ASSOCIATION BETWEEN COVID -19 VACCINATION AND SEVERITY AMONG THE COVID 19 PATIENTS IN URBAN BANGLADESH

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Abstract

The novel coronavirus that causes COVID-19 can be transmitted through human-to-human contact or indirectly with contaminated objects. On March 7, 2020, Bangladesh reported the first COVID-19 case. This study aimed to determine the prevalence of vaccination and its association with COVID -19 severity among the COVID 19 patients in urban Bangladesh. The study used the cross-sectional survey by collecting data randomly selected COVID-19 four dedicated hospitals (Both Government and Non-Government) of Dhaka city using a multistage stratified sampling method. In regression analysis we found significant association between vaccination and COVID-19 severity level p value < 0.01 and recovery time (p=0.019) but no significant association between vaccination and age (p=0.296). In the result of ROC curve, we found severity, recovery time and occupation significantly associated with COVID-19 vaccination. The study revealed that approximately 25% of the patients in the trial had a moderate COVID-19 infection. Also, the majority of patients who received vaccinations recovered in less than 14 days.

Keywords: *COVID-19, Sociodemographic, Vaccination, Severity, Recovery Time*

Introduction

The novel coronavirus that causes COVID-19 can spread either directly or indirectly through contact with contaminated objects or other people (Chen et al., 2020). Fever, dry coughing, vomiting, diarrhea, nausea, and fatigue are some of the symptoms that might cause serious issues like breathing, speaking, moving, and chest pain (Chen et al., 2020; Ali et al., 2020). On January 30, 2020, the World Health Organization (WHO) categorized COVID-19 as a global public health concern. On March 11, 2020, the virus was reclassified as a pandemic (Ferdous et al., 2020). From Wuhan, China, COVID-19 has quickly and widely spread to other regions of the world, endangering the lives of numerous individuals (WHO, 2020a). After rising for almost two months (since mid-June), the number of new cases reported globally from August 23–29, 2021, was just under 4.4 million. This is comparable to the previous weeks' reports (WHO, 2021a).

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On March 7, 2020, Bangladesh announced the confirmation of the first COVID-19 case on its soil. At that time, the government of Bangladesh took drastic non-therapeutic measures to stop the spread of illness. The government closed all malls and stores save for pharmacies and food stores, stopped all incoming and outgoing airplanes, and closed all educational institutions. A recent outbreak can be contained in three months with very successful contact tracing and case isolation, according to a new Lancet article (Perera *et al*., 2020). The success or failure of the unprecedented governmental measures taken to contain the outbreak primarily depends on public behavior (Bignardi *et al*., 2021). In complex situations, the WHO advised symptomatic therapy and advised seeking urgent care via the established COVID-19 care pathway. Patients at Bangladeshi hospitals were given antipyretic medications to reduce fever, analgesics to ease discomfort, oxygen to treat respiratory distress, and saline to stay well hydrated. There was no advantage to patients' reduced morbidity and death, according to the study (Bignardi *et al*., 2021). WHO has approved several vaccines for use in the human body, though some vested quarters are spreading vague messages about the vaccines. Vaccine elicits broad immune response; therefore, the vaccine will not be utterly ineffective in case of a change or mutations in the virus (WHO, 2021b). There are safe and efficient vaccines that offer robust defense against COVID-19-related significant disease, hospitalization, and death. The COVID-19 vaccine has been administered to billions of people. One of the most crucial things you can do to protect yourself and your loved ones from COVID-19, stop the pandemic, and prevent the emergence of new variants is to be vaccinated. Furthermore, data indicates that those who have received the Covid-19 immunization exhibit fewer symptoms than those who have not (CDC, 2021). Nearly a billion people in lower-income nations are still unvaccinated as of May 22, 2022. Just 57 nations—nearly all of them wealthy nations—have 70% of their people immunized (WHO, 2022). This study aimed to determine the prevalence of COVID -19 vaccination and its association with severity among the COVID 19 patients in urban Bangladesh.

Methodology

Study Design and settings

The study used the cross-sectional survey to assess the prevalence of vaccination and its association with COVID-19 patients in urban Bangladesh. The data were collected from both hospital and community settings during May – August 2021. Information on COVID-19 patients was collected from the randomly selected four COVID-19 dedicated hospitals (Both Government and Non-Government) of Dhaka city. The selected Government Hospitals were: 1) Dhaka Medical College Hospital 2) Magda Medical College Hospital 3) Shaheed Suhrawardy Medical College Hospital 4) Kurmitola General Hospital. In addition, to obtain the samples from the community/wards, we randomly selected 8 wards from Dhaka city. They were: Wards 6, 13, 29, 51 from South City Corporation and wards 19, 23, 34, 53 form North City Corporations.

Study Population

Patients above 18 years of age irrespective of sex, religion, ethnicity, and level of education, occupation were selected for interview. COVID-19 positive patients who received treatment either at home or in the hospitals were the study population. However, the study excluded those patients who were severely infected and hospitalized, and the patients attending the selected hospitals from other cities.

Sample Size Estimation

In this study, sample size determination depended on the target parameter, i.e., percentage of the study population that includes COVID positive cases those received treatment either at home or in the hospitals. There is a lack of information on this issue. We decided to use the target proportion as 50% since it maximizes the distribution, and we do not know any information about the parameter.

Sample size was calculated by the following formula –

$n = \frac{z^2 pq}{d^2}$ Where, n = desired size; z = 1.96 (95% confidence interval)

p = Population proportion (Considering 50% people are being infected), and

q = 1 - p; d = precision level (4%) and adjusting 10.0% non-response. By considering all those parameters, the study sample size is 659.

Sampling process

A multistage stratified sampling was followed to gather a representative sample of both in public and private hospitals and community settings. In the first stage, four hospitals (both public & private) were randomly selected from the list of COVID dedicated hospitals. Additionally, eight wards (four wards from each North and South City corporation of Dhaka city) were randomly selected for gathering data from community level. Finally, clinically positive cases (659) in targeted study areas/centers were selected using the probability proportional sampling procedures-- 375 from hospitals and 284 from wards/community. The selected participants' age and sex were considered as the strata.

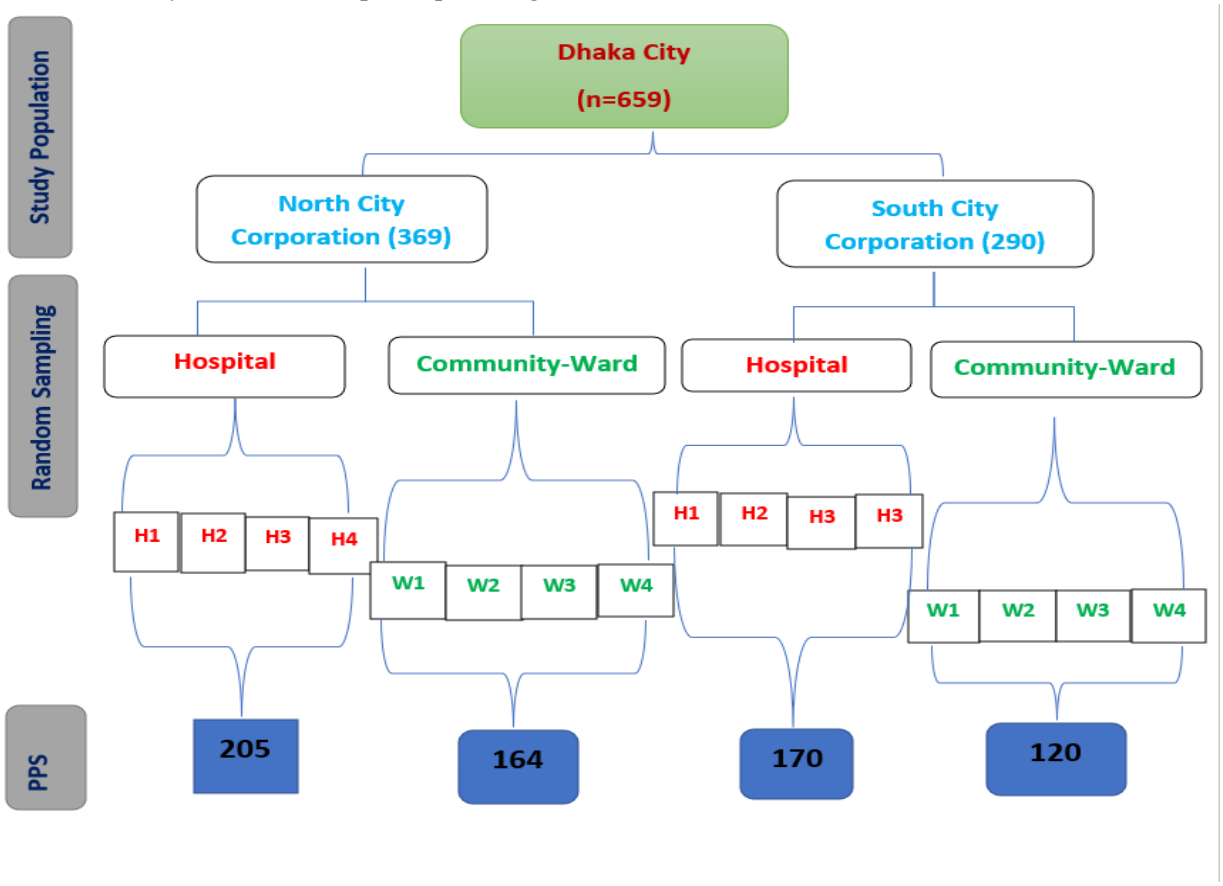

Figure 1: A Multistage Sampling Strategy

Data Collection tools and techniques

A semi-structured questionnaire was used for collecting the survey data. A multidisciplinary team including social scientists, epidemiologists, physicians, and statisticians were involved in developing the questionnaire of the study. Both Electronic Survey Form and face-to-face data collection were used to collect the data. Data was collected from patient attendance through questionnaires. The questionnaire was designed according to the objectives of the survey. The field staff will be intensively trained on background of the study, detailed objectives, methodology, individual sections of the instruments and interviewing techniques. Prior to data collection, interviewers explained the objectives of the study in short to the respondents to make them mentally ready about the specific question. Before the interview, an informed written/verbal consent was taken from the participants.

Quality control

Field supervisor was responsible for day-to-day information collection, quality control of the regular fieldwork, and conduct KIIs as well with the Principal Investigator (PI) and Mentor of the study. The Bengali version of the questionnaire was pre-tested in non-sampled participants in the hospital and community to get feedback on the suitability, appropriateness, and sequencing of the questions.

Data analysis

Quantitative data was rechecked and then coded and entered the database using SPSS software. Incorrect/incomplete data were rejected. Analysis was targeted on the study objectives and consideration of the indicators. Key findings were explored with descriptive statistics such as frequency, percent, bar, and pie charts. To examine how level of treatment, management and prevention are associated with participant's demographic characteristics and other factors bivariate and multivariate logistic regression analysis (adjusted) was used. Participant's pattern of COVID 19 treatment was considered as a dependent variable and was used as a reference category as well. Covariates was considered in the modeling include age, sex, socio-demographic status, using protective measures, place of the cares etc. The associations were presented in the form of regression coefficients and their 95% confidence intervals (CIs). All tests were performed at the 5% level of significance.

Ethical Approval

Ethical approval was obtained prior to the commencement of the study (Ethical clearance number: FAHSREC/DIU/2021/SMIG-06, Date: 05/04/2021). Before conducting any interviews, interviewers briefed participants on the background and objectives of the study. Anonymity and confidentiality were strictly maintained.

Result

Table 1 depict the demographic representation among the vaccinated patients. The majority of patients were aged between 30-49 years of age were vaccinated (24.4%; n = 659). However, 22.9% patients were non-vaccinated, which is close to the number of vaccinated patients. On the contrary, patients' aging up to 29 were vaccinated in high number (20.0%; n = 659), in contrast to the non-vaccinated subject (9.6%; n = 659). The number of vaccinated patients aging 50 years of age and above (14.7%; n = 659) were almost twice than the non-vaccinated (8.3%; n = 659). Vaccinated Female were in greater number (n = 234) than the vaccinated male (n = 156). Same is in the case of non-vaccinated female who were in higher number, (n = 163) than that of non-vaccinated male (n = 106) as shown in the table below.

Table 1. Sociodemographic characteristic among the vaccinated subject

Demographic variable	Vaccinated		p-value
	Yes n (%)	***No n (%)***	
Age			0.001
< 29	132 (20.0%)	63 (9.6%)	
30 – 49	161 (24.4%)	151 (22.9%)	
>50	97 (14.7%)	55 (8.3%)	
Sex			0.878
Male	156 (23.7%)	106 (16.1%)	
Female	234 (35.5%)	163 (24.7%)	
Marital status			0.119
Single	87(15.20%)	49(7.77%)	
Married	303(45.98%)	220(33.38%)	
Level of education			.046
Below Secondary	60(15.38%)	32(11.90%)	
Secondary	54(13.85%)	22(8.18%)	
Higher Secondary	109(27.95%)	79(29.38%)	
Bachelor & above	167(42.82%)	136(50.56%)	
Monthly family income (Taka)			.003
Up to 50000 BDT	219(56.15%)	134(49.81%)	
> 50000 BDT	171(43.85%)	135(50.19%)	
Mean, Median	54633, 50000		
Family Size			.176
Up to 5	300 (76.93%)		
>5	90 (23.07%)		

The Table 2 shows that patients who were suffering from mild level of COVID-19 were mostly vaccinated (n = 328). Whereas most of the patient with severe level disease were not vaccinated, (n = 73). Severity level of covid-19 is significantly associated to vaccination (p value < 0.001). 236 vaccinated patients took less than 14 days to recover whereas 154 vaccinated patients took more than 14 days to recover. 138 non vaccinated patients took less than 14 days to recover and 131 non vaccinated patients took more than 14 days to recover. This shows there is no statistical significance between recovery time and vaccination (p value > 0.005). There is also no significant association between age and vaccination, (p > 0.296) as shown in table 3.

Table 2 Severity level and recovery time with COVID vaccinated status

Variables	Got vaccinated		P value
	Yes	No	
Severity Level			
Mild (with/without symptoms)	328(49.77%)	196(29.74%)	<0.001
Severe (Oxygen therapy/ICU	62(9.41%)	73(11.08%)	
Recovery time			
Up to 14 days	236(35.81%)	138(20.94%)	0.019
More than 14 days	154(23.37%)	131(19.88%)	

Table 3. shows that Age demonstrated a minimal and statistically non-significant association with vaccination response ($\beta = 0.028$, $R^2 = 0.002$, $F = 1.096$, $p = 0.296$). In contrast, severity level exhibited a more substantial, statistically significant relationship ($\beta = 0.167$, $R^2 = 0.019$, $F = 12.55$, $p < 0.001$). Recovery time also displayed a significant, though less pronounced, effect on vaccination response ($\beta = 0.091$, $R^2 = 0.008$, $F = 5.533$, $p = 0.019$).

Table 3 Regression weight of vaccination with age, severity level and recovery time

Regression weight of vaccination	Beta coefficient	R^2	F	P value
Age	0.028	0.002	1.096	0.296
Severity Level	0.167	0.019	12.55	<0.001
Recovery time	0.091	0.008	5.533	0.019

Discussion

According to reports, SARS Covid-19 is extremely contagious. The COVID-19 pandemic has been a major shock to our societies and economies, highlighting the need for humans in both home and frontline settings while also revealing systemic disparities in every area, from health to the economy (UN WOMEN, 2021). Investigating vaccination prevalence and its relationship to COVID-19 severity among COVID-19 patients in metropolitan Bangladesh was the main goal of this study. Finding out the vaccination rate and its correlation with COVID-19 severity in COVID-19 patients is one of the goals of this exploratory investigation.

A total of 659 samples were studied, of them 39.8% were male and 60.2% female which is contradicted the male and female ratio of Covid-19 infection report released by DGHS. Around one-third of the targeted male samples could not be reached due to their lack of interest or work/job outside home during data collection. In regard to the hospitalization of Covid-19 patients, this study found that more than half of the participants (59.5%) had admitted to hospitals. A prior study observed that 69.3% of people took isolation at home, while 27.9% and 2.8% were admitted to COVID specialized hospitals and non-COVID hospitals respectively (Ali et al., 2021). Data for this study was gathered during the second wave of the Covid-19 pandemic, which may have contributed to the greater proportion of patients needing hospital treatment as opposed to at-home care. The average age of those affected was 35±14.9 years, as per a study carried out in Bangladesh to delineate the clinical and sociodemographic characteristics of COVID-19 cases (Ali et al.,2021) which upholds the current study findings regarding to the mean age of patients as it found 38.4±13.9 years.

According to this study, of the 659 patients, 79.5% had a severe COVID-19 infection, and the remaining 20.5% had a mild infection. When considering the age of the study participants, this result seems a little dubious because previous research indicated that people between the ages of 0 and 40 had a considerably lower risk of developing a severe case of COVID-19 (Cannistraci et al., 2021). Therefore, comprehensive analytical research on the effect of age on the severity of Covid-19 infection is suggested to conduct.

Socioeconomic and demographic characteristics of the respondents showed that 42% were service holders and the median monthly family income was Taka 50,000, while the mean (± SD) family size was 4.42 (± 1.39).

Even though Bangladesh began immunizing in February 2021, vaccine acceptance played a significant role at first. A meta-analysis conducted worldwide, including Bangladesh, revealed a 58.5% vaccination uptake rate (Patwary et al., 2022). Results from other surveys conducted in Bangladesh corroborated the assertion, with willingness ranging from roughly 52% to 61% (Abdullah-Al-Shoeb et al., 2022; Mahmud et al., 2021).

However, it was discovered that people living in cities were more inclined to get vaccinated.

Between May and August of 2021, this study was carried out among urban residents, and 65.1% (n = 659) of the study participants received a vaccine dosage. Based on the data provided, 11.17% of the population in Bangladesh appears to have received vaccinations by that point. Given that the study was carried out during the second COVID-19 wave, it illustrates how immunization can affect both the severity and the course of the disease (Parvin et al., 2022). According to the study, 390 respondents, or 84.1% of the total, had mild diseases that did not require oxygen or intensive care unit support. Research indicates that those who have received the Covid-19 immunization exhibit less symptoms than those who have not (CDC, 2021) which agrees with the results of the current investigation. According to the study, hospitalization for SARS COV-2 variants other than Omicron, which was common after the trial was conducted, decreases by around 85% in response to two doses of vaccination. Our research thus demonstrates that the effectiveness of immunization in Bangladesh is consistent with global results (Parvin et al., 2022).

Most of the vaccinated individuals in our study recovered in less than 14 days. Polack et al.'s 2020 trial revealed that the vaccination had a 94.6% success rate and a less than 14-day recovery period. According to a different study, 94.1% of vaccinated individuals recovered from their illness in less than 14 days (Baden et al., 2020). Covid-19 affects different people in different ways. Most patients with the infection have moderate to severe symptoms. The World Health Organization states that fever, cough, exhaustion, and loss of taste or smell are the most typical signs of this infectious disease (WHO, 2021). Additionally, it states that infected individuals may occasionally have sore throats, headaches, aches and pains, diarrhoea, skin rashes, discoloration of fingers or toes, red or irritated eyes, and in more severe cases, dyspnea, shortness of breath, difficulty speaking or moving, confusion, and chest pain. Nearly all of the Covid-19 symptoms listed by the WHO were displayed by the study participants.

Conclusion

According to the findings of the study, almost one in four of the subjects had a low-level COVID-19 infection. In addition, the vast majority of patients who were given the vaccine had a full recovery in fewer than 14 days.

Recommendation

Mass awareness programs emphasizing the importance of wearing masks and maintaining safe physical distance should be implemented on a large scale. Additionally, patients with reported comorbidities need to exercise greater caution in their lifestyle choices.

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