



SARS-COV-2 SEROPREVALENCE AMONG EMERGENCY PROVIDERS AND THE IMPORTANCE OF PERSONAL PROTECTIVE EQUIPMENT.

General Medicine

Tuong Pham	MD, Department of Emergency Medicine, Valley Health System, 500 N Rainbow Blvd, STE 203 Las Vegas, NV 89107 USA.
Michael Doctor	MD, Envision Physician Services, 500 N Rainbow Blvd, STE 203 Las Vegas, NV 89107 USA. Department of Emergency Medicine, Valley Health System, 500 N Rainbow Blvd, STE 203 Las Vegas, NV 89107 USA.
Ryliezl Abby Reyes	Touro University Nevada, College of Osteopathic Medicine, 874 American Pacific Dr, Henderson, NV 89014 USA
Caroline Runco	Touro University Nevada, College of Osteopathic Medicine, 874 American Pacific Dr, Henderson, NV 89014 USA.
Alberto Hazan	MD, Envision Physician Services, 500 N Rainbow Blvd, STE 203 Las Vegas, NV 89107 USA. Department of Emergency Medicine, Valley Health System, 500 N Rainbow Blvd, STE 203 Las Vegas, NV 89107 USA.
Patrick Olivieri*	MD, Envision Physician Services, 500 N Rainbow Blvd, STE 203 Las Vegas, NV 89107 USA. Department of Emergency Medicine, Valley Health System, 500 N Rainbow Blvd, STE 203 Las Vegas, NV 89107 USA.*Corresponding Author

ABSTRACT

Background: Healthcare workers (HCWs) have elevated exposure risks to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). However, there is limited published information regarding the transmission rate and the seroconversion among HCWs. The goals of this study are to determine the seroprevalence among emergency providers and the correlation between working hours and utilization of personal protective equipment with the likelihood of seroconversion.

Methods: This prospective study evaluated Emergency Department physicians and advanced practice providers, who had been tested for SARS-CoV-2 IgG serology, at 10 different hospitals in the location area. An anonymous survey was sent to the Emergency Department providers via email inquiring about the following: results of serology and/or nasopharyngeal testing, the testing site used, the presence or absence of COVID-19 symptoms, utilization of personal protective equipment (PPEs), exposure to potential COVID-19 patients, and average clinical hours since March.

Results: 43 participants responded to the survey. 3 had positive SARS-CoV-2 antibody or viral tests indicating exposures to COVID-19 despite utilization of various types of PPE. There was a surprisingly high number of HCWs treating known/suspected COVID-19 patients without proper PPE (18.6%). 21 (48.8%) HCWs routinely wore an N-95 mask, 11 (25.6%) used a powered air-purifying respirator (PAPR), 6 (14%) wore surgical masks, and 5 (11.6%) used elastomeric face respirators. None of the COVID-19 positive HCWs used a PAPR while treating known or suspected COVID-19 patients.

Conclusion: Our knowledge regarding the complications related to SARS-CoV-2 infection post-acute phase remains limited. Our data suggest PAPR use may be protective compared to other PPE modalities. There can be unanticipated long-term morbidities that result from an infection with SARS-CoV-2. Therefore, frontline HCWs, who have an inherently elevated exposure to this virus, must use PPE and maintain vigilance while treating patients, regardless of the presence of COVID-19 symptoms.

KEYWORDS

SARS-CoV-2, COVID-19, seroprevalence, Emergency department, personal protective equipment

1. BACKGROUND

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is currently a global health emergency. As of August 9th, 2020, the US had the highest number of confirmed cases and deaths related to coronavirus disease (COVID-19) worldwide, 4,974,959 and 161,284, respectively.¹ During the same period, location reported 55,644 confirmed cases and 977 deaths, with 86% of both cases and deaths recorded within location, the most populous county in the state.² Transmission rate varies between regions and is greatly affected by the population density and use of infection prevention and control measures in healthcare facilities.³ Healthcare workers (HCWs) have elevated exposure risks; however, there is limited published information regarding the transmission rate, seroconversion among HCWs, or the efficiency of various PPE against Covid-19. Two large case series studies in China and the Netherlands demonstrated a low infection rate among HCWs (1.1% and 0.89%, respectively) using SARS-CoV-2 RNA oropharyngeal swabs.^{4,5} Emerging studies on the prevalence of IgG antibodies to SARS-CoV-2 in all Emergency Department showed a significantly higher rate of IgG seroconversion at 5.6 - 36%.^{6,7} There is a lack of high quality studies to guide PPE choice for respiratory infections.⁸⁻⁹ Recent studies in China demonstrated a low infection rate of Covid-19 in HCWs who performed intubation if proper PPE were utilized.^{10,11} The primary objective of this study was to determine the prevalence of seroconversion among emergency providers in location. The secondary objectives are to determine if there is a correlation between the number of hours worked and

personal protective equipment worn with the likelihood of seroconversion.

2. METHODS

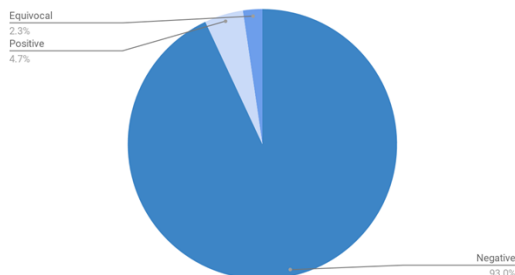
We evaluated Emergency Department emergency providers at 10 different hospitals in location. These hospitals treat a socioeconomically diverse patient population and are distributed throughout the location area. Free SARS-CoV-2 IgG testing was offered to all ED physicians and advanced practice providers. To be included, providers must have worked clinically since March when the first coronavirus case was confirmed in location. An anonymous survey was sent via email in June, 2020 to all ED providers who had been tested for SARS-CoV-2 IgG serology, which inquired about the following: results of serology and/or nasopharyngeal testing, the testing site used, the presence or absence of COVID-19 symptoms, utilization of personal protective equipment (PPEs), exposure to potential COVID-19 patients, and average clinical hours worked since March.

3. RESULTS

Survey was sent to 150 ED physicians and advanced practice providers. 43 participants responded to the survey. 2 (5%) HCWs tested positive for SARS-CoV-2 IgG antibodies, 1 (2%) HCW had an equivocal result, and 40 (93%) tested negative. Both providers who seroconverted denied having symptoms of COVID-19. The HCW with equivocal results for antibody serology was the only provider that

tested positive for COVID-19 via nasopharyngeal swab during this period.

Figure 1. IgG Serology Test Results



HCWs received testing at Quest (72.1%), LabCorp (9.3%), medical facilities (9.3%), and others (9.3%). 21 (48.8%) HCWs wore an N-95 mask, 11 (25.6%) used a powered air-purifying respirator (PAPR), 6 (14%) wore surgical masks, and 5 (11.6%) used elastomeric face respirators. Some participants (11.6%) reported exposures outside of the hospital (Table 1), and none of the HCWs who tested positive for COVID-19 reported having these exposures. Of those who tested positive for COVID-19, two wore N95 respirators and one used an elastomeric respirator while treating known or suspected COVID-19 patients.

Table 1. COVID-19 test result by use of PAPR versus use of Other PPE

Test Results \ Types of PPE used while treating known or suspected COVID-19 patients	PAPR	Other PPE
Positive	0 (0%)	3 (7%)
Negative	8 (18.6%)	32 (74.4%)

Table 2. COVID-19 Exposures

	Yes	No
Had exposure to confirmed COVID-19 case outside the hospital	5 (11.6%)	38 (88.4%)
Had exposure to suspected or confirmed COVID-19 patient while not wearing PPE	8 (18.6%)	35 (81.4%)

11 (25.6%) HCWs worked for <100 hours per month, 22 (51.2%) worked 100-120 hours per month, 8 (18.6%) worked 120-150 hours per month, and 2 (4.7%) worked 150-180 hours per month. There is one positive case for each of the categories of <100, 120-150, and 150-180 working hours.

4. DISCUSSION

There are 3 participants with positive SARS-CoV-2 antibody or viral tests, indicating exposures to COVID-19 despite utilization of various types of PPE. There is a surprisingly high number of HCWs treating known/suspected COVID-19 patients without proper PPE. This could be due to the knowledge learned of COVID-19 symptoms, which were unknown during early encounters. Patients with a subclinical or mild form of the disease may also present to the ED for unrelated complaints, which can distract HCWs from using proper PPE. Our findings highlight the increased exposure risks to COVID-19 among HCWs during a pandemic and further emphasize the importance of proper PPE. Consistent protection for HCWs is vital in providing a safe working environment to care for COVID-19 patients.

Of note, none of the COVID-19 positive HCWs used a PAPR while treating known or suspected COVID-19 patients (Table 2). Theoretically, a PAPR is more protective due to its ability to filter smaller droplets and provides full face coverage that minimizes the failure rate compared to other types of PPE. While this finding is not statistically significant, we believe this is due to the low number of participants. A PAPR is possibly more effective at protecting against COVID-19; however, further research is required on this topic.

There does not appear to be a correlation between serology results and hours worked. Although many providers reported working less than

full-time, this is largely due to decreased staffing levels rather than provider preference. The low seroconversion rate among asymptomatic patients could be a contributing factor since most participants did not report any symptoms. As seroconversion can take weeks, our serology results could also be falsely low given the unknown time between symptoms and testing in our participants.

5. LIMITATIONS

This study has a few limitations that warrant discussion. The relatively small sample size, comprising only 43 HCWs, may not accurately represent the overall ED HCW population in the location area. There was no confirmed timeline between the onset of symptoms and the testing date. The serology results could be falsely low given the unknown time between symptoms and testing in our participants. Although testing was predominantly performed at Quest Diagnostic and Labcorp (81.3%), which use immunoassays with reliable sensitivity and specificity of 99-100%, we were unable to confirm the quality of the tests at the other sites.

6. CONCLUSION

Since the emergence of COVID-19, our understanding of this novel virus has expanded, yet our knowledge regarding its complications post-acute phase remains limited. An infection with SARS-CoV-2 can lead to unanticipated long-term morbidities. Therefore, frontline healthcare workers must use proper personal protective equipment while treating patients regardless of the presence of COVID-19 symptoms to prevent infection. The health and safety of frontline healthcare workers are vital to providing sustainable care for patients in the current pandemic.

7. ACKNOWLEDGEMENTS:

Not applicable

8. LIST OF ABBREVIATIONS:

ED: emergency department

COVID-19: coronavirus disease 2019

HCW: healthcare workers

PAPR: powered air-purifying respirator

PPE: personal protective equipment

SARS-CoV-2: severe acute respiratory syndrome coronavirus 2

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