



The Effects of Preexisting Health Conditions and Vaccination on the COVID-19 Complications

Nasrin Akter^a, Md. Mejbah Uddin Mithu^b, Md. Ripon Hossain^c, Rakibul Hasan^d, Md. Shahinur Karim^e, Hoymonti Shukla^f, Mahfuza Mubarak^g, Hasi Rani Saha^h, Bidhan Chandra Sarkarⁱ, Md. Shahinul Islam^{j*}

^{a,c,d,e,f,h,i,j}Department of Biochemistry & Molecular Biology, Primeasia University, Dhaka, Bangladesh

^{b,g}Department of Public Health & Informatics, Jahangirnagar University, Savar, Dhaka, Bangladesh

^{s,j}4-Green Research Society, Savar, Dhaka, Bangladesh

^aEmail: naimunanasrin@gmail.com, ^bEmail: mejbahuddin4262@gmail.com, ^cEmail: kmripon197@gmail.com,

^dEmail: gazirakibul03@gmail.com, ^eEmail: Hridoy8494@gmail.com, ^fEmail: shuklahoymonti@gmail.com,

^gEmail: mahfuzakbsi@gmail.com, ^hEmail: hasirani85@gmail.com, ⁱEmail: bidhan.sarkar@primeasia.edu.bd,

^jEmail: shahinul.islam@primeasia.edu.bd

Abstract

In recent years, the coronavirus pandemic disease has been more fatal in the world. The presence of several comorbidities, particularly asthma, cardiovascular problems, diabetes, and kidney disease, has been linked to a worse prognosis of COVID-19 infection. This paper examined the progression of the disease, significant health risks, effects of vaccination and COVID-19 complications rates among people with comorbidities. A cross-sectional study has been conducted with direct interviews of 1002 patients in different parts of Bangladesh following a well-organized questionnaire. This study clearly shows that pre-existing health problems are extremely high-risk factors for long-term major health complications such as shortness of breath, hypertension, loss of taste and appetite, mental depression, dementia, uncontrolled blood pressure, and sugar levels during and after recovery from COVID-19 infection.

* Corresponding author.

Among them, almost 70% of asthma and cardiovascular disease patients were suffering from severe health complications, including shortness of breath, hypertension, and mental health problems, after getting the COVID-19 infection. Moreover, it also revealed that vaccination can significantly reduce the severity of COVID complications up to 50% compared to unvaccinated people. The overall finding of this study can be useful for the prediction of possible ways to avoid the life-threatening risk of COVID-19 infection for people who are already suffering from various preexisting health problems.

Keywords: Preexisting health problem; COVID-19 complications; Comorbidities; Vaccination; Long-COVID.

1. Introduction

Over 180 nations have been affected by COVID-19 which is causing by the severe acute respiratory syndrome Coronavirus 2 (SARS-COV-2) [1]. COVID-19 is an extremely contagious disease which certainly become the biggest challenge to global health today [1,2]. COVID-19 infection was first reported in Wuhan China and spread quickly all over the world. Now it's turned into an unprecedented global pandemic [3-6]. According to Johns Hopkins University (JHU) by the end of August 2022 total of 607 million cases and 6.51 million deaths have been recorded around the world [7]. In Bangladesh, total case 2.01 million and total death was 29329 people until August 2022, after the first case of COVID-19 was confirmed on 8th March 2020 [8]. Anyone can be infected by breathing in the virus if he/she is near someone who has COVID-19, or by touching a contaminated surface and then eyes, nose, or mouth. The risk of spreading this virus more indoors and in crowded settings [9].

COVID-19 affects different people in different ways. In most cases, the infected person suffers from mild to moderate illness, and hospitalization is required on the basis of their health condition and severity of symptoms [10]. The most commonly reported symptoms of COVID-19 infection include fever, headache, shortness of breath, cough, fatigue, loss of smell, muscular pain, and joint pain [11–14]. The COVID-19 virus not only affects the respiratory tract, but also other organs in the human body, including the liver, lungs, kidney, heart vessels, and other organs [15]. The most common complications of severe COVID-19 infection are acute respiratory distress syndrome (ARDS) and respiratory failure [15-17]. The probable risk factors for developing serious illness may be old age and people living with preexisting health problems (comorbidities) like diabetes, chronic respiratory disease, cardiovascular disease, or cancer [18]. COVID-19 outpatient requires several weeks to completely recover from disease manifestation. Approximately one third of patients do not return to their usual state of health until approximately two to three weeks after diagnosis [19].

Several studies have been found that patients with preexisting health problems like diabetes, chronic obstructive pulmonary disease, cardiovascular diseases, hypertension, and other comorbidities are the most susceptible to COVID-19 life-threatening situations [20, 21]. Independent of respondents' age, gender, living situation, smoking status, exercise, alcohol intake, and nutrition, pre-existing conditions and poor subjective health status were linked to a higher risk for moderate-to-severe health problems and post-traumatic stress symptoms. It was also found strong associated between hospitalization and preexisting health conditions [22, 23]. An epidemiological study in Bangladesh found that the recovered individuals experienced some short-term

outcomes, including pains and aches (31.8%), anxiety or depression (23.1%), and weakened attention span (24.4%) [24, 25]. On the other hand, subclinical lung abnormalities may be associated with asymptomatic COVID-19 patients as identified by a CT-scan [26]. Research on COVID-19 patients in the Eastern Province of Saudi Arabia demonstrated that abnormal chest radiographs were in 15.5% of asymptomatic and 46% of symptomatic patients [27]. The difference in comorbidities and COVID-19 complications between symptomatic and asymptomatic COVID-19 cases in Bangladesh remains a mystery. Therefore, it is of utmost importance to identify the population group that is more susceptible to the development of COVID-19's negative effects in order to prevent the deterioration of mild and moderate illnesses to severe ones and mortality.

Several studies found persistence of some symptoms for a long time over 12 weeks for patients who had comorbid physical conditions before the COVID-19 infection. This type of situation is termed as a post-COVID-19 condition, post-acute COVID-19 syndrome, or long COVID. It is a condition characterized by several symptoms in everyday life, such as fatigue, shortness of breath, sleeping disturbances, cognitive dysfunction, and so on. Symptoms usually continue over 3 months from the onset of acute COVID-19 symptoms, and cannot be explained by an alternative diagnosis. Several studies revealed that preexisting health conditions played a key role in hospitalization risk in COVID-19 patients for a long time [28, 29].

In this cross-sectional study, we investigated the possible risk of the severity of COVID-19 complications by conducting systematic studies of some pre-existing diseases in some COVID-19 infected people after a direct interview with a well-designed questioner. Furthermore, we are aiming to find out the negative impact of some selected comorbidities like asthma, cardiovascular disease, diabetes, and kidney problems on the progression of the COVID-19 disease complications. Beyond this, the role of vaccination in the prevention and remediation of COVID-19 complications will also be addressed in this study. Individuals with comorbidities should take all necessary steps to avoid COVID infection and associated mortality. A global public health effort is required to increase awareness about minimizing the burden of these comorbidities that cause fatalities in COVID-19 patients.

2. Methods and Measure

2.1. Selection of Participants and Sample Collection

The cross-sectional study was carried out from July, 2021 to May, 2022. The patients diagnosed with COVID-19 infection by Reverse Transcription-Polymerase Chain Reaction (RT-PCR) assay was selected for this study. Patients who were tested negative after two consecutive RT-PCR tests at least at a gap of 24 hours were considered for studying COVID-19 complications in individuals. Only the patient who took vaccine prior to 30 days of COVID-19 infection was considered as Vaccinated. Patients who did not give their consent during the interview were excluded from this study. Following evaluation of a total of 1134 of different age between 18 to 70 years and gender (both male and female) were selected. Finally, a total of 1002 data was used for final analysis after removing incomplete responses.

2.2. Independent and Dependent Variables

In this study, among the various socio-demographic characteristics such as age, sex, occupation, education etc, only some selected preexisting health problems (comorbidities) such as asthma, heart disease, cardiovascular disease and diabetes were considered as independent variables and explored their influential dependent variables by direct interview.

The independent variables of this work were some factors those have direct influence on the choosing of dependent variables. Some of the important variables such as days to become COVID-19, shortness of breath, loss of smell, fever etc were used to demonstrate their association with the comorbidities of the patients. Moreover, some other variables vaccination status, follow-up time, COVID-19 symptoms like, fever, cough, hypertension, uncontrol diabetes and mental health status were used for determining their significance relation with the persistence of COVID-19 complications up to four months.

2.3. Ethical Consideration

An ethical approval was obtained from the ethics committee at Primeasia university, Dhaka, (Reference: PAU/IEAC/22/13) for this study. This study was conducted among the COVID-19 infected patients confirmed by the various COVID-19 dedicated hospitals in Bangladesh. Written permission was taken from the authority of the hospital. Verbal consent was taken from the patients at the beginning of the interview. The results of this research were used only in scientific purpose and not in any other aims, and the confidentiality was strictly maintained.

2.4. Statistical Analysis

After collection, raw data were processed and sorted out by Microsoft Excel 2020 before their formal analysis. Then data were analyzed using the Statistical Package for Social Science (SPSS) version 26. Descriptive statistics (i.e., percentage, frequency, mean etc) and inferential statistics (i.e., p-value) were executed in the study. A Chi-square test was used to evaluate the relations between dependent and independent variables. A p-value of <0.05 was set as statistically significant.

3. Results

3.1. Socio-demographic Characteristic of the Participants

In this study, total 1002 patient's information were collected and analyzed using a structured questionnaire-based interview. Before that some basic information of the study populations were recorded from four COVID-19 dedicated hospitals those are operated in four different division of Bangladesh. As shown in Table1, the total number of populations was (n) 1002, among them, percentage of male and female were almost similar (51% and 49% respectively). Selected age group populations were below 20 to around 70 years with 23.5% was 30~39 years old. Significantly, maximum 34% patients age range was 50~60+ years old. In case of education, 51% were graduated and only 3.9% was school going children. Furthermore, 31% businessmen, 15% student, 6.0% house wife and same percentage of day labor were infected by COVID-19. Majority 67.0% people was with normal body weight (in terms of BMI) and only 6% was obese patients. Over one-third (78%) of the people are

living in city corporation and district town area in Bangladesh. According to the calculation, 67% patients belong to different age group are healthy, whereas only 5% is underweight and about 28% is overweight-obese. Comparative BMI values among the male and female shows similar distribution pattern. Importantly, 36.0% of the patients had no preexisting health problems; otherwise, the rest of the 64% of COVID-19 patients were suffering from either asthma (14%), kidney problems (9.0%), diabetes (20.0%), or cardiovascular diseases (22.0%). In here, among the above-mentioned sociodemographic characteristics, only preexisting health problems (comorbidities) as well as impact of vaccination on the complications of COVID-19 infection will be discussed.

Table 1: Distribution of the sociodemographic variables of the respondents.

Variables		Frequency	Percentage (%)
Gender	Male	511	51.0
	Female	491	49.0
Age	Below 20	67	6.7
	20-29	207	20.6
	30-39	236	23.5
	40-49	155	15.4
	50-59	159	15.8
	60+	180	17.9
Educational status	No schooling	40	3.9
	Primary	77	7.7
	SSC	166	16.5
	HSC	170	17.0
	Bachelor	343	34.2
	Masters & above	208	20.7
Occupation	Unemployed	186	18.6
	Student	152	15.3
	Employee	224	22.3
	Day Labor	64	6.4
	House wife	61	6.1
	Businessman	315	31.5
Residence	City/town	781	77.8
	Urban	223	22.2
Vaccination status	Unvaccinated	662	66
	Vaccinated	340	34
BMI	Underweight	49	4.9
	Normal	669	66.8
	Overweight	222	22.2
	Obese	62	6.2
Pre-existing health problems	No problem	356	36.0
	Diabetes	199	20.0
	Cardiovascular problems	217	22.0
	Kidney Problems	88	9.0%
	Asthma	142	14.0%

3.2. Preexisting Health Problems and Days to Become COVID-19 Negative

Table 2 shows that, time required to become COVID-19 negative has noticeable relation with preexisting health problems. Majority percent (62%) COVID-19 patient with no preexisting health issue, obtained negative results of COVID-19 RT-PCR test less than 14 days ($p \leq 0.001$). On the other hand, after infection, more than 14 days were required for confirming the COVID-19 negative for the patient those were suffering from some comorbidity problems like diabetes (62%, $p = 0.011$), cardiovascular disease (56%, $p = 0.013$), kidney problem (33%, $p = 0.024$) and asthma (66%, $p = 0.016$) before COVID-19 infection. Preexisting cardiovascular and diabetes patients reported a significantly higher tendency to make more delay (>14 days) to be COVID-19 negative than asthma and kidney patients ($p = 0.016$ and 0.240) respectively. It was clear from these results that, preexisting health problem was directly affecting on the time (days) to be free from COVID-19 infections.

Table 2: Association between the days to become COVID-19 negative and patient with various pre-existing health problems.

Preexisting health problems		Days to become COVID-19 Negative		P-Value [Yes vs No]
		>14 days	≤14 days	
Problem before covid infection	Yes =646[64%]	248[38.4%]	398[61.6%]	0.000
	No =356[36%]	216[60.7%]	140[39.3%]	
Diabetes	Yes=199[20%]	124[62.0%]	75[38.0%]	0.011
	No=803[80%]	469[58.4%]	334[41.6%]	
Cardiovascular problems	Yes=217[22%]	95[56.0%]	122[44.0%]	0.013
	No=785[78%]	334 [43.0%]	451[57.0%]	
Kidney Problems	Yes=88[9%]	29[33.0%]	59[67.0%]	0.024
	No=914[91%]	521[57.0%]	393[43.0%]	
Asthma	Yes=142[14%]	94[66.0%]	48[34.0%]	0.016
	No=860[86%]	373[43.4%]	487[56.6%]	

3.3. Severity of COVID-19 Complications with Various Preexisting Health Problems

As demonstrates in Table 3, about 83% of the COVID-19 patient those who got some comorbid problems was suffering from fever and cough. Therefore, after infection, symptoms and severity of COVID-19 infection also were dependent on their current health conditions. Some preexisting issues like asthma (78%, $p \leq 0.001$) and kidney problem (61%, $p \leq 0.001$) shows significant interaction with fever and cough, whereas it was not dependent on the preexisting diabetes ($p = 0.480$) and cardiovascular disease ($p = 0.059$) of COVID-19 patient (Table 3). In addition, loss of taste and smell was significance interaction with some comorbid conditions like diabetes ($p \leq 0.000$), kidney disease ($p \leq 0.000$). Maximum 81% diabetes patient was lost their taste and smell after becoming COVID-19 positive. However, loss of taste was not dependent on the cardiovascular diseases ($p = 0.062$). After COVID infection, overall, 63% patient was lost their taste and smell function because of

preexisting health problem.

Table 3: Significant relationship between the fever-cough and loss of taste-smell with patients pre-existing health problems.

Preexisting health problems and COVID-19 complications		Fever and Cough			Loss of taste and smell		
		{Yes} (n%)	{No} (n%)	P-Value [Yes vs No]	{Yes} (n%)	{No} (n%)	P-Value [Yes vs No]
Problem before COVID-19 infection	Yes =646[64%]	549 [83.6%]	58 [16.7%]	0.000	340 [52.6%]	306 [47.4%]	0.021
	No =356[36%]	108 [16.4%]	588 [89.5%]		69 [19.5%]	588 [80.5%]	
Diabetes	Yes=199[20%]	32 [20.5%]	128 [79.5%]	0.482	232 [82.0%]	28 [18.0%]	0.000
	No=803[80%]	132 [15.8%]	710 [84.2%]		66 [7.8%]	638 [92.2%]	
Cardiovascular problems	Yes=217[22%]	24 [11.1%]	193 [88.9%]	0.059	217 [22%]	46 [67.6%]	0.062
	No=785[78%]	164 [16.6%]	820[83.4%]		91 [9.2%]	893 [90.8%]	
Kidney Problems	Yes=88[9%]	54 [61.3%]	34 [38.7%]	0.001	58 [66.0%]	30 [34.0%]	0.000
	No=914[91%]	162 [16.6%]	813[83.4%]		94 [10.0%]	820 [90.0%]	
Asthma	Yes=142[14%]	84 [78.5%]	23 [21.5%]	0.000	15 [14.0%]	92 [86.0%]	0.038
	No=860[86%]	143 [15.9%]	752 [84.1%]		80 [8.9%]	815 [91.1%]	

Table 4 exhibits that, shortness of breath is strongly associate with the preexisting health problems for all cases ($p < 0.001$). Statistically, patients with diabetes 55%, cardiovascular disease 68%, kidney problem 59% and for asthma maximum 79% was suffering from shortness of breath after COVID-19 infection.

In addition, some mental health problems like sleeping disorder, mental stress, depression and dementia are dependent on the preexisting health problem ($p \leq 0.000$) for all cases as stated in Table 4. Along with the physical suffering, almost 70% of the COVID-19 patient with comorbid problem were suffering from various mental problem, or stress. Moreover, maximum severity of breath and asthma problem reported for asthma as it was 78% and 67% respectively.

Table 4: Significant relationship between the shortness of breath and patient with various pre-existing health problems.

Preexisting health problems and COVID-19 complications		Shortness of breath			*Mental health problems		
		{Yes} (n%)	{No} (n%)	P-Value [Yes vs No]	{Yes} (n%)	{No} (n%)	P-Value [Yes vs No]
Problem before covid infection	Yes =646[64%]	549 [83.6%]	58 [16.7%]	0.000	449 [69.5%]	197 [29.5%]	0.000
	No =356[36%]	108 [16.4%]	588 [89.5%]		108 [16.4%]	588 [89.5%]	
Diabetes	Yes=199[20%]	109 [54.8%]	90 [45.2%]	0.000	123 [61.8%]	76 [37.2%]	0.000
	No=803[80%]	230 [28.6%]	573 [71.4%]		204 [24.3%]	638 [75.7%]	
Cardiovascular problems	Yes=217[22%]	46 [67.6%]	22 [32.4%]	0.000	128 [59.0%]	89 [41.0%]	0.000
	No=785[78%]	292 [31.3%]	640 [68.7%]		232 [23.5%]	752 [76.5%]	
Kidney Problems	Yes=88[9%]	52 [59.0%]	36 [41.0%]	0.000	55 [62.5%]	30 [37.5%]	0.001
	No=914[91%]	317 [36.0%]	657 [64.0%]		237 [24.3%]	738 [75.7%]	
Asthma	Yes=142[14%]	112 [79.3%]	29 [20.7%]	0.000	69 [64.5%]	38 [35.5%]	0.000
	No=860[86%]	255 [29.7%]	605 [70.3%]		202 [22.5%]	695 [77.5%]	

*In this study sleeping disturbances, depression, anxiety, dementia have been considered as the

“Mental Health Problem”.

3.4. Prevalence of COVID-19 Complications Based on the Vaccination Status.

Table 5: Comparative prevalence of COVID-19 complications of patients with various pre-existing health problems based on the vaccination status.

Symptoms	^a Asthma: Vaccination and complication (%)		^b CVD: Vaccination and complication (%)		^c Diabetes: Vaccination and complication (%)		^d Kidney problem: Vaccination and complication (%)	
	Disease status	(Vacc./Unvacc.)	Disease status	(Vacc./Unvacc.)	Disease status	(Vacc./Unvacc.)	Disease status	(Vacc./Unvacc.)
Fever	Asthma	28.0/40.0	CVD	41.2/54.5	Diabetes	50.0/78.8	Kidney disorder	26.0/41.0
	Noasthma	21.2/34.5	No CVD	21.2/34.5	No diabetes	21.2/34.5	No kidney disorder	18.2/32.0
Cough	Asthma	30.7/72.2	CVD	33.9/52.0	Diabetes	36.1/75.0	Kidney disorder	40.0/58.7
	Noasthma	47.8/52.5	No CVD	47.8/52.5	No diabetes	47.8/52.5	No kidney disorder	41.8/52.5
Loss of taste and smell	Asthma	47.1/60.0	CVD	41.0/57.6	Diabetes	51.3/74.9	Kidney disorder	46.7/58.9
	Noasthma	31.9/45.4	No CVD	31.9/45.4	No diabetes	31.9/45.4	No kidney disorder	31.9/45.4
Shortness of breath	Asthma	54.0/79.9	CVD	46.4/68.0	Diabetes	48.0/62.9	Kidney disorder	49.7/68.3
	Noasthma	42.4/51.5	No CVD	42.4/51.5	No diabetes	42.4/51.5	No kidney disorder	42.4/51.5
Mental problem	Asthma	51.4/63.0	CVD	55.0/69.0	Diabetes	31.0/54.0	Kidney disorder	33.0/56.0
	Noasthma	38.2/50.3	No CVD	38.2/50.3	No diabetes	38.2/50.3	No kidney disorder	38.2/50.3
Hypertension and palpitation	Asthma	47.1/62.6	CVD	60.0/84.6	Diabetes	63.9/81.6	Kidney disorder	52.9/69.0
	Noasthma	32.9/39.1	No CVD	32.9/39.1	No diabetes	32.9/39.1	No kidney disorder	32.9/39.1
Uncontrol Diabetes	Asthma	54.3/76.9	CVD	52.0/65.4	Diabetes	57.2/93.3	Kidney disorder	48.0/83.0
	Noasthma	30.8/43.6	No CVD	38.8/52.0	No diabetes	31.8/50.0	No kidney disorder	36.8/53.6

To evaluate the role of vaccination on the prevention, or remediation of physical and mental complications for COVID-19 patients, all the suffering complications were recorded and summarized in Table 5. It was found that, nearly 90% unvaccinated and over 70% of vaccinated people with pre-existing asthma problem was suffering from cough, breathing problem and uncontrol blood sugar as well. These complications were higher than any other problems like fever, loss of taste etc (Table 5). Compare to the nonvaccinated asthma patients, percentage of post COVID-19 complications for vaccinated patients were significantly low. Within 3 to 4 months, these values were decreased at 3~6%. At the same period, 21% and 18% of the nonvaccinated asthma were suffering from cough, shortness of breath as well as loss of taste respectively.

*Here, **CVDs** stands for Cardiovascular problems, **No CVDs** for No cardiovascular problems. ^a[Asthma (n)= 142; Noasthma =346, Vaccinated = 79, unvaccinated = 63]. ^b[CVDs (n)= 217; No CVDs =346, Vaccinated = 119, Unvaccinated = 98]. ^c[Diabetes (n)= 199; No diabetes=346, Vaccinated = 102, Unvaccinated = 97]. ^d[Kidney disorder (n) = 88; No kidney disorder =346, Vaccinated= 40, Unvaccinated = 48].

The results also show that, initially, over 80% of unvaccinated COVID-19 patients with preexisting cardiovascular problems (CPs) seriously suffered from shortness of breath, chest pain, palpitation, as well as irregular blood pressure (p 0.001). Vaccination reduces these complications by about 15% to 20%, remarkably (Table 5).

Moreover, preexisting diabetes may lead to the development of uncontrolled sugar levels by up to 93%, and hypertension by about 81% for unvaccinated COVID-19 patients. In the case of vaccination, this percentage is reduced to almost 40% to 50 % (Table 5). In addition, uncontrolled blood pressure, fatigue, and mental disorder symptoms were observed for over 60% of unvaccinated patients, whereas in the case of vaccinated people, this value was reduced by about 35% (Table 5). Furthermore, unvaccinated kidney patients had significantly higher rates of complications such as hypertension (69%), diabetes (83%), and cough (58%), compared to people without kidney disease (48%, 53%, and 43%, respectively). Compared to the vaccinated patient with no kidney problem, the percentage of the above-mentioned complications in nonvaccinated people was very high at 36%, 48%, and 32%, respectively.

4. Discussion

The presence of several comorbidities has been associated with a worse prognosis, especially with asthma, cardiovascular problems, diabetes, and kidney disease being a critical risk factor. As shown in the results section, the prevalence rate of COVID-19 complications like fever-cough, loss of taste-smell, shortness of breath, mental health problems etc. among the patients with comorbidities was about double compared to the people without any preexisting health problems. Among these preexisting health problems, after COVID infection, 70% to 80% of asthma patients were suffering more than any other patients. This finding can be explained because of pulmonary viral infections causing fluid to fill up in the air sacs of the lungs as well as viral infection induced exacerbations of previous asthma, which is known as' postviral hypereactive airways [30].

Another group of people at high risk were patients with preexisting cardiovascular problems. As the coronavirus causes fluid to fill up the air sacs in the lungs, an insufficient amount of oxygen can reach the bloodstream. Therefore, the heart needs to work harder to pump blood through the body, which can be dangerous in people with preexisting cardiovascular problems [31, 32]. As a result, coughing, shortness of breath, hypertension, irregular blood pressure, and palpitation were extremely common and severe in patients with asthma and heart disease.

Several studies have suggested that respiratory viral infections can raise blood sugar levels and cause diabetes during and after COVID-19 infection [33]. In addition, use of steroid drugs for the treatment of severe COVID-19 patients can cause elevated insulin resistance [34, 35]. Therefore, preexisting diabetics are a risk factor for the severity of COVID-19 complications as well as the permanent development of diabetes and comorbidities. Many patients with severe COVID-19 infection have uncontrolled blood sugar levels and hypertension. Both of these physical complications increase the creatinine level and develop kidney disease [36].

Vaccination markedly reduced the post-COVID complications, as described in the results section. The statistical analysis reveals that vaccination decreased COVID symptoms from 40% to 50% in some special cases like shortness of breath, hospitalization, cardiovascular problems, and physical and mental weakness. The development of immunity in the human body against the COVID virus was the main reason for obtaining success. More research and advancement are necessary to boost the body's disease system permanently against this lethal virus [37]. Finally, this study, for the first time in Bangladesh, assessed (i) the prevalence rates of complications of COVID-19 infection in patients with preexisting health issues (comorbidities), and (ii) the role of vaccination in the reduction of severity of COVID-19 symptoms (iii) monitoring of the persistence of complications on the basis of the vaccination status of Bangladeshi people.

5. Limitations of this study

It is worth mentioning that this study's findings can be limited because of its nature being cross-sectional, where causality can be inferred. As a result, more information on some other factors, such as a comparative study on the impact of single, double, and triple doses of vaccine on COVID-19 complications, is needed. Another limitation was that sociodemographic parameters like occupation, age, education, living status, etc, were not addressed in this study. Further study will be necessary to cover the rest of the actors in detail.

6. Conclusion

It has been found that patients with COVID-19 infection who have comorbidities, such as hypertension, diabetes mellitus, cardiovascular disease, lung disease are more likely to get a more serious illness. Because of the infection and damage of some organs by coronavirus such as lung, kidney, heart, patients with comorbidities have the most exceedingly bad prognosis, they should to take all vital precautions to protect from getting infected with COVID-19. 70% to 80% of the comorbid people especially preexisting asthma, CDV and diabetes patients suffer severely after COVID infection. This study found that, vaccination can reduce 30% to 40% of COVID-19 complications for instance shortness of breath, recovery time, sleeping disorder, mental depression,

physical weakness as well as heart problems compares to the unvaccinated patients. Furthermore, a significant population in the post-COVID-19 state needs continuous monitoring for the future. Individuals with comorbidities should take all necessary steps to avoid COVID infection and associated mortality. Global public health effort is required to increase awareness about minimizing the burden of these comorbidities that cause fatalities in COVID-19 patients. Additionally, a well-designed study can identify more depth association among vaccination and post COVID-19 complications.

7. Conflict of interest

The authors of the research work do not have any conflict of interest.

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