had acute respiratory distress syndrome (ARDS), 15% developed acute cardiac injury, 12% had secondary infection and 100% had pneumonia [12].

Non-survivors of COVID-19 were more likely to have comorbidities [15]. In this study, 241 (69.7%) patients had co-morbidities. The most common comorbidities identified in these patients were diabetes (45.1%), hypertension (41.7%) and cardiovascular disease (14.4%). The less common comorbidities were chronic kidney disease (8.5%), bronchial asthma or COPD (7%), liver disease (0.6%) and malignancy (0.6%) which is shown in figure 1. In the study of Zhou *et al*., comorbidities were present in 48% of COVID-19 patients, with hypertension accounting for 30% of cases, diabetes for 19%, and coronary heart disease for 8% [10]. In another study, the most common comorbidity was hypertension (15.8%), which was followed by cardiovascular and cerebrovascular conditions (11.7%) [14].

In our study, death was 8.7% among them predominant patients were >65 years old (83.8%) and most of them had comorbidities (80.6%) which is shown in table 4. In a study, death rate in the elderly group was 5.56% and in the young and middle-aged group was 5.26% [6]. Up to 2% of patients diagnosed with COVID-19 die from COVID-19-related complications such as acute respiratory disease syndrome (ARDS) [2]. Among the 31 death cases of this study, 22.6% of patients were critical and 77.4% had severe disease based on clinical criteria of case management according to vitals (shown in table 4). Of the non-survivor COVID-19 patients, 78% were critical and 22% had severe disease by Zhou *et al*., [10]. Among the death cases of this study, the more common comorbidities were diabetes mellitus, hypertension and cardiovascular disease; less common were COPD, chronic kidney disease and cancer which is shown in table 4. Compared to COVID-19 patients without diabetes, those with diabetes had a more than two-fold increased risk of developing severe COVID-19 disease and a three-fold increased risk of mortality from the virus [16].

A meta-analysis showed that hypertension raised the risk of severe symptoms of COVID19 by approximately 2 times and the risk of death by approximately 3.5 times, with the effects being slightly stronger in individuals over 50 [17]. In one more study, higher mortality rate (~25% vs. ~15%), severe symptoms (~634% vs. 42%), need for mechanical ventilation (~17% vs. ~8%), and ICU transfer (~23.4% vs. ~12%) were all associated with hypertension in COVID-19 patients [18]. COVID-19 patients with cardiovascular comorbid conditions have poor outcomes [8]. According to a meta-analysis, patients with COVID-19 had a five-fold higher mortality rate from cardiovascular disease [19]. Other studies have also reported comorbidities that frequently increase the risk of mortality in patients, such as lung cancer, chronic myeloid leukemia, and infections with the HIV virus [16].

The elderly people with underlying uncontrolled illnesses such as diabetes, hypertension, lung, liver, kidney disease and cancer patients on chemotherapy are at increased risk of COVID-19 infection and are also at an increased risk of death [5].

CONCLUSION

COVID-19 is a transmittable disease with a variable course. Some patients may have fewer symptom but some may be critically ill. The risk of developing severe COVID-19 infection is higher in patients with a history of HTN, DM, COPD, cardiovascular condition. There are limited numbers of related studies, so further analysis is required.

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