pISSN2394-6032 | eISSN2394-6040

Original Research Article

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20213779

Compliance to infection prevention and control practices for prevention of SARS-CoV-2 transmission at tertiary care hospital in North Mumbai

Kinjal Patel^{1*}, Suraj Purusottaman², Trupti Carval³, Lekhan Narvekar³

Received: 18 August 2021 Accepted: 15 September 2021

*Correspondence:

Dr. Kinjal Patel,

E-mail: Kinjal.1527@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Infection control practices played a major role in prevention of SARS-CoV-2 in healthcare settings. Aim of the study was to know the compliance to infection control and prevention practices by healthcare workers in COVID-19 pandemic and the measures taken for prevention of SARS-CoV-2 spread in the hospital.

Methods: An observational study was conducted at tertiary care hospital for a period of one month. All healthcare workers involved in patient care of COVID-19 and non COVID-19 was observed for their infection control practices. Areas were divided in two category, intensive care unit and indoor wards for audit. Environmental samples of various surfaces from intensive care unit and wards were taken and analyzed for the presence of SARS-CoV-2 RNA by reverse transcriptase polymerase chain reaction.

Results: Overall compliance to infection prevention practices were improved during pandemic. Hand hygiene compliance in intensive care unit and indoor wards of COVID-19 unit were 78.66% and 74.36% whilst in non COVID-19 units was 72.47% and 62.31% respectively. Compliance to revised biomedical waste (BMW) policy at COVID-19 unit were 85.20% and 71.49% in intensive care unit and ward respectively. However, at non COVID-19 unit, it was 65.22% and 57.60%. Nursing station and doffing area of ICU at non-COVID-19 unit showed presence of SARS-CoV-2 virus. While all samples collected from COVID-19 unit were negative.

Conclusions: Infection prevention and control practices play a key role to curtail transmission of infection. Awareness among healthcare workers, hospital environment, and usage of personal protective equipment should be optimized even at non COVID-19 facility.

Keywords: COVID-19, Infection prevention, SARS-CoV-2, Surface cleaning

INTRODUCTION

In late December 2019, a cluster of patients with an initial diagnosis of pneumonia of an unknown etiology admitted to hospitals. These patients were epidemiologically linked to a seafood and wet animal wholesale market in Wuhan, Hubei Province, China. A novel Coronavirus (nCoV) that has not been previously identified in humans called as SARS-CoV-2 and the illness, Coronavirus disease 2019

(COVID-19) was identified that spread throughout the world causing a pandemic and WHO declared public health emergency. Most common route of human-to human transmission had been the contact with infectious respiratory droplets or fomites. All healthcare workers faced extreme challenges during the first wave of COVID-19 pandemic for reducing the transmission of infection. Although the level of risk of transmission across hospital was less except where aerosol-generating

¹Department of Microbiology, Apoorva Diagnostics and Healthcare, Mumbai, Maharashtra, India

²Department of Medicine, ³Department of Microbiology, Bhaktivedanta Hospital and Research Institute, Mumbai, Maharashtra, India

procedures like intubation, suction, bronchoscopy, cardiopulmonary resuscitation were performed. Such procedures facilitate droplet transmission from patients to healthcare workers.^{3,4} In hospital settings, major contributing factors for transmission were poor compliance to infection prevention and control practices, overcrowding in emergency rooms/patient's waiting areas and environmental contamination.⁵ Guidelines for prevention and control of COVID-19 transmission have been developed and adopted worldwide. The most important measures recommended were suspected source control, use of personal protective equipment, rapid diagnosis, physical distancing, isolation, investigation and follow-up of close contacts.6 Hence, awareness amongst healthcare workers and continuous training is essential during pandemic to prevent the spread of infection in hospital as well as in community. Along with, monitoring the implementation of revised practices. Hence, present study was conducted to check the infection control and prevention practices by healthcare workers in COVID-19 pandemic and the measures taken for prevention of SARS-CoV-2 spread in the hospital.

METHODS

Study period and location

An observational study was conducted at 200-bedded tertiary-care hospital, which was declared as non COVID-19 hospital, and another unit of hospital was declared dedicated COVID-19 hospital having capacity of 65 beds located two kilometer away from main hospital. Study was conducted for a period of one month from 1st November to 30th November 2020. Hospital has well planned infection control committee and robust infection control team. All guidelines and protocols followed in hospital are as per NABH (National accreditation board for hospitals and healthcare providers) standards. During COVID-19 pandemic, infection prevention and control guidelines were modified as per the international standards and implemented.

Study source

Both COVID-19 and non COVID-19 units were included in study. Intensive care units and indoor wards dedicated for both RT-PCR confirmed COVID-19 patients and non COVID-19 patients were the sources for environmental sampling.

Inclusion criteria

All healthcare workers working in COVID-19 and non COVID-19 units were included in the study.

Exclusion criteria

Healthcare workers working in pharmacy, accounts, receptions and those who were on leave were excluded from the study. For environmental sampling, wards and

intensive care units where patients admitted for complaints other than fever were excluded from the study.

Data collection tool and technique

Infection control nurse collected data using different checklists prepared by infection control team as per NABH standards. Audits were done by both active and passive surveillance methodology. Hand hygiene, biomedical waste management, PPE (personal protective equipment) protocol and laundry audits were done. Monitoring was done to check the knowledge and practices of healthcare workers. Daily trainings were conducted in small groups to update all healthcare workers. All non-compliances were noted and on the spot feedback were given for correction and prevention.

Surface sampling

Environmental samples of various surfaces from intensive care unit and wards of both COVID-19 and non COVID-19 units were taken. Samples were collected from patient's bed, nursing station, donning area, doffing area and high touch surfaces. Areas included in high touch surfaces were door handles, bed rails and IV stands. All samples were collected using rayon swabs and immediately immersed in viral transport medium. They were transported to the laboratory within two hour of collection maintaining a cold chain and refrigerated at2-8°Cuntil testing was performed. All samples were analyzed for the presence of SARS-CoV-2 RNA by reverse transcriptase polymerase chain reaction using thermal cycler (Thermo scientific Quantstudio 5, United States) and using PCR assay (Meril diagnostics private limited, India). The assay amplifies two target genes namely ORF1ab and N gene.

Data analysis

All audit sheets were checked and compliance was noted. Feedback given to all respective departments. The study was conducted with approval from institutional ethics committee.

RESULTS

Infection prevention and control practices of healthcare workers were observed for the period of one month. Compliance score were generated separately for all audits namely hand hygiene, biomedical waste management, laundry management and PPE donning and doffing practices. It was observed that overall compliance to infection prevention practices were good at both COVID-19 and non COVID-19 units. Overall hand hygiene compliance was improved. Policy made for Biomedical Waste Management and line management were followed appropriately. Donning and doffing practices of healthcare workers were better at COVID-19 units as compared to non COVID-19 units (Table 1-2).

Environmental surfaces were one of the major sources of transmission in healthcare settings. It was observed that nursing station and doffing area of non-COVID-19 unit showed presence of SARS-CoV-2. While all samples collected from COVID-19 dedicated units were negative. (Table 3).

Table 1: Comparison of compliance to infection control practices in intensive care units.

Observations	COVID-19 hospital (%)	Non COVID-19 hospital (%)
Hand hygiene	78.66	72.47
Biomedical waste management	85.20	76.38
Laundry	66.73	80.11
PPE practices	75.93	65.22

Table 2: Comparison of compliance to infection control practices in indoor wards.

Observations	COVID-19 hospital (%)	Non COVID-19 hospital (%)
Hand hygiene	74.36	62.31
Biomedical waste	71.49	68.11
management		
Laundry	58.22	66.58
PPE practices	66.33	57.60

Table 3: RT-PCR of environmental surfaces from COVID-19 and non COVID-19 hospital.

Environmental samples	COVID-19	Non COVID-19
Nursing station	Negative	SARS-CoV-2 detected
Patients bed	Negative	Negative
Donning area	Negative	Negative
Doffing area	Negative	SARS-CoV-2 detected
High touch surfaces	Negative	Negative

DISCUSSION

Inappropriate infection prevention measures and limited awareness about transmission dynamics created a biggest challenge and threat to healthcare workers during COVID-19 pandemic. Furthermore, knowledge and skills about the use of personal protective equipment, biomedical waste management and laundry varied. Routine flaws in infection control practices do not generally result in highly visible disease outbreaks but may contribute to ongoing transmission of nosocomial infection.^{6,7} Therefore, a critical review of the available literature related to the COVID-19 outbreak and its appropriate implementation is essential.

This pandemic had resulted in increased hand hygiene awareness in healthcare as well as in community. The centers for disease control and prevention recommended frequent hand washing with soap and water, alternatively hand sanitizer containing 70% alcohol if soap and water are not available.8 To note the percentage of compliance amongst healthcare workers, their hand hygiene practices were observed daily. Active surveillance was difficult due to movement restriction in certain areas of hospital; hence passive surveillance was carried out. Passive surveillance was prevented reporting of higher compliance as per the Hawthorne effect. In present study, it was observed that pandemic led to drastic increase in compliance rate of hand hygiene practices. Majority of healthcare workers had good knowledge and awareness about the prevention protocols. Hand hygiene compliance in intensive care unit and indoor wards of COVID-19 unit were 78.66% and 74.36% whilst compliance in non COVID-19 units was 72.47% and 62.31% respectively. Raised compliance to hand hygiene practices might be due to apprehension amongst healthcare workers and rapid surge in information through social media. Considering many patients being asymptomatic, universal precautions along with hand hygiene should be emphasized.

The second major issue noted during pandemic was biomedical waste management. Government of India did amendments in guidelines to simplify segregation, handling and disposal protocols but still biomedical waste management is a serious concern for healthcare facilities. 9,10 Scenario worsened when piles of personal protective equipment accumulated in the hospital premises during pandemic. Indiscriminate use of PPE ultimately generated huge quantity of waste that were difficult to store and transport with limited resources. Central pollution control board (CPCB) published guidelines for management of waste generated during treatment and diagnosis of COVID-19 patients. 11 Based on guidelines, hospital policy was revised to prevent contamination and transmission of viruses. Separate bins were placed for disposing gowns at each floor. Designated area created at each floor for donning and doffing of PPE. All used disposable PPE were discarded in yellow bag. At COVID-19 units, all yellow bags were sprayed with 1% sodium hypochlorite and autoclaved as per the Maharashtra Pollution Control board guidelines. separate vehicle was used by BMW treatment facility for transportation of biomedical waste generated in COVID-19 facility. While, policy was not revised at non COVID-19 units. In present study, it was observed that compliance to revised policy at COVID-19 unit were 85.20% and 71.49% in intensive care unit and ward respectively. While at non COVID-19 unit were 76.38% and 68.11% respectively. Lower compliance at non COVID-19 units might be due to new staff and mixing of biomedical waste. Institutional infection prevention and control team should conduct regular training of all healthcare workers for biomedical waste management and monitor the practices because stringent observation and adherence to policy will ensure better handling of waste.

During pandemic, world health organization and Government of India published guidelines regarding rational use of PPE but all healthcare settings were experiencing high demand of PPE from all categories of HCWs. 12,13 To prevent misuse of PPE, cloth gowns were given to healthcare workers of non-critical and low risk areas based on level of exposure. At the end of duty shift, all gowns were disposed in dedicated bins located at each floor. As cloth gowns being used, linen washing was another issue. Therefore, instructions were given to use 1% sodium hypochlorite instead of alcohol-based quaternary ammonium compound, which was used routinely.

Hence, all gowns were dipped in freshly prepared sodium hypochlorite solution for 30 minutes followed by further washing and drying. It was observed that compliance at COVID-19 unit were 85.20% and 58.22% in intensive care unit and ward respectively. While at non COVID-19 unit were 80.11% and 66.58% respectively. The main reason was unavailability of staff and refusal for washing linen generated from COVID-19 units. The major drawback observed after revision of policy was the reduced durability of fabric and colour fading. To prevent wear and tear of fabric, concentration of sodium hypochlorite was further lower down tom 0.01%.

Donning and doffing practices were poor amongst all healthcare workers, hence multiple trainings were conducted. Risk of contamination can occur during any procedural step.¹⁴ Incorrect removal technique, improper handling and disposal can expose healthcare workers. 15,16 Since continuous monitoring of donning and doffing practices was difficult, senior ward in charge were instructed to monitor practices of their staff. It was observed that compliance rate at COVID-19 unit was 86.73% and 66.33% at intensive care unit and indoor ward respectively. However, at non COVID-19 unit, it was 65.22% and 57.60%. Reason might be due to impatience and severe exhaustion after wearing continuously for long hours. Such practical challenges were difficult to resolve but maintaining uniformity in the institutional guidelines should be prioritized in pandemic crisis.

Hospital environment acts as a reservoir for many potential pathogens and there is documented evidence that environmental cleaning reduces the rates of healthcare associated infections. ¹⁷ Hospital environment as a source of transmission is often overlooked in practice. ¹⁸ As per the guidelines released, surface cleaning was done by sodium hypochlorite. Environmental samples were taken from critical care areas as well as from indoor wards. SARS-CoV-2 viruses were recovered from nurse's station and doffing area of non COVID-19 unit. The reason might be inappropriate cleaning of these areas and asymptomatic carriers. Contamination on surfaces, especially frequently touched surfaces by multiple people is one of the major route of spreading infection. Frequently touched surfaces must be identified

and regularly disinfected to reduce the risk of infection. Precautions should be taken by health-care settings to prevent the potential spread of COVID-19.

In present study, infection prevention practices of two different units were noted and it was observed that compliance was improved with due consideration of practical challenges. The differences observed between two units might be due to the infrastructure, sample size and study participants. Other possible reason might be due to differences in training of healthcare workers. Present study had limitations that observations were done over the period of one month only. Continuous monitoring required for observing the trends in infection prevention practices. Second limitations were that inability to observe all healthcare worker son daily basis. Those who are on leave or resigned were excluded from the study. Audits were done by passive surveillance, hence limited observations were recorded.

CONCLUSION

Present study focuses on infection prevention practices of healthcare workers during COVID-19 pandemic. Awareness of healthcare workers about infection prevention, hospital environment, and usage of personal protective equipment play a key role to curtail transmission even at non-COVID-19 facility. Constant efforts from hospital administration and hospital infection prevention committee required. Enforcement of existing laws on infection prevention at work places with continuous monitoring helps to improve the standards.

ACKNOWLEDGEMENT

Authors are thankful to hospital administration and all healthcare workers for support.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

REFERENCES

- 1. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19-19) outbreak. J Autoimmun. 2020;102433.
- 2. Seto WH, Tsang D, Yung RW. Effectiveness of precautions against droplets and contact in prevention of nosocomial transmission of severe acute respiratory syndrome (SARS). Lancet. 2003;361:1519-20.
- 3. Varia M, Wilson S, Sarwal S. Investigation of a nosocomial outbreak of severe acute respiratory syndrome (SARS) in Toronto, Canada. CMAJ. 2003; 169:285-92.
- 4. McDonald LC, Simor AE, Su I-J. SARS in healthcare facilities, Toronto and Taiwan. Emerg Infect Dis. 2004;10:777-81.

- Simor AE, Su I-J. SARS in healthcare facilities, Toronto and Taiwan. Emerg Infect Dis. 2007;5:752-9.
- 6. Wang D, Shang D, Wang W. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. JAMA. 2020;323:1061-9.
- Strategies of personal protective equipment to prevent self-contamination in the health care setting. Am J Infect Control. 2019;47:534-9.
- 8. Infection control in healthcare personnel: infrastructure and routine practices for occupational infection prevention and control services. 2019. Available at: https://www.cdc.gov/infectioncontrol/guide lines/healthcare-personnel/index.html. Accessed on 20 March 2021.
- 9. Forest and Climate Change, Government of India. Biomedical Waste Management Rules-2016. Available at: http://www.indiaenvironmentportal.org.in/files/file/BMW%20Rules,%20 2016.pdf. Accessed on 20 March 2021.
- 10. Ministry of Environment, Forest and Climate Change, Government of India. Biomedical Waste Management (Amendment) Rules-2018. Available at: http://www. indiaenvironmentportal.org.in/files/file/Bio%20medic al%20waste%20management%20(amendment)18384 7. Accessed on 20 March 2021.
- 11. Guideline for quarantine facilities COVID-19. New Delhi; 2020. Available at: https:// ncdc.gov.in/Write ReadData/1892s/90542653311584546120. Accessed on 20 March 2021.
- 12. Rational use of personal protective equipment (PPE) for coronavirus disease (COVID-19). Available at: https://www.who.int/publications-detail-redirect/rational-use-of-personal-protective-equipment-for-coronavirus-disease-(covid-19)-and-considerations-during-severe-shortages. Accessed on 20 March 2021.

- Covid-419 infection. Available at: https://apps.who.int/iris/bitstream/handle/10665/331498/ WHO-2019-nCoV-IPCPPE_use-2020.2-eng.pdf. Accessed on 20 March 2021.
- 14. Novel Coronavirus Disease 2019 (COVID-19-19): Guidelines on Rational Use of Personal Protective Equipment. Available at: https://www.mohfw.gov.in/pdf/GuidelinesonrationaluseofPersonal ProtectiveEquipment. Accessed on 20 March 2021.
- Tomas ME, Kundrapu S, Thota P. Contamination of health care personnel during removal of personal protective equipment. JAMA Intern Med. 2015;175: 1904-10.
- 16. Kang J, O'Donnell JM, Colaianne B. Use of personal protective equipment among health care personnel: results of clinical observations and simulations. Am J Infect Contro.l 2017;45:17-23.
- 17. Cleaning and disinfection of environmental surfaces in the context of COVID-19.Interim Guidance. Available at: https://www.who.int/publications/i/item/cleaning-and-disinfection-of-environmental-surfaces-inthe-context-of-covid-19. Accessed on 20 March 2021.
- 18. Dancer SJ. The role of environmental cleaning in the control of hospital acquired infection. J Hosp Infect. 2009;73:378-85.

Cite this article as: Patel K, Purusottaman S, Carval T, Narvekar L. Compliance to infection prevention and control practices for prevention of SARS-CoV-2 transmission at tertiary care hospital in North Mumbai. Int J Community Med Public Health 2021;8:4837-41.