Serum IgG Antibody Testing Against SARS-CoV-2 in Healthcare Workers

WVUVedicine

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ABSTRACT

Background: With the COVID-19 pandemic, many changes were made in healthcare institutions including but not limited to canceling elective surgeries, limiting face-toface clinic visits, and implementing visitor restrictions. Phased reopening began at West Virginia University (WVU) Medicine on May 25, 2020. While preparing for transition, concern was raised regarding potential for more employee exposures to persons with SARS-CoV-2 infection. In West Virginia (WV), we did not get the predicted surge of SARS-CoV-2. Current cumulative percent positivity for SARS-CoV-2 PCR in WV is 2332 positives of 133,142 tests (1.75%). We provided appropriate personal protective equipment (PPE), including controlled air purifying respirators (CAPRS) for all healthcare workers (HCW) caring for persons with suspected or confirmed COVID-19 from the beginning. Policies requiring masks for all HCW and patients took effect on March 27, 2020 and April 29, 2020, respectively. We hypothesized that due to appropriate PPE use there would be no difference in SARS-CoV-2 antibody positivity in HCW working in high versus low risk areas.

Methods: Serum samples from 1042 randomly selected HCW across 4 WVU Medicine hospitals, ranging from 170 to 690 beds with 121 cumulative SARS-CoV-2 PCR positive patients at the time of the study, were tested for SARS-CoV-2 IgG between May 26, 2020 and June 5, 2020. Physicians, nurses, and respiratory therapists were characterized as high or low risk based on work location. Environmental services (EVS) workers were included but not risk-stratified. A questionnaire was used to obtain information on demographics, chronic medical conditions, symptoms, and exposures.

Results: SARS-CoV-2 lgG was positive in 9 of 1042 (0.86%) randomly selected HCW. Seroprevalence was lower in high risk 5/835 (0.60%) versus low risk 4/176 (2.27%) group. This was not statistically significant. No EVS workers tested positive 0/31 (0%). Of 9 HCW who tested positive, 2 had previously tested positive for SARS-CoV-2 PCR.

Conclusions: SARS-CoV-2 IgG seroprevalence in a large sample of HCW across 4 WVU Medicine hospitals was low (0.86%). Low seroprevalence among HCW in high risk areas may be related to appropriate PPE use. Seroprevalence in HCW not caring for patients with COVID-19 could be from community or other inadvertent exposure.

BACKGROUND

- SARS-CoV-2, a novel coronavirus, emerged in China in December 2019 and resulted in COVID-19, an acute respiratory disease declared a pandemic on March 11, 2020
- Transmissibility during asymptomatic or mildly symptomatic infection, worldwide travel, and absence of prior SARS-CoV-2 exposure contributed to rapid spread to US



Decreasing hospital capacities Canceling surgical procedures Reducing face-to-face visits Implementing visitor restrictions

- Many changes were made in healthcare institutions
- WVU Medicine is the affiliated academic medical system of WVU
- WVU Health System, its largest component, consists of 14 hospitals, provides management services to 6 additional hospitals, and includes 5 institutions

BACKGROUND

- Appropriate PPE, including CAPRS for all HCW caring for persons with suspected or confirmed COVID-19, was provided from pandemic onset
- Stay at Home order instructing nonessential employees to refrain from going to work was issued by Governor of WV March 24, 2020
- Policies requiring masks for all HCW and patients were implemented March 27, 2020 and April 29, 2020, respectively
- While preparing for WVU Medicine's phased reopening, which began May 25, 2020, concern was raised regarding potential for increased employee exposures to persons with SARS-CoV-2
- WV, a rural state, did not experience the predicted surge of SARS-CoV-2

SARS-CoV-2 PCR **Cumulative Percent Positivity:** 2332 positives/133,142 tests (1.75%)

- FDA emergency use authorization for serologic tests began April 15, 2020
- We hypothesized that due to appropriate PPE, there would be no difference in SARS-CoV-2 antibody positivity in HCW working in high vs. low risk areas

METHODS



- Multicenter cross-sectional study at 4 WVU Medicine Hospitals in WV COVID-19 hotspots with 121 cumulative SARS-CoV-2 PCR positive patients
- Total of 2400 randomly selected physicians, nurses, respiratory therapists, and EVS workers invited undergo SARS-CoV-2 IgG antibody testing
- SARS-CoV-2 IgG assay by Abbott used to detect IgG antibodies against nucleocapsid protein
- Physicians, nurses, and respiratory therapists classified as high or low risk based on work location

High risk Intensive care units, stepdown units, operating rooms, emergency departments Floor units, pediatrics units, ambulatory settings, remote locations Low risk EVS workers not risk-stratified due to multiple work locations

- Confidential online questionnaire used to obtain information about demographics, chronic medical conditions, symptoms, and exposures
- Comparisons between high and low risk groups were made using Pearson's chisquare or Fisher's exact test

	RESULTS		
	Positive	Negative	Total
J.W. Ruby Memorial Hospital	2 (0.40%)	497 (99.60%)	499
United Hernital Conter	2(0,000/)	222(00.110/)	224
United Hospital Center	2 (0.89%)	222 (99.11%)	224
Berkeley Medical Center	5 (2.59%)	188 (97.41%)	193
Camden Clark Medical Center	0 (0.00%)	126 (100.00%)	126
All Hospitals	9 (0.86%)	1033 (99.14%)	1042
	Positive	Negative	Total
			025
HIGH KISK	5 (0.60%)	830 (99.40)	835
Low Risk	4 (2.27%)	172 (97.73%)	176
EVS Workers	0 (0.00%)	31 (100.00%)	31
All HCW	9 (0.86%)	1033 (99.14%)	1042
	High Risk	Low Risk	P-value
Responded to Survey			<0.001
Yes	649 (77.72%)	115 (65.34%)	
Age in Years			0.055
< 30	205 (32.39%)	25 (22.12)	
30-39	185 (29.23%)	30 (26.55%)	
40-49	135 (21.33%)	29 (25.66%)	
50-59	69 (10.90%)	15 (13.27%)	
50-59 ≥ 70	30 (5.09 %) 2 (0.47%)	13 (11.50%)	
2 /U Gender	3 (0.47%)	1 (0.89%)	0 0 2 8
Male	178 (28 12%)	20 (17 70%)	0.020
Female	455 (71.88%)	93 (82,30%)	
Race/Ethnicity	100 (7 2.0070)	00 (02.0070)	0.411
American Indian/Alaskan	8 (1.27%)	1 (0.89%)	
Asian/Pacific Islander	18 (2.85%)	7 (6.20%)	
Black	5 (0.79%)	0 (0.00%)	
White	579 (91.76%)	103 (91.15%)	
Hispanic	5 (0.79%)	1 (0.89%)	
Other	16 (2.54%)	1 (0.89%)	
Chronic Disease Present			
Lung	28 (4.47%)	14 (12.61%)	0.002
Diabetes	19 (3.01%)	6 (5.36%)	0.248
Heart	11 (1.75%)	0 (0.00%)	0.385
Hypertension	86 (13.65%)	22 (20.00%)	0.106
Kidney	2 (0.32%)	0 (0.00%)	1.000
Liver		0(0.00%)	1.000
Ever/Cough/Ducance	22 (3.51%)	4 (3.54%)	1.000
Ves	200 (21 25%)	27 (22 7/10/)	0.913
	200 (31.03%)	57 (52.74%)	<0.001
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DISCUSSION

- SARS-CoV-2 IgG antibodies typically develop 1 to 3 weeks after infection
- Antibody responses against SARS-CoV-2 have not been proven to confer immunity • The aim of this study was to determine SARS-CoV-2 seroprevalence in HCW across
- 4 WVU Medicine Hospitals and assess if it differed in high vs. low risk groups • SARS-CoV-2 IgG antibodies were detected in 9/1042 (0.86%) randomly selected HCW; of HCW who tested positive, 2/9 (22.22%) previously had positive SARS-CoV-2 PCR
- While not statistically significant, seroprevalence was lower in high risk 5/835 (0.60%) vs. low risk 4/176 (2.27%) HCW; EVS workers were excluded from analysis due to low participation and absence of risk stratification
- Compared to those in low risk group, HCW in high risk group were 7.3X more likely to be exposed to a person with confirmed COVID-19
- In a voluntary seroprevalence study across 52 sites in greater New York City area, SARS-CoV-2 antibodies (all assays included IgG) were detected in 5523/40,329 (13.7%) HCW, with seroprevalence rate approximating that in randomly tested adults in New York (14%)
- In a smaller seroprevalence study at a tertiary hospital in Germany, SARS-CoV-2 IgG antibodies were detected in 5/316 (1.6%) HCW with statistically insignificant lower seroprevalence in high risk 3/244 (1.2%) vs. low risk 2/37 (5.4%) group
- In a larger seroprevalence study at a tertiary hospital in Belgium, SARS-CoV-2 IgG antibodies were detected in 197/4125 (6.4%) HCW with clinical care, work during lockdown phase, care for COVID-19 positive patients, and exposure to COVID-19 positive co-workers not found to be associated with seroprevalence
- In a larger study in public hospitals and outpatient services in Italy, SARS-CoV-2 IgG antibodies were detected in 377/5444 (6.9%) HCW with statistically significant lower seroprevalence in those with limited/indirect contact (5.2%) vs. close contact (7.5%) with COVID-19 positive patients
- To our knowledge, our study is the largest seroprevalence study with riskstratified HCW presented in US to date
- Data may suggest availability of and adherence to appropriate PPE at WVU Medicine

CONCLUSIONS

- Overall SARS-CoV-2 IgG seroprevalence in a large sample of HCW across 4 WVU Medicine Hospitals was low (0.86%)
- Low seroprevalence among HCW in high risk areas may be from appropriate PPE use
- Seroprevalence in HCW not caring for patients with COVID-19 may be from community or other inadvertent exposure
- Informing healthcare institutions and HCW about SARS-CoV-2 seroprevalence as hospital capacities, surgical procedures, and face-to-face visits increase may provide useful framework

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