

## Original Research Article

# Risk factors associated with COVID-19 patients in the Northern part of Bangladesh

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## ABSTRACT

**Background:** In several countries, health care delivery is being compromised due to the surge in the number of infected patients during the pandemic.

**Methods:** This was a retrospective COHORT study which was conducted at the department of cardiology at Rangpur medical college hospital, Rangpur, Bangladesh during the period from July 2020 to December 2020. In total, 235 laboratory-confirmed COVID-19 cases were included in the study population. Proper written consent was obtained from the participants before data collection. A pre-designed questionnaire was used in the patient data collection. All data was processed, analyzed and compiled using Microsoft office and statistical package for the social sciences (SPSS) version 22.

**Results:** In this study, in analyzing the risk factors of COVID-19, 10 factors were found to be considerable, which were gender as male, age of  $\geq 65$  years, smoking, two or more comorbidities, diabetes mellitus, hypertension, chronic respiratory disease (CRD), chronic kidney diseases, cardiac diseases and cancer/immunodeficiency. But finally, gender as male, age of  $\geq 65$  years, two or more comorbidities at a time, CRD and cardiac diseases were found as the most potential risk factors for COVID-19 and against those risk factors the p values were found to be 0.023, 0.003, 0.004, 0.005 and 0.032 respectively.

**Conclusions:** In this study, gender was defined as male, age of  $\geq 65$  years, two or more comorbidities at a time and CRD and cardiac diseases were found as the most potential risk factors for COVID-19. To get more reliable information, we would like to recommend conducting more studies in several places with larger samples.

**Keywords:** Risk factors, COVID-19, CRD, Corona, Clinical status

## INTRODUCTION

On 8 March 2020, the first COVID-19 patient was detected in Bangladesh. Until then, the number of COVID-19 patients is being increased. In several countries, health care delivery is being compromised due to the surge in the number of infected patients during a pandemic. This disease is changing its own nature and dimension frequently, forming new hotspots around the globe. Age and gender are well-established risk factors for severe

COVID-19 outcomes; in the United Kingdom (UK), over 90% of COVID-19-related deaths occurred in people over 60, with men accounting for 60%.<sup>1</sup> Various pre-existing conditions have also been associated with increased risk. For example, the Chinese center for disease control and prevention reported in a study of 44,672 individuals (1,023 deaths) that cardiovascular disease, hypertension, diabetes, respiratory disease and cancers were associated with an increased risk of death.<sup>2</sup> However, correction for relationships with age was not possible. A UK cross-sectional survey of 16,749 patients who were hospitalized

with COVID-19 showed that the risk of death was higher for patients with cardiac, pulmonary and kidney disease as well as cancer, dementia and obesity (HRs of 1.19-1.39 after correction for age and sex).<sup>3</sup> Obesity was associated with treatment escalation in a French intensive care COHORT (n=124) and a New York hospital presentation COHORT (n=3,615).<sup>4,5</sup> The risks associated with smoking are unclear.<sup>6</sup> People from black and minority ethnic groups are at increased risk of poor outcomes from COVID-19, for reasons that are unclear.<sup>7</sup> The incubation period of COVID-19 infection is around 5.2 days and the period from the onset of symptoms to death ranges from 6 to 41 days with a median of 14 days.<sup>8</sup> A study conducted in Wuhan, China found that increased age and various comorbidities like hypertension (HTN) and diabetes mellitus (DM) were associated with the severity of COVID-19. But the study did not identify tobacco use and chronic obstructive pulmonary disease (COPD) as the risk factors for COVID-19.<sup>9</sup> Another study conducted in China found that nearly half of the patients had comorbidity where HTN was the most common, followed by DM and coronary heart disease. Another study showed that severe patients were older and had comorbidities including HTN (30.0%), DM (12.1%) and cardiovascular diseases. The median age was 64 years in severe cases and 51.5 years in non-severe cases.<sup>9</sup> The study also established the association between increased age and the death of the COVID-19 patients.<sup>10</sup> The presence of any comorbidity was more common among the severe patients than those having a mild or moderate disease (38.7% versus 21.0%) with a similar exposure history between the two groups of disease severity.<sup>11</sup> One of the leading studies conducted in Wuhan, China, found higher percentages of current and former tobacco users among the patients that needed intensive care unit (ICU) support, mechanical ventilation, or who had died, and a higher prevalence of smoking among the severe cases.<sup>12</sup> A study conducted on the outcomes of the COVID-19 patients found that non-survivors were more often older and men, and they had a higher prevalence of DM, hyperlipidemia and CHDs. The history of current tobacco uses and having COPD was more common among the non-survivors. The main objective of this study was to assess the risk factors associated with COVID-19 patients in the northern part of Bangladesh.

## **Objectives**

### *General objectives*

General objective of the study was to assess the risk factors associated with COVID-19 patients in the northern part of Bangladesh.

### *Specific objectives*

Specific objectives of the study were to collect information regarding the socio-demographic status of COVID-19 patients; to collect information regarding the clinical status of COVID-19 patients; and to collect information

regarding the risk factors associated with COVID-19 patients.

## **METHODS**

This was a retrospective COHORT study which was conducted at the department of cardiology in Rangpur medical college hospital, Rangpur, Bangladesh during the period from July 2020 to December 2020. In total 235 laboratory-confirmed COVID-19 cases attended the mentioned hospital with proper documents were enrolled as the study population. Proper written consents were taken from all the participants before starting data collection. A pre-designed questionnaire was used in patient data collection. Descriptive statistics were used to describe categorical variables that were presented by counts and percentages. In contrast, continuous variables were based on the median and interquartile range (IQR) since the normality test was significant using the Kolmogorov-Smirnov test and the Shapiro-Wilk test. The non-parametric Mann Whitney U-test was used to compare two numerical groups. Categorical variables underwent a test of association using the Chi-square test or Fisher exact test when the number of cases was small. All data were processed, analyzed and disseminated by Microsoft office and statistical package for the social sciences (SPSS) version 22 as per need.

## **RESULTS**

In this study, among 31 critical COVID-19 patient 58% were male and 42% were female whereas among 204 non-critical COVID-19 patient 53% were male and the rest 47% were female. Among critical patients 9.68%, 48.39%, 29.03% and 12.9% were from 1-20, 21-40, 41-60 and >60 years' age groups respectively. On the other hand, among non-critical patients 9.8%, 55.88%, 27.94% and 6.37% were from 1-20, 21-40, 41-60 and >60 years' age groups respectively. According to the occupational status of the participants of both the groups we observed, the highest number of them were farmer and/or household worker which were 71% in critical and 77% in non-critical patient group (Table 1). In critical patient's group, 29% and in non-critical patient's group 22% were smoker in this study. DM was found in 6 (19.35%) critical and 22 (10.78%) non-critical patients, HTN was found in 5 (16.13) critical and 30 (14.71) non-critical patients, CKD was found in 1 (3.23%) critical and 7 (3.43%) non critical patients, CRD were found in 4 (12.9%) critical and 26 (12.75%) non critical patients, cancer/immunodeficiency was found in 2 (6.45%) critical and 9 (4.41%) non critical patients and cardiac diseases were found in 3 (9.68%) critical and 11 (5.39%) non critical patients. Besides these, no co morbidity was found among 58% critical and 37% non-critical patients and two or more co-morbidities were found 26% critical and 12% non-critical patients. As symptoms fever, cough, sore throat, runny nose, headache, GI symptoms and myalgia were found among 29.03%, 83.87%, 74.19%, 67.74%, 32.26%, 12.9% and 22.58% critical patients respectively. On the other hand, those

symptoms were found among 77.45%, 79.9%, 64.22%, 56.86%, 27.94%, 13.73% and 26.47% non-critical patients respectively. In this study we observed the heart rate was  $\geq 100$  among 42% critical and 45% non-critical patients. Besides these, the respiratory rate,  $>24$  breath/min was found among 3.4% critical and 11% non-critical patients. In this study in analyzing the risk factors of COVID-19, 10 factors were found considerable which were gender as

male, age of  $\geq 65$  years, smoking, two or more comorbidities, DM, HTN, CRD, CKD, cardiac diseases and cancer/immunodeficiency (Table 2). But finally, gender as male, age of  $\geq 65$  years, two or more comorbidities at a time, CRD and cardiac diseases were found as the most potential risk factors for COVID-19 and against those risk factors the p values were found as 0.023, 0.003, 0.004, 0.005 and 0.032 respectively (Table 3).

**Table 1: Socio-demographic status of participants (n=235).**

Characteristic	Critical (31)		Non-critical (204)		P value
	N	%	N	%	
<b>Gender distribution</b>					
Male	18	58.06	108	52.94	
Female	13	41.94	96	47.06	
<b>Age distribution</b>					
1-20	3	9.68	20	9.8	0.029
21-40	15	48.39	114	55.88	
41-60	9	29.03	57	27.94	
>60	4	12.9	13	6.37	
<b>Occupational status</b>					
Service holder	7	22.58	32	15.69	0.033
Business	2	6.45	15	7.35	
Farmer and household	22	70.97	157	76.96	

**Table 2: Clinical status of participants (n=235).**

Characteristic	Critical (31)		Non-critical (204)	
	N	%	N	%
<b>Smoking status</b>				
Yes	9	29.03	45	22.06
No	22	70.97	159	77.94
<b>Distribution of comorbidities</b>				
Diabetes mellitus	6	19.35	22	10.78
Hypertension	5	16.13	30	14.71
Chronic kidney disease	1	3.23	7	3.43
Chronic respiratory diseases	4	12.9	26	12.75
Cancer/immunodeficiency	2	6.45	9	4.41
Cardiac diseases	3	9.68	11	5.39
No comorbidity	18	58.06	75	36.76
2 or more comorbidity	8	25.81	25	12.25
<b>Symptoms distribution</b>				
Fever	9	29.03	158	77.45
Cough	26	83.87	163	79.9
Sore throat	23	74.19	131	64.22
Runny nose	21	67.74	116	56.86
Headache	10	32.26	57	27.94
GI symptoms	4	12.9	28	13.73
Myalgia	7	22.58	54	26.47
<b>Heart rate (beats/min)</b>				
<100	18	58.06	113	55.39
$\geq 100$	13	41.94	91	44.61
<b>Respiratory rate (breaths/min) distribution</b>				
$\leq 24$	24	11.8	181	88.73
>24	7	3.4	23	11.28

**Table 3: Risk factors associated with COVID-19 patients (n=235).**

Risk factors	Crude OR (95% CI)	P value	Adjusted OR (95% CI)	P value
<b>Gender (male)</b>	2.11 (1.19-2.96)	0.004	1.98 (1.14-3.17)	0.023
<b>Age (≥65) years</b>	3.19 (1.36-6.77)	0.006	3.12 (1.33-6.42)	0.003
<b>Smoker</b>	0.96 (0.49-1.69)	0.173	0.78 (0.42-1.61)	0.306
<b>Two or more comorbidity</b>	3.32 (1.87-6.02)	0.002	2.64 (1.35-5.57)	0.004
<b>Diabetes mellitus</b>	2.38 (1.32-4.35)	0.005	1.68 (0.98-3.07)	0.513
<b>Hypertension</b>	2.37 (1.31-4.19)	0.006	1.67 (0.87-3.11)	0.331
<b>CRD</b>	2.25 (1.44-4.13)	0.007	2.18 (1.22-3.91)	0.005
<b>Chronic kidney diseases</b>	1.49 (0.31-7.02)	0.076	1.09 (0.26-5.02)	0.497
<b>Cardiac diseases</b>	4.27 (1.55-9.08)	0.003	3.16 (1.27-8.36)	0.032
<b>Cancer/immunodeficiency</b>	3.05 (0.97-7.84)	0.033	2.41 (0.76-7.06)	0.082

## DISCUSSION

The aim of this study was to assess the risk factors associated with COVID-19 patients in the northern part of Bangladesh. Data regarding in-hospital mortality, ICU admission, use of invasive mechanical ventilation, total hospital length of stay, complications and treatment patterns were recorded. Fever was defined as a temperature of 38°C or higher, a high respiratory rate was defined as more than 24 breaths per minute and low oxygen saturation was defined as less than 94%.<sup>13</sup> In parallel with the WHO protocols, COVID-19 was diagnosed based on the results of quantitative reverse transcriptase-polymerase chain reaction (RT-PCR) testing from nasopharyngeal samples.<sup>14</sup> Comorbidities were classified based on the International classification of diseases, revision 10 (ICD-10) diagnostic codes, then we reported any comorbidity, one or more comorbidity and two or more comorbidities.<sup>15</sup> A lymphocyte count of less than 1500 per cubic millimeter was defined as lymphocytopenia.<sup>16</sup> Critical cases were defined as patients with ICU admission or death. Non-critical cases were defined as recovered patients with hospital discharge without ICU admission in accordance with Ministry of Health (MoH) coronavirus disease guidelines.<sup>17</sup> In this current study, in analyzing the risk factors of COVID-19, 10 factors were found to be considerable, which were gender as male, age of ≥65 years, smoking, two or more comorbidities, DM, HTN, CRD, CKD, cardiac diseases and cancer/immunodeficiency. But finally, gender as male, age of ≥65 years, two or more comorbidities at a time, CRD and cardiac diseases were found as the most potential risk factors for COVID-19, and against those risk factors the p values were found to be 0.023, 0.003, 0.004, 0.005 and 0.032 respectively. These findings are consistent with previous evidence that suggested male patients have a higher severity and mortality.<sup>18</sup> Consistent with the literature, cases aged 65 years or older had an increased risk of being admitted to the ICU or dying from COVID-19.<sup>19</sup> The results were also significant in patients >60 years of age, with an increase in risk of 3.65 times (95% CI: 1.19-11.31) in relation to those 1-20 year-old cases. Remarkably, 15.6% of the critical cases were over the age of 60. These findings confirmed the previous evidence

reporting age as a risk factor for poor outcomes.<sup>20</sup> This might be related to comorbidities appearing at an early age in our population.<sup>21</sup> Both DM and HTN were associated with worse outcomes, with a crude OR around 2.38 and 2.37, respectively. This was supported by previous COHORT studies confirming similar findings.<sup>22</sup> The impact of cardiovascular diseases in COVID-19 could be related to the impaired cardiovascular compensatory mechanism or the direct cardiac injury reported to be associated with a higher incidence of worse outcomes.<sup>23</sup> Furthermore, a study conducted in Wuhan, China, found cardiac injuries in almost 20% of their COVID-19 patients and more frequent in cardiac patients with higher mortality.<sup>24</sup> In our study, CRD was a significant factor for ICU admission and mortality as adjusted with an OR of 2.18 (CI: 1.22-3.91) and p=0.005. This was supported by similar findings from a recent observational study carried out in the UK indicating that CRD was a risk factor for in-hospital mortality in COVID-19 patients.<sup>22</sup> All the findings of this study may be helpful in the treatment arena of COVID-19 patients and further similar studies.

## Limitations

This was a single-centered study with a small sample size. So, the findings of this study may not reflect the exact scenario of the whole country. Due to the retrospective nature of this study, we could not reject missing variables, especially in the vital signs and laboratory results. Therefore, no data analysis or interpretation could be withdrawn from all the variables. Radiological studies were not available in the HESN database. This would have an additive value in risk-stratifying patients based on their radiological abnormalities. Many of the laboratory results were not retrieved, including renal function tests, liver function tests, D-dimer, coagulation profile as well as troponin levels.

## CONCLUSION

In this study, gender as male, age of ≥65 years, two or more comorbidities at a time, and CRD and cardiac diseases were found as the most potential risk factors for COVID-

19. Besides some potential findings, in this study, we have some limitations.

### Recommendations

It is recommended that, to get more reliable information, we would like to recommend conducting more studies in several places with larger samples.

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*Ethical approval: The study was approved by the Institutional Ethics Committee*

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