Prevalence and Outcomes of COVID-19 Infection and its Associated Socio-Demographic Factors among Population in North-East Region of Bangladesh

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Abstract

Background: Different countries and different regions within those countries have exhibited distinct COVID-19 infection prevalence and clinical outcomes. These are important to assess owing to understanding the magnitude of the disease in a particular area and to initiate appropriate intervention. **Objective:** The objective of the present study was to investigate the prevalence and outcomes of COVID-19 infection, and its associated sociodemographic factors among the population at the Shylet district in Bangladesh. **Methodology:** This retrospective study was carried out in the Department of Microbiology at Sylhet MAG Osmani Medical College, Sylhet, Bangladesh from 4 April to 6 September 2020. Patient data collection was collected from different healthcare institutions located in Sylhet. Those patients attended the institutions to diagnose COVID-19 infection during the ongoing pandemic. Microsoft Excel and SPSS software was used for the data analysis. $P<0.05$ at a 95.0% confidence interval was specified as the standard of significance. **Results:** Participants aged more than 60 years old showed the highest rate of death (8.3%) and the lowest proportion of cure (91.7%). A significant association has been found in the COVID-19 infection outcome of the participants with their age, occupation, and place of treatment for infected people ($p<0.001^*$). People aged 20 to 40 years, showed the highest odds of being infected with COVID-19 [OR: 4.685; CI: 1.25-17.51; $p<0.05$]. Moreover, people taking treatment from private hospitals were significantly less likely [OR: 0.061; CI: 0.03-0.13; $p<0.001$] to present COVID infection outcomes than those who were treated in public hospitals. Again, healthcare workers had the highest death rate (2.9%) than that of people from other professions. **Conclusion:** In conclusion, elderly people are commonly died due to COVID-19 infection, which is related to the site of treatment as well as the occupation of the patients. [*Bangladesh Journal of Infectious Diseases, June 2024;11(1):30-37*]

Keywords: Prevalence; Outcomes; COVID-19 infection; Socio-demographic factors; Bangladeshi population

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Introduction

The COVID-19 pandemic first became apparent as viral pneumonia in Wuhan, in the province of Hubei in China, in 2019[1-2]. It is usually transmitted between individuals when they come into close contact with contaminated droplets created when coughing, conversing, or blowing[3]. Patients with severe COVID-19-positive instances develop acute respiratory distress syndrome (ARDS), organ damage, and cardiovascular disease, which can result in death[4]. This virus is very quickly transmitted from person to person, and it has extended towards many countries throughout the world[5]. As of September 3, 2021, there were approximately 4,534,755 fatalities and 218,580,734 confirmed incidences of COVID-19 around the world[6]. This has been highlighted in South Asia, notably in Bangladesh, as a major source of infectious disease concerns and outbreaks[7]. On March 8, 2020, Bangladesh witnessed its first recorded case of COVID-19[5]. There have been 1,507,116 recorded incidents of COVID-19 in this country from that time to September 3, 2021, with 26,362 deaths[6]. Consequently, it greatly affected Bangladesh, a country with a dense population. However, as of August 30, 2021, 26,535,211 COVID-19 vaccine doses had been provided[8], potentially lowering the risk of infection amongst the public.

COVID-19 is predicted to disproportionately impact geographically well-connected regions with significant population concentrations. In a previous study, researchers argued that prolonged urbanization could make societies more prone to the spreading of infectious illnesses[9]. Given its high population density, Bangladesh faces an unusual problem of protecting itself from COVID-19[10]. In a study performed in Bangladesh, the researchers concluded that 40.6% of those surveyed had COVID-19-positive acquaintances, and 50.0% of the detected patients appeared to have immediate interactions with other COVID-19-positive individuals[11].

Epidemic intervention is thus both an epidemiologic and a societal conundrum, showing not just patterns of pathogen propagation, but also social and geographic patterns of disparity, community cohesion, and trustworthiness[12]. Government officials have undertaken far-reaching plans to safeguard that societal separation, quarantine, isolation, organizational closers, academic shutdowns[12].

The intention of the present research was to determine the prevalence of COVID-19 infection and associated sociodemographic characteristics among the people in Sylhet, Bangladesh. To analyze this, we gathered data from numerous Sylhet hospitals during the pandemic, yielding a substantial data set. We will analyze the demographic, health service facilities, and geographical factors that are associated with the spread of the epidemic.

Methodology

Study Design: This retrospective study was conducted in the Department of Microbiology at Sylhet MAG Osmani Medical College, Sylhet, Bangladesh from 4 April to 6 September 2020. For collecting data, we used a data collection form, containing questions related to COVID test results, and participant's sociodemographic information such as age, gender, occupation, residence, etc. It also collected information related to the place of their treatment and if they were referred to any other hospitals.

Study Area: Patient data collection was collected from different healthcare institutions located in Sylhet such as Sylhet M.A.G. Osmani Medical College, Shahid Shamsuddin Hospital, RAB Complex, Sylhet Cantonment, Sylhet Women's Medical College Hospital, Jalalabad Ragib Rabeya Medical College & Hospital, Shahjalal University of Science and Technology, Sylhet, Bangladesh and different Upazilla Health Complex of Shylet. After taking the patient record, this study was done by the researcher from the Department of Microbiology at National Institute of Neurosciences & Hospital, Dhaka, Bangladesh.

Study Population: The study population consisted of the people who attended the above hospitals for screening due to COVID-19 cases in the data collection period during the ongoing pandemic. A COVID-19 case was characterized as an individual having screening tests for the virus that causes COVID-19 infection, regardless of their clinical manifestations, as per the European Center for Disease Control guidelines for readiness and responding to the COVID-19 outbreak. So, all suspected cases of COVID-19 at any age with sexes were selected as the study population.

Study Procedure: All suspected COVID-19-infected patients were referred to the medical facility. As clinical isolates, the healthcare staff obtained nasopharyngeal swabs of the participants,

including their demographic and socioeconomic data. Post-COVID-19 clinical manifestations were noticed on every patient's discharge from the medical facility following two consecutive RT-PCR testing at 24-hour spacing indicating that these people were completely COVID-19 negative. Consequently, a recovered case was detected after two sequential tests yielded negative findings. Moreover, a death case has been detected after two sequential tests yielded negative findings.

Statistical Analysis: Microsoft Excel was used to process the data, and SPSS (Statistical Package for Social Sciences) was employed for its analysis. To summarize data related to the socio-demographic characteristics of the patients, frequencies, and percentage was determined. To find out the significant association between COVID-19 infection outcome and different influential factors such as, individual regional factors, a chi-squared test and logistic regression analysis were followed. At a 95.0% confidence level, the level of significance was assigned at p <0.05.

Ethical Consideration: Study participants were asked to give their data voluntarily before starting the data collection procedure. The people collecting ensured the confidentiality of their identity. However, the institutional review committee of Sylhet MAG Osmani Medical College, Sylhet, Bangladesh approved this study.

Results

Background Characteristics of the Study Participants: The majority of the population (around 50%) were aged between 20 to 40 years old. Of the total of all, around 72.4% were male. Again, 57.4% and 19.7% were working in the health care profession and law enforcement agency respectively. A greater proportion of participants were from Sylhet Sadar (around 92.7%) (Table 1).

Table 1: Background characteristics of the participants in the study (n=5725)

Characteristics	Frequency	Percent
Age group (years)		
• < 20	513	8.6
• 20 to 40	2986	50.0
• 40 to 60	1760	29.5
• > 60	711	11.9
Gender		
• Male	4325	72.4
• Female	1645	27.6
Occupation		
• Law Enforcement Agency	1125	19.7
• Health Care Workers	3288	57.4
• Service Holder	800	14.0
• Others	512	8.9
Residence		
• Sylhet	5533	92.7
• Habigonj	106	1.8
• Moulovi Bazar	205	3.4
• Sunamgonj	115	1.9
• Outside Sylhet	11	0.2

Association between COVID-19 Outcome with Participant's Age, Gender, and Occupation: Participant's Age was significantly associated with the COVID-19 infection outcome ($p <0.001^*$). The highest proportion of death (8.3%) and the lowest proportion of cure (91.7%) was found among people aged more than 60 years old. The gender of participants showed an insignificant association with COVID-19 infection outcome. Nevertheless, the death rate was more among the male population than the female population (male: 1.8%; female: 1.5%). There was a significant association between the participant's occupation and COVID-19 infection outcome ($P <0.001^*$).

Table 2: Association of COVID-19 Infection Outcome and Individual Factors (n =5725)

Variables	Total	Disease Outcome [n (%)]		P value
		Death	**Cure**	
Age Group				
• < 20 Years	513	4 (0.8%)	509 (99.2%)	
• 20 to 40 Years	2986	5 (0.2%)	2981 (99.8%)	
• 40 to 60 Years	1760	36 (2.0%)	1724 (98.0%)	<0.001*
• > 60 Years	711	59 (8.3%)	652 (91.7%)	
Gender				

Variables	Total	Disease Outcome [n (%)]		P value
		Death	**Cure**	
• Male	4325	80 (1.8%)	4245 (98.2%)	0.303
• Female	1645	24 (1.5%)	1621 (98.5%)	
Occupation				
• Law Enforcement Agency	1125	5 (0.4%)	1120 (99.6%)	<0.001*
• Health Care Workers	3288	94 (2.9%)	3194 (97.1%)	
• Service Holder	800	1 (0.1%)	799 (99.9%)	
• Others	512	2 (0.4%)	510 (99.6%)	

*p <0.001, **p <0.05; Test is significant

Table 3: Association of COVID-19 infection Outcome and Geographical Factors (n=5970)

Variables	Total	Disease Outcome		P value
		Death	**Cure**	
Residence				
• Sylhet	5533	92(88.5%)	5441 (92.8%)	0.167
• Habigonj	106	5 (4.8%)	101 (1.7%)	
• Moulovi Bazar	205	5 (4.8%)	200 (97.6%)	
• Sunamgonj	115	2 (1.9%)	113 (3.4%)	
• Outside Sylhet	11	0 (0.00%)	11 (0.2%)	
Total	**5970**	**104(100.0%)**	**5866(100.0%)**	
Place of Treatment				
• Home	3130	9 (8.7%)	3121 (53.2%)	<0.001*
• Public Hospital	1436	50 (48.1%)	1386 (23.6%)	
• Private Hospital	1004	45 (43.3%)	959 (16.3%)	
• Others	400	0 (0.0%)	400 (6.8%)	
Total	**5970**	**104(100.0%)**	**5866(100.0%)**	
Place of Referral				
• Public Hospital	3301(55.3%)	62 (59.6%)	3239 (55.2%)	0.195
• Private Hospital	432(7.2%)	7 (6.7%)	425 (7.2%)	
• Upazila Health Complex	664(11.1%)	5 (4.8%)	659 (11.2%)	
• Civil Surgeon Office	351(5.9%)	3 (2.9%)	348 (5.9%)	
• Public University	992(16.6%)	22 (21.2%)	970 (16.5%)	
• Others	230(3.9%)	5 (4.8%)	225 (3.8%)	
Total	**5970(100.0%)**	**104(100.0%)**	**5866(100.0%)**	

*p <0.001, **p <0.05; Test is significant

After being infected with COVID-19 infection, healthcare workers had the highest proportion of death (2.9%), and the lowest proportion of cure (97.1%) that that of people from other professions (Table 2).

Association between COVID-19 outcome with Participant's Residence, and Place of Treatment and Referral: Table 3 interprets the association between COVID-19 infection outcome and geographical factors like residence, place of treatment, and place of referral. There was no significant relation between the participant's

residence and COVID-19 outcome. A higher proportion of death (around 4.7%) was found among the population from the Habigonj district.

However, the significant association has been noticed between the place of management and treatment for COVID-19-infected people and their disease outcome (*p* <0.001*). Around 99.7% of people, taking treatment at their home were cured from COVID-19 infection. The death rate of people who had their treatment at public and private hospitals was 3.5% and 4.5% respectively. The association between COVID-19 infection outcome

and place of referral was insignificant. However, about 1.9% of people who died due to COVID-19 infection was referred to the public hospital before.

Logistic Regression between COVID-19 Infection Outcome and Its Associated Factors: Table 4 has presented participant's COVID infection outcomes and their associated influential factors. Here, people aged 20 to 40 years, were found 4.685 times more likely to be infected with COVID-19 [CI: 1.254 - 17.506; *p* < 0.05] than

people less than 20 years old. Again, participants who were working as health care professionals were significantly less likely [OR: 0.152; CI: 0.062 - 0.374; *p* <0.001] to show positive COVID infection outcomes than the other service holder population. Similarly, the people who were taken treatment from a private hospital were significantly less likely [OR: 0.0614; CI: 0.030 - 0.126; *p* <0.001] to present COVID infection outcomes than those who were treated in a public hospital [OR: 0.080; CI: 0.039 - 0.163].

Table 4: Regression analysis between COVID-19 infection outcome and associated influential factors (N=5725)

Characteristics	Odds Ratio (OR)	95% Confidence Interval (CI)	P value
Age group (Year)			
• < 20 Years	1		
• 20 to 40 Years	4.685	1.254 - 17.506	0.022**
• 40 to 60 Years	0.376	0.133 - 1.063	0.065
• > 60 Years	0.087	0.031 - 0.241	<0.001*
Occupation			
• Law Enforcement Agency	1		
• Health Care Workers	0.152	0.062 - 0.374	<0.001*
• Service Holder	3.567	0.416 - 30.589	0.246
• Others	1.138	0.221 - 5.887	0.877
Place of treatment			
• Home	1		
• Public Hospital	0.080	0.039 - 0.163	<0.001*
• Private Hospital	0.0614	0.030 - 0.126	<0.001*

p <0.001, ***p* <0.05; Test is significant

Discussion

Our study was based on information on COVID-19 infection among the people in the Sylhet area, when COVID-19 pandemic first began in Bangladesh. We have assessed the prevalence of the disease among the population and some sociodemographic factors associated with it. According to Li et al., it was critically important to identify and treat anticipated COVID-19 patients as promptly as possible with the intent to stop the epidemic from spreading; hence, the source of infection and severing the transmission pathway was needed to be treated[13].

We have assessed some influential factors affecting the COVID-19 infection rate. It is essential because Age, sex, socio-demographic background, social circumstances, and pre-existing diseases are all predisposing factors that put people in a certain neighborhood at various risk levels for serious

illness and mortality[14-17]. For example, Poor and marginalized population groups are more vulnerable to infectious diseases[18]. Minority groups in the US had previously been inclined to reside in socially impoverished regions before the outbreak, which is marked by higher unemployment and poverty rates, costly housing, and insufficient healthcare facilities. This may contribute to the greater burden of disease in those areas[19].

It is established that personal risk variables including gender, age, and race/ethnicity affect the occurrence of contagious diseases[18,20]. In a previous study, it was discovered that an individual's age was related to whether they had symptoms or not (p = 0.000). Age categories ranging from 0 to 9 years (7.2%), 10 to 19 years (7.2%), and 20 to 29 (28.8%) were observed to be associated with a greater incidence of silent cases[11]. In the current study, the collected data did not find out whether the COVID-

19 cases were either symptomatic or asymptomatic. However, patients' age was significantly associated with the COVID-19 infection outcome ($p < 0.001*$). Again, a greater proportion (8.3%) of COVID-infected dead patients were aged more than 60 years old. Again 2.0% of people were aged between 40 to 60 years old, who died of COVID-19 infection. Moreover, death due to COVID was found to be less among younger patients in our study. A separate study with a similar outcome indicated a comparatively reduced infection rate in young adults alongside a lesser rate of mortality (less than 1%)[21].

Our study found that the gender of participants was insignificantly associated with COVID-19 infection outcomes. However, the death rate was more among the male population than that of female population (male: 1.8%; female: 1.5%). This finding was consistent with the findings from Li et al., 2020, where the COVID-19 infection rate has been reported to be higher in males than in females[13]. Nevertheless, another study found a similar infection rate between both males and females. They additionally discovered that men have a greater likelihood to have concurrent medical conditions such as, diabetes, obesity which are associated with factors linked to adverse COVID-19 outcomes[22-23].

Job, routine daily labor, and amount of time spent outside all have an impact on COVID-19 infection, with some jobs putting an individual at higher risk than others[24]. This study finding were paralleled with the above statements; since we found a significant association between participant's occupation and COVID-19 infection outcome ($p < 0.001*$). Among all other professions, healthcare workers showed the highest proportion of death rate (2.9%), after being infected with COVID-19 disease.

The domicile of a person influences COVID-19 transmission and distribution to some extent[12,24]. In a study in the USA, demographic factors (population density and urbanity) were significantly associated with COVID-19 incidence and mortality[19]. In this study, most of the participants were from the Sylhet district, and most of them were from the Sylhet Sadar area. However, the participant's residence did not show any significant association with the COVID-19 disease outcome ($p > 0.05$). Similarly, another paper has found that infections, hospitalization, and mortality related to COVID-19 were not correlated with the population density or urbanity of the municipality[12].

Due to the requirement for home isolation amid the COVID-19 pandemic, which mandates a discrete bedroom, dwelling condition is particularly crucial[25-26]. In such a densely populated country like Bangladesh, many people could not afford to provide a separate isolation room in their houses, which may influence the transmission rate within their household. Around 54.67% of total participants stayed their home and took management for their disease, instead of being hospitalized or using isolation facilities from any kind of healthcare institution. Our study findings demonstrated that participants' place of treatment for their COVID-19 infection had a highly significant association with their disease outcome ($p < 0.001$). In another study, investigators discovered that worse neighborhood conditions, such as a lack of medical facilities, are linked to higher COVID-19 death rates[27]. In addition to providing a scientific foundation for preventing and managing the outbreak in Bangladesh and other pandemic countries throughout the world, this study offers a peek of the overall public health readiness. Implementation of proper lockdown, considerable guidance, and a prepared healthcare system are needed. Fair and efficient risk-based resource allocations of limited preventative resources, like immunizations, are necessary to lessen the COVID-19 load on people[17,28].

This study has some limitations also. Such as, we could not assess whether the whole population attended all hospitals situated in Shylet. Therefore, it lacks generalization. However, employing spatially gathered information has drawbacks, as associations discovered in ecological research will not consistently resemble ones, which can be noticed on an individual basis. We have limitation related to the interpretation of results because studies exactly related to the sociodemographic, geographical, and health facility factors influencing the COVID-19 prevalence was scarce at the District level in Bangladesh. Hence, it was difficult to compare our results with any further such kind of findings.

Conclusion

In conclusion, elderly people are commonly died due to COVID-19 infection, which is related to the site of treatment as well as the occupation of the patients. There was no significant relation between the participant's residence and COVID-19 outcome. A higher proportion of death was found among the population from the Habigonj district. However, the significant association has been noticed between the place of management and treatment for COVID-19-

infected people and their disease outcome. The association between COVID-19 infection outcome and place of referral was insignificant. However, people who died due to COVID-19 infection was referred to the public hospital before.

Conflict of Interest
We declare that we have no conflict of interest.

Contribution to authors:
MAY conceptualized and designed the overall study. ZZ is involved in data collection. ABB is involved in data input and data cleaning. MAY and ZZ conducted data analysis. MAY, ZZ, AM, ARS, MR, MMR and ABB drafted the manuscript. All authors reviewed and approved the final manuscript.

Data Availability
Any questions regarding the availability of the study's supporting data should be addressed to the corresponding author, who can provide it upon justifiable request.

Ethics Approval and Consent to Participate
The Institutional Review Board granted the study ethical approval. Since this was a retrospective study, not every study participant provided formal informed consent. Each method followed the appropriate rules and regulations.

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