

NOSOCOMIAL TRANSMISSION OF SARS COV-2 IN A TERTIARY CARE HOSPITAL IN PESHAWAR, PAKISTAN

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ABSTRACT

OBJECTIVES

The study aimed to determine the frequency of nosocomial transmission of severe acute respiratory syndrome coronavirus-2 (SARS CoV-2) in a tertiary care hospital in Peshawar, Pakistan.

METHODOLOGY

This cross-sectional, analytical study was conducted in Hayatabad Medical Complex, Peshawar, Pakistan, from June-August 2021. Consecutive patients aged 18 years and above admitted for conditions other than COVID-19 with a negative rapid antigen test for COVID-19 at admission were included. Patients with respiratory symptoms or those hospitalized for any reason in the preceding six weeks in any healthcare facility were excluded. The study protocol was completed by 90.9% of the participants. The rapid antigen test was repeated for participants at the time of discharge or symptoms suggestive of COVID-19. Patients with a positive quick antigen test for COVID-19 at discharge or symptom onset were considered to have acquired nosocomial SARS-CoV-2 infection. Statistical Package for the Social Sciences version 21 for Windows was used for data analysis.

RESULTS

The frequency of nosocomial transmission of SARS-CoV-2 was 2.7% (13/482). Patients with nosocomial COVID-19 stayed longer in the hospital than those who tested negative (7.5±4.0 versus 4.8±3.6 days; p=0.006). Age (p=0.796), gender (p=0.453), department of inpatient stay (p=0.943), major surgery (p=0.678), minor surgery (p=0.576), and visit to the radiology department (p=0.707) did not affect nosocomial spread of SARS-CoV-2.

CONCLUSION

Nosocomial transmission of COVID-19 was infrequent, accounting for 2.7% of participants in this study.

KEYWORDS: COVID-19, SARS-CoV-2, Infections, Delivery of Health Care

INTRODUCTION

The coronavirus disease 2019 (COVID-19) started as an outbreak of unusual pneumonia in people who visited a wholesale seafood market in Wuhan, China, where wild animals were also sold. The World Health Organization declared the COVID-19 epidemic a public health emergency of global concern on January 30, 2020, and a pandemic on March 11, 2020.¹ As of February 8, 2022, there were 396,558,014 cases of COVID-19 globally, and the number of deaths reached 5,745,03.² Pakistan registered its first case on March 26, 2020, and thus far, 1,470,161 cases and 29,601 deaths have been reported.³ Coronavirus disease 19 is primarily transmitted through respiratory droplets of symptomatic, presymptomatic, and even asymptomatic patients. Additional transmission sources are direct contact with infected surfaces, fomites, and aerosol-generating procedures in healthcare facilities.⁴ Patients visiting healthcare facilities are usually frail and have comorbid conditions like diabetes mellitus,

hypertension, and cardiopulmonary problems. It has been reported that the outcome of COVID-19 is worse in patients with comorbidities.⁵ Healthcare facilities where patients with COVID-19 are treated could turn into a potential reservoir of transmission for patients who visit hospitals for health issues other than COVID-19.⁶ Many patients are reluctant to utilize essential health services during the COVID-19 pandemic due to the fear of acquiring severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection in healthcare facilities. This contributed to reduced hospital visits and admissions by patients with diseases other than COVID-19.⁷ Up to 79% of respondents opted against visiting a hospital at any cost during the COVID-19 pandemic.⁸ The refusal to seek health care has been associated with a rise in mortality rates from non-COVID-19 illnesses.⁹ To halt the nosocomial transmission of SARS CoV-2 and to alleviate public concerns, it is essential to regularly test all hospital inpatients irrespective of the reason for hospital

admission.¹⁰ The nosocomial spread of SARS-CoV-2 has varied in different hospitals depending on the phase of the pandemic, infrastructure, level of preparedness, effectiveness of infection control policies, and resources. In Wuhan, 12.3% of patients admitted for other health reasons acquired SARS-CoV-2 nosocomial infection, while this rate was 11% in London.^{5,11} There is a paucity of research about the nosocomial transmission of SARS-CoV-2 from developing countries where hospital resources and the level of preparedness struggle to meet the required international standards. We aimed to determine the frequency of nosocomial transmission of SARS CoV-2 in a tertiary care hospital. Such data can help hospital administrations judge the effectiveness of current infection control policies and address public concerns regarding their safety in healthcare facilities during the COVID-19 pandemic.

METHODOLOGY

This study was conducted in a 1200-bed tertiary care hospital in Peshawar, Pakistan, with 14 beds dedicated to COVID-19 critical care unit and 140 beds for COVID-19 patients. This study was endorsed by the institutional review board of Khyber Girls Medical College (No. 4360/Estt./KGMC, dated 10.05.2021). This study follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. All consecutive patients aged 18 years and above admitted to the hospital from June 1, 2021, to August 31 2021, with health issues other than COVID-19 or respiratory symptoms, were eligible to be included in the study. Patients admitted to a health care facility in the preceding 6 weeks were not enrolled. After informed consent was obtained, all patients were screened for COVID-19 rapid antigen (Panbio™ COVID-19 Ag Rapid Test Device) using nasopharyngeal swabs on admission (Test 1).¹² All patients with negative rapid antigen tests on admission were recruited for the study. Rapid antigen tests were repeated for participants at discharge (Test 2). An additional rapid antigen test was performed at the decision of the attending doctor if the patient developed symptoms suggestive of COVID-19 before discharge (Test 2). All patients who tested negative on admission and subsequently had a positive rapid antigen test for COVID-19 either at the time of symptom onset or discharge were considered to have acquired nosocomial SARS-CoV-2 infection. SARS-CoV-2 reverse transcriptase polymerase chain reaction (RT-PCR) on nasopharyngeal swabs subsequently confirmed all rapid antigen-positive cases. These patients were isolated and offered standard treatment. All data were recorded on a structured proforma. Data from patients who completed

the study protocol were analyzed using SPSS version 21 for Windows. Mean, and standard deviation were determined for age and length of stay. Frequencies and percentages were calculated for sex, age group, department of inpatient stay, and the result of test 2. Differences in the means of age and length of visit were evaluated by the Mann-Whitney U test. The chi-square test evaluated differences in the frequencies. A P value of less than 0.05 was considered significant.

RESULTS

Overall, 620 patients were hospitalized during the study period. Of 620 patients, 530 fulfilled the inclusion criteria and were enrolled. Repeat testing for COVID-19 rapid antigen was performed in 479 patients at discharge and three patients who developed symptoms suggestive of COVID-19 during the hospital stay. Of these 482 patients, 285 (59.1%) were female, and 224 (46.5%) were admitted to the Department of Medicine. The mean age of the study subjects was 44.6 ± 19.5 years, and the mean length of stay was 4.9 ± 3.6 days. The demographic parameters of the study participants are presented in Table 1. Thirteen patients tested positive on repeat testing, accounting for a 2.7% frequency of nosocomial spread of SARS-CoV-2 in this study. The mean age did not differ significantly ($p=0.796$) between those who tested positive (46.8 ± 21.9 years) and those who were negative (44.5 ± 19.4 years) on repeat testing. Patients who acquired SARS-CoV-2 stayed longer in the hospital than those who tested negative on repeat testing (7.5 ± 4.0 versus 4.8 ± 3.6 days; $p=0.006$). Sex ($p=0.453$), age over 40 years ($p=0.288$), department of inpatient stay ($p=0.943$), major surgery ($p=0.678$), minor surgery ($p=0.576$), and visit to the radiology department ($p=0.707$) did not affect nosocomial transmission of SARS-CoV-2. A comparison between patients with negative and positive repeat tests is summarized in Table 2.

Table 1: Demographic Parameters of the Study Population (n=482)

Age, Mean \pm SD (years)	44.6 \pm 19.5
Length of Stay, Mean \pm SD (days)	4.9 \pm 3.6
Gender, No. (%)	
Male	197 (40.9%)
Female	285 (59.1%)
Age groups, No. (%)	
Up to 40 years	218 (45.2%)
More than 40 years	264 (54.8%)
Department, No. (%)	
Medicine	224 (46.5%)
Surgery	127 (26.3%)
Gynaecology & Obstetrics	131 (27.2%)

SD: Standard deviation

Table 2: Comparison between Patients with Negative and Positive Test 2

Variables	Test 2 Results No. (%)		P-Value	
	Negative (n=469)	Positive (n=13)		
Age, Mean \pm SD (years)	44.5 \pm 19.4	46.8 \pm 21.9	0.796	
Length of stay, Mean \pm SD (days)	4.8 \pm 3.6	7.5 \pm 4.0	0.006	
Gender, No. (%)	Male	193(98%)	04(2%)	0.453
	Female	276(96.8%)	09(3.2%)	
Age groups, No. (%)	Up to 40 years	214(98.2%)	04(1.8%)	0.288
	More than 40 years	255(96.6%)	09(3.4%)	
Department, No. (%)	Medicine	218(97.3%)	06(2.7%)	0.943
	Surgery	124(97.6%)	03(2.4%)	
	Gynaecology & Obstetrics	127(96.9%)	04(3.1%)	
Major surgery, No. (%)	No	375(97.2%)	11(2.8%)	0.678
	Yes	94(97.9%)	02(2.1%)	
Minor surgery, No. (%)	No	458(97.2%)	13(2.8%)	0.576
	Yes	11(100%)	0(0%)	
Radiology department visit, No. (%)	No	56 (96.6%)	02(3.4%)	0.707
	Yes	413(97.4%)	11(2.6%)	

SD: Standard deviation

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DISCUSSION

SARS-CoV-2 poses a challenge to infection control strategies in hospitals worldwide. Since the onset of the COVID-19 pandemic, hospitals have segregated areas for suspected and confirmed COVID-19 patients to minimize the spread of SARS-CoV-2 to patients with non-COVID-19-related health issues. However, there have been frequent outbreaks of COVID-19 in the non-COVID-19 areas of healthcare facilities.^{11,13} These outbreaks have been presumed to be nosocomial in nature. Nosocomial transmission of SARS-CoV-2 has substantial implications for patients and healthcare workers.¹⁴ Many hospitals have evaluated their systems to restore public confidence and the safety of non-COVID-19 patients and to judge the effectiveness of existing infection control strategies. This study aimed to determine the proportion of patients who acquired

SARS-CoV-2 infection while hospitalized in a tertiary care centre for reasons other than COVID-19. After a thorough search of published literature, we consider this to be the first study of its kind where every patient was screened for SARS-CoV-2 infection on admission and discharge. In contrast, global research on nosocomial COVID-19 transmission is based on epidemiological investigations into outbreaks of COVID-19 in hospitals. The frequency of nosocomial SARS-CoV-2 infections in this study was 2.7%. Dilshad et al. from Lahore reported a 2.3% risk of acquiring COVID-19 in gastrointestinal endoscopy patients.⁶ Sánchez et al. reported similar findings (2.1%) in patients undergoing urological surgeries.¹⁵ Similarly, a lower frequency of nosocomial COVID-19, ranging from 0% to 1.4%, has been described.^{16,17} However, studies from Wuhan and London in 2020 reported a higher proportion (12.3% and 11%, respectively) of patients presumed to have nosocomial COVID-19.^{5,11} The lower frequency in this study could be explained by several reasons. Rapid antigen testing was used in this study, which has inherently lower sensitivity for screening than RT-PCR, employed in the studies from Wuhan and London.¹² Unlike the studies from Wuhan and London, this study was conducted during a phase of the pandemic when the disease burden was low in our country, and vaccination programmes had already been rolled out.³ Moreover, the length of stay of patients in this study was comparatively shorter, and the study protocol did not include follow-up of patients for the development of symptoms after discharge. The results of this study cannot be compared directly with most published studies, as not every patient in the previous studies was screened for SARS-CoV-2 infection on admission. Patients with nosocomial COVID-19 had longer in-hospital stays than those who did not acquire the infection. In some studies, the length of stay for patients with nosocomial SARS-CoV-2 infection has ranged from 2.2 to 52 days.^{15,16,18} However, comparisons with patients without nosocomial COVID-19 have not been described. In a study conducted in a stroke/neurology ward in the United Kingdom, Jewkes stated that the mean age of cases with nosocomial COVID-19 was 75 years.¹⁹ Similarly, the median age of study participants with hospital-acquired COVID-19 was 81 and 75 years, as reported by Wake and Rickman, respectively.^{11,18} This differs from the mean age of patients with nosocomial COVID-19 (46.8 years) in this study. The participants in this study were, on average, comparatively younger at baseline. This may describe the difference in age of nosocomial COVID-19 cases between this study and the abovementioned studies, as age alone did not influence the risk of nosocomial SARS-CoV-2 infection. Since increasing age is a risk factor for nosocomial COVID-19, the

lower mean age of participants may also have contributed to the lower frequency of nosocomial COVID-19 in this study. The risk of having nosocomial COVID-19 in this study did not differ by gender or department of inpatient stay. Differences in the risk of nosocomial COVID-19 due to gender or department have not been reported in the literature. In a study from the National Health Services (NHS) Trust Hospital, South London, cases with nosocomial COVID-19 were hospitalized for various problems ranging from fall-related injuries to medical issues.¹⁸ Similarly, undergoing minor and major surgeries or radiological procedures during the hospital stay did not affect the risk of acquiring SARS-CoV-2 infection.

LIMITATIONS

The main strength of this research was its protocol, in which every inpatient was screened by a SARS-CoV-2 rapid antigen test on admission and at the time of discharge. The study was not without limitations. A rapid antigen test was used due to its quicker result and lower cost, but it might have underestimated the burden of nosocomial COVID-19 due to its lower sensitivity compared to RT-PCR, especially in asymptomatic patients. The study protocol did not include follow-up after discharge, and some patients may have been infected during the hospital stay and developed symptoms after discharge. Some patients failed to complete the study protocol because they died or were discharged before being tested. The source of SARS-CoV-2 was not studied.

CONCLUSIONS

Nosocomial spread of SARS-CoV-2 was infrequent in this study. A longer inpatient hospital stay increases the risk of nosocomial SARS-CoV-2 spread. Age, sex, department of inpatient stay, major or minor surgery and visit to the radiology department did not affect the transmission of SARS-CoV-2.

CONFLICT OF INTEREST: None

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