

Post-COVID-19 Complications and Associated Factors among COVID-19 Survivors in Southern Part of Bangladesh

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ABSTRACT

Objective: SARS-CoV-2 infection causes numerous post-COVID (COV) complications among patients after recovery. **Materials and Methods:** This cross-sectional study was conducted at Sher-E-Bangla Medical College (SBMC), Barishal, Bangladesh, on 773 SARS-CoV-2 survivors from February to June 2021. Baseline characteristics, including comorbidity and post-COV complications, were assessed. **Results:** The prevalence of post-COV complications was 22.8% (95% CI: 19.9%–25.9%). Fatigue (18.2%) was the most common complication, followed by shortness of breath (14.6%), cough (11.1%), chest pain (6.5%) and body ache (5.4%). Bronchial asthma (OR = 2.38), diabetes mellitus (OR = 2.07), Business and service (OR = 1.82), Good education (OR = 2.91), and tobacco use (OR = 1.40) were among the significant factors associated with the post-COV complications while hypertension and residence could not produce significant odds of association, though they were associated in the preliminary analysis. **Conclusion:** COVID-19 is associated with many complications involving all systems of the body. Certain comorbidities and demographic factors are associated with post-COV complications. The factors should be addressed in advance if the infection emerges again in the future.

Keywords: COVID-19, COVID-19 survivors, post-COVID complications, SARS-CoV-2.

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1. INTRODUCTION

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), also known as the 2019 novel coronavirus, has caused the coronavirus disease (COVID-19) pandemic with various symptoms such as fever, breathing difficulty, lung infection and kidney failure in humans [1]. The commonly reported longer symptoms are breathlessness, fever, cough, fatigue, headache, runny nose, chest pain, and body ache after the initial infection [2]. Individuals continuing with the post-COVID-19 (post-COV) symptoms increase the risk of long-term health problems and compromised quality of life [3].

Post-COV complications are defined as the persistence of symptoms and/or delayed or long-term symptoms beyond several weeks from the first onset of acute symptoms of COVID-19, which is divided into two categories,

including sub-acute or ongoing symptoms with abnormalities persist from 4–12 weeks beyond COVID-19 infection and chronic or post-COV symptoms with abnormalities persisting or present beyond 12 weeks of the onset of acute COVID-19 [4]–[6]. People recovering from the pathogen of coronavirus after a certain period of time bear the risk of suffering from different continuing symptoms as well as developing complications leading even to death within one year of being infected [7].

Though apparently it seemed to affect the respiratory system, gradually, data emerged about it to affect the heart, gastrointestinal system, kidney, nerve, blood, and immune system [8]–[11]. Because of its novelty, we need to record these complications to have a better idea of the dynamics of the disease as well as the pathogenic affection towards different organs and systems. In addition, we also need to be acquainted with the symptoms persisting

after a considerable period has passed following recovery. The present study highlights the post-COV complications after 6 months of COVID-19 infection in the southern part of Bangladesh to refute the null hypothesis that COVID-19 infection has no relationship with post-COV complications.

2. MATERIALS AND METHODS

We conducted this cross-sectional study in the Microbiology Department of Sher-E-Bangla Medical College (SBMC), Barishal, Bangladesh, from February 2021 to August 2021, on 773 SARS-CoV-2 survivors willing to participate. The microbiology department acts as a center for RT-PCR testing to detect COVID-19 infection in the southern part of Bangladesh, Barishal division, and surrounding areas. We conveniently contacted participants from the records of the RT-PCR laboratory over the telephone after six months of infection. We encountered 3 participants who were dead due to post-COV complications revealed from the telephone call. The Department of Microbiology collaborated with the Department of Community Medicine to conduct this study. We obtained ethical clearance from the Intuitional Review Board of SBMC before commencing the study.

The principal investigator/co-investigators obtained verbal consent before interviewing the respondents using a semi-structured questionnaire. The questionnaire contained two major portions. The basic characteristics of respondents (i.e., age, sex, education, occupation, history of any comorbidity, history of contact with positive cases, and selected personal behavior such as tobacco use and chewing betel nuts) were in the first part. Post-COV complications were in the second portion of the questionnaire, where we recorded the complications and later diagnosed by the clinicians.

We entered the collected data in Microsoft Excel for preliminary assessment of quality control. After cleaning the data, we transferred it to SPSS for final analysis. In SPSS, we ran the frequency to assess the normality of quantitative data. Afterward, we transformed the necessary variables into categories as needed. The quantitative data was presented as mean ± SD, minimum, maximum, and quartiles, while the qualitative data was presented as frequency and percentage.

We categorized the age into <20 years=, 20=, 50=, years= and=>50 years of age group. The educational status was categorized as poor, small, and good education. The students, service holders, cultivators, business people, dependents, and others (retired officials or day laborers) were among the occupation categories. Later, we reclassified the occupation group, putting unemployed with others in one group and business people with service holders into another group, according to the distribution and affection with post-COV complications. The presence of diseases like diabetes mellitus (DM), hypertension (HTN), and bronchial asthma were among the comorbidity variables.²⁰

We constructed a dichotomous variable of our study participants with and without complications as outcome

TABLE I: BASELINE CHARACTERISTICS ASSOCIATED WITH COMPLICATIONS OF POST-COV PATIENTS

Variables	No complication	Complication	p*
Age (years)	38.55 ± 13.77	39.91 ± 11.67	0.23
BMI	24.81 ± 3.32	25.25 ± 3.43	0.18
Age group			
≤20	41 (6.9)	5 (2.8)	0.12
21–50	444 (74.4)	140 (79.5)	
>50	112 (18.8)	31 (17.6)	
Sex			
Female	138 (23.1)	36 (20.5)	0.46
Male	459 (76.9)	140 (79.5)	
Residence			
Barishal	432 (72.4)	143 (81.3)	0.02
Other than Barishal	165 (27.6)	33 (18.8)	
Education			
Poor	60 (14.2)	7 (4.4)	0.001
Small	160 (37.9)	55 (34.8)	
Good	202 (47.9)	96 (60.8)	
Occupation			
Unemployed + Others	328 (54.9)	47 (26.7)	<0.001
Business + Service	269 (45.1)	129 (73.3)	
Contact with COVID-19 positive case			
No	428 (71.7)	118 (67.0)	0.23
Yes	169 (28.3)	58 (33.0)	

Note: Continuous variables expressed as Mean ± SD categorical variables as n (%); independent sample t-test used for continuous variables while χ^2 test used for categorical variables to obtain the p values.

TABLE II: FACTORS ASSOCIATED WITH POST-COV COMPLICATIONS

Variables	No complication	Complication	p
Tobacco use			
No	552 (92.5)	152 (86.4)	0.01
Yes	45 (7.5)	24 (13.6)	
Betel leaf			
No	560 (93.8)	168 (95.5)	0.5
Yes	37 (6.2)	8 (4.5)	
DM			
No	543 (91.0)	133 (75.6)	<0.001
Yes	54 (9.0)	43 (24.4)	
HTN			
No	547 (91.6)	144 (81.8)	<0.001
Yes	50 (8.4)	32 (18.2)	
Bronchial asthma			
No	574 (96.1)	153 (86.9)	<0.001
Yes	23 (3.9)	23 (13.1)	

Note: Continuous variables are expressed as Mean ± SD categorical variables as n (%); independent sample t-test used for continuous variables while χ^2 test used for categorical variables to obtain the p values.

variables from the recorded complications. We ran the univariate and bivariate analysis with different factors and this variable (Tables I and II). Taking the significant variables from these basic analyses, we constructed a multivariable logistic regression model with the odds ratio (OR) and 95% confidence interval (CI) of the OR (Table III).

3. RESULTS

The prevalence of post-COV complications in our study was 22.8% (n = 176, 95% CI: 19.9%–25.9%), leaving the rest 597 with no complications. Out of these complications,

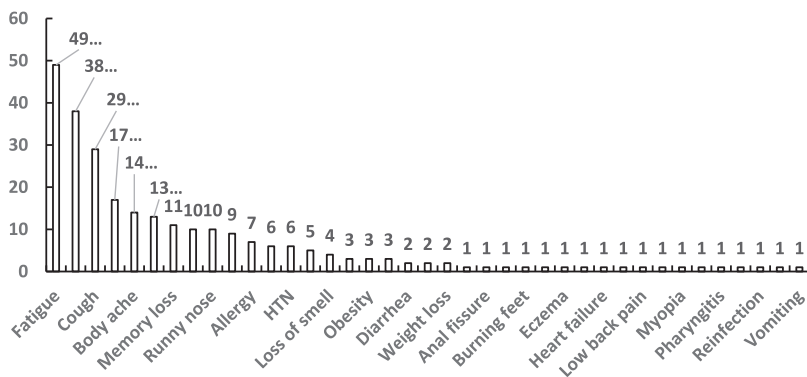


Fig. 1. Frequency distribution of post-COV complications.

TABLE III: LOGISTIC REGRESSION TO ASSESS VARIABLES ASSOCIATED WITH POST-COV COMPLICATIONS

Variables	OR (95% CI)	p
Education (No)	Ref.	
Education (Some)	2.27 (0.95–5.43)	0.07
Education (Good)	2.91 (1.23–6.90)	0.02
Occupation (Business + Service)	1.82 (1.17–2.83)	0.008
District (Barishal)	1.40 (0.78–2.52)	0.26
Tobacco use	1.82 (1.03–3.21)	0.04
Asthma	2.38 (1.22–4.65)	0.01
DM	2.07 (1.20–3.60)	0.009
HTN	1.40 (0.78–2.52)	0.26

78 (10.1%) had a single complication, while the rest, 98 (12.7%) had multiple complications. We recorded a total of 39 complications from the patients. The top ten frequent complications the patients experienced are fatigue (n = 49, 18.7%), shortness of breath (n = 38, 14.6%), cough (n = 29, 11.1%), chest pain (17 6.5%), body ache (n = 14, 5.4%), headache (n = 13, 5.0%), memory loss (n = 11, 4.2%), fever (n = 10, 3.8%), runny nose (n = 10, 3.8%), and joint pain (n = 9, 3.4%). The other complications were allergy, angina, hypertension, diabetes mellitus, loss of smell, insomnia, obesity, mental instability, diarrhea, feeling of paralysis, weight loss, abdominal pain, anal fissure, asthma, burning feet, dehydration, eczema, hair fall, heart failure, kidney damage, low back pain, loneliness, myopia, neurological disorder, pharyngitis, pneumonia, reinfection, urine infection, and vomiting. The complications are depicted in Fig. 1.

Table I shows the basic characteristics of post-COV patients. Though most of the patients were between 21–50 years old, age was not different between patients with and without complications. We encountered the lowest age of 1 year and the highest of 85 years. Patients in Barishal (p = 0.02) had more complications than those from other districts. We found an increasing proportion of complications as the educational level increased (p = 0.001). Business people and service holders suffered more from complications than their counterparts (p < 0.001). Gender, BMI, and contact with COVID-19-positive cases did not have any relationship with complications.

We crosstabulated some behavioral characteristics and comorbidities against complication (Table II). Use of tobacco (p = 0.01) was significantly associated with complications, while betel leaf consumption was not. When

we enquired about the comorbidities, DM (p < 0.001), HTN (p < 0.001), and bronchial Asthma (p < 0.001) were significantly associated with post-COV complications.

We constructed a logistic regression model (Table III) to assess the factors related to post-COV complications. Compared to no education, some education (OR = 2.27) and good education (OR = 2.91) produced significant odds with complications. Business and service holders were 82% more at risk of suffering from complications compared to unemployed and others. Of the behavior, tobacco users also produced significant odds (OR = 1.82, p = 0.04) to be associated with complications. In contrast, they looked at bronchial asthma (OR = 2.38), small education, and DM (OR = 2.07). People who were actively engaged in outside activities (OR = 1.82) also produced significant odds of suffering from complications. HTN failed to produce any significant odds.

4. DISCUSSION

We recorded at least 39 posts of COVID-19 complaints from patients; some continued the symptoms of COVID-19, while some were new and remained for a considerable amount of time after they recovered from the illness. Our study’s five most common sequelae of COVID-19 were fatigue, shortness of breath, cough, chest pain, and body aches. Lopez-Leon *et al.* [12] assimilated 55 long-term effects of COVID-19 in their systematic review. Their study’s five most common symptoms were fatigue, headache, attention disorder, hair loss, and dyspnea. Their findings are fairly similar to ours.

Though we encountered the lowest age of 1 year and the maximum of 85 years, more than half of the patients in our study were between 21–40 years (53%), followed by 41–50 years (21.7%) and 51–60 years (13.6%). In the USA, the distribution of adults aged 35–49 was homogeneous across states, whereas the estimated contributions of young adults aged 20–34 to COVID-19 spread tended to be higher in southern, southwestern, and western regions [13]. Another study showed that the highest number of people (38.7%) with complications were 35 years old and above among 536 cases in Spain [14].

More than three-fourths of the patients were males (n = 773, 77.5%) and significantly had more infection with SARS-CoV-2 than females. In one study, 56% were males among 425 COVID-19 patients [15], and another study of

140 indicated that 50.7% were males [16]. So, we observe a variable gender distribution among different study findings. However, as our sample size is larger than the others, our findings can be more reliable with normal distribution.

Only four (1.1%) SARS-CoV-2 positive cases were identified among 362 specimens with a travel history during the pandemic [17]. In our study, we found 6 (0.8%) positive individuals had contact with foreign returnees, although we could not be sure that all of them were affected by SARS-CoV-2. Close contact with COVID-19 increases the infection rate more rapidly than the other factors. The positivity was encountered as 29.4% of the 773 positive cases were infected by close contact. Avoiding close contact with the suspected people is important to minimize the transmission of coronaviruses within communities.

Post-COV complications depend on numerous types of factors, i.e., comorbidity, consumption of tobacco, or betel leaf. The complications develop as a result of organ or tissue damage, resulting in joint pain, heart failure, urinary infection, gastrointestinal problems, etc. Patients who are diagnosed earlier with diabetes mellitus, hypertension, or bronchial asthma can go through critical conditions because of COVID-19. Our study revealed that 12.5% have a history of diabetes mellitus and 10.6% have hypertension and bronchial asthma, only 6.0% of patients.

The invasion of the COVID-19 virus on the angiotensin-converting enzyme 2 (ACE-2) receptor causes pneumonia and myocardial injuries that persist for a long time in COVID-19 patients [18]. Cardiovascular disorders (0.53%) and respiratory diseases (0.13%) were recorded in our study as such. Most of our study's patients (N = 9, 1.17%) suffered from neurological and orthopedic problems. A small proportion (N = 3, 0.39%) suffered from immune-mediated disorders and gastrointestinal disorders followed by other complaints (N = 4, 0.52%) such as weight loss, hair fall, etc. Research on post-COV neurological complaints reported headache, tastelessness, loss of smell, dizziness, impaired consciousness, and other neurological complications, including cerebrovascular diseases as non-specific COVID-19 infection [19]. Desai *et al.* reviewed diarrhea as a gastrointestinal symptom with a 6% prevalence among the 10 most common complaints; other gastrointestinal symptoms, including vomiting and abdominal pain, possibly attributed to viral replication even after recovery [20].

We cannot attribute any risk factor to causality because of the cross-sectional design of our study. The complications were not assessed clinically, which might compromise the quality of the responses. However, this study was conducted on a relatively big sample of nearly 800 post-COV survivors compared to other studies [21] to give strength to the analysis, hence the reliability of the study.

5. CONCLUSION

Our study indicates that COVID-19 is associated with long-term complications after recovery. Risky behaviors like tobacco consumption should be avoided in all circumstances. Comorbidities like DM and bronchial asthma should be managed cautiously. We need a long follow-up

of the post-COV patients to find out the duration of post-COV complications through surveillance and notification.

AUTHOR CONTRIBUTIONS

AK and SB designed the study; AK, JF, FF, IK, and ST collected and entered the data; SB imported and analyzed the data; JF and SB wrote the initial manuscript. All the authors read and reviewed the manuscript and finalized the draft.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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