

Prevalence of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Asymptomatic Infections in 2 Large Academic Health Systems in Wisconsin

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Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) asymptomatic infections may play a critical role in disease transmission. We aim to determine the prevalence of asymptomatic SARS-CoV-2 infection at 2 hospital systems in 2 counties in Wisconsin. The SARS-CoV-2 prevalence was 1% or lower at both systems despite the higher incidence of coronavirus disease 2019 (COVID-19) in Milwaukee County.

Keywords. COVID-19; SARS-CoV-2; asymptomatic; novel coronavirus; n-CoV.

The coronavirus disease 2019 (COVID-19) pandemic, caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is responsible for more than 2 million COVID-19 cases in the United States [1]. As of June 23, 2020, Dane and Milwaukee counties in Wisconsin had reported a COVID-19 rate of 215 and 1085.2 cases per 100 000 people, respectively [2]. Some studies suggest that asymptomatic infections could be responsible for amplifying the spread of the disease [3]. However, data regarding the prevalence of asymptomatic infections and their impact on transmission are still scarce. This study aims to determine the prevalence of asymptomatic SARS-CoV-2 infection at 2 hospital systems in 2 counties with markedly different rates of COVID-19.

METHODS

This study was performed at Froedtert Health (879-bed system, Milwaukee, WI) and University of Wisconsin Health (UW Health; 1044-bed system, Madison, WI), the only 2 academic medical centers

in the state. During the fiscal year 2019, there were 4 139 602 outpatient visits and 113 866 admissions at both health systems. Since early April 2020, both health systems implemented SARS-CoV-2 protocols on all hospitalizations, on all patients scheduled for elective surgeries, including deliveries (at Froedtert Health only), or among all patients with known SARS-CoV-2 exposure in the absence of symptoms. Nasopharyngeal (Froedtert Health and UW Health) and oropharyngeal (Froedtert Health only) swab specimens were collected by a healthcare professional, and reverse transcription-polymerase chain reaction was performed in the clinical laboratories.

Testing Methodology

Combined nasopharyngeal/oropharyngeal swab specimens or nasopharyngeal specimens only were collected at Froedtert Health and UW Health, respectively, according to standard institutional procedures. A nasopharyngeal swab was inserted into the nose until it reached the nasopharynx, rotated for 10 seconds, and removed. The oropharyngeal swab was collected by swabbing the poster pharynx and tonsillar areas; the oropharyngeal swab was combined with the nasopharyngeal swab into a single tube of transport media and sent to the laboratory. Specimens were promptly tested using either the ThermoFisher TaqPath SARS-CoV-2 Assay or the Roche Cobas 6800 SARS-CoV-2 Assay (at Froedtert Health) or the Hologic Panther Fusion SARS-CoV-2 Assay (at UW Health), all according to the manufacturer's instructions for use under Food and Drug Administration emergency use authorization.

Demographic characteristics were retrospectively assessed from electronic medical records. An asymptomatic infection was defined as the presence of a positive SARS-CoV-2 test in the absence of any of the following symptoms: fever or chills,

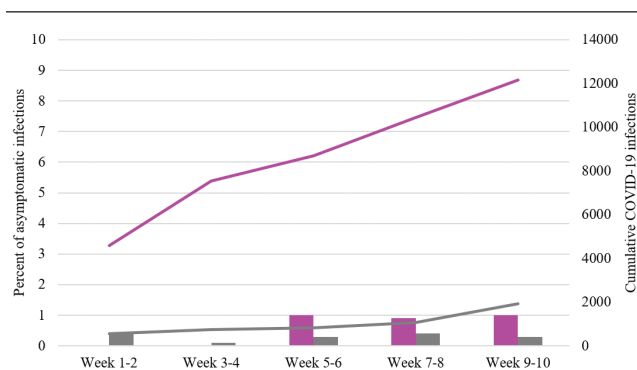


Figure 1. Asymptomatic infections by health system and cumulative cases by county. Bars: percent of asymptomatic infections (pink bars: Froedtert Health; gray bars: University of Wisconsin Health). Lines: cumulative COVID-19 infections (pink line: Milwaukee County; gray line: Dane County) as per the Wisconsin Department of Health Services (<https://www.dhs.wisconsin.gov/covid-19/county.htm>), Week 1 for Froedtert Health started on 23 April, 2020; week 1 for University of Wisconsin Health started on 5 April, 2020. Abbreviation: COVID-19, coronavirus disease 2019.

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Table 1. Demographic Characteristics of SARS-CoV-2 Asymptomatic Infected Patients Stratified by Health System

	Froedtert Health					University of Wisconsin Health					Total	P Value ^a
	Weeks 1-2	Weeks 3-4	Weeks 5-6	Total	Weeks 1-2	Weeks 3-4	Weeks 5-6	Total	Week 9			
Total number of SARS-CoV-2 tests performed, n	623	1830	1529	3982	722	1317	2018	2479	1136	7672	-	
SARS-CoV-2 positive tests, n (%)	6 (1)	17 (0.9)	15 (1)	38 (1)	3 (0.4)	1 (0.08)	6 (0.3)	10 (0.4)	3 (0.3)	23 (0.3)	.001	
Demographic characteristics of SARS-CoV-2-positive patients												
Age, y, median (IQR)	65 (38)	35 (17)	56 (36)	42 (37)	35 (29)	34 (0)	49 (22)	62 (44)	46 (21)	46 (38)	.765	
Gender: male, n (%)	1 (17)	7 (41)	8 (53)	14 (37)	0	0	3 (50)	6 (60)	1 (33)	11 (48)	.397	
Race, n (%)												
White	2 (33)	5 (29)	10 (67)	17 (45)	3 (100)	1 (100)	3 (50)	9 (90)	3 (100)	19 (83)	.003	
African-American/Black	3 (50)	9 (53)	4 (27)	16 (42)	0	0	2 (33)	1 (10)	0	3 (13)	.017	
Other	1 (17)	3 (18)	1 (7)	5 (13)	0	0	1 (17)	0	0	1 (4)	.262	
Ethnicity, n (%)												
Hispanic	0	2 (12)	2 (13)	4 (11)	1 (33)	0	1 (17)	1 (10)	0	3 (13)	.765	
Non-Hispanic	6 (100)	15 (88)	13 (87)	34 (89)	2 (67)	1 (100)	5 (83)	9 (90)	3 (100)	20 (87)	.765	
Reason for testing, n (%)												
Admitted for surgical procedure	0	6 (35)	3 (20)	9 (24)	1 (33)	1 (100)	3 (50)	5 (50)	1 (33)	11 (49)	.051	
Emergency department admission	6 (100)	5 (29)	7 (47)	18 (47)	1 (33)	0	2 (33)	3 (30)	1 (33)	7 (30)	.192	
Pregnant women	0	3 (18)	1 (7)	4 (11)	1 (33)	0	0	0	0	1 (4)	.393	
History of exposure	0	1 (6)	4 (27)	5 (13)	0	0	0	2 (20)	1 (33)	3 (13)	.989	
Employer requirement	0	2 (12)	0	2 (5)	0	0	0	0	0	0	.263	
Other	0	0	0	0	0	0	1 (17)	0	0	1 (4)	.195	
Comorbidities, n (%)												
Diabetes	3 (50)	2 (12)	3 (20)	8 (21)	0	0	1 (17)	1 (10)	2 (67)	4 (17)	.727	
Hypertension	4 (67)	4 (24)	5 (33)	13 (34)	1 (33)	0	2 (33)	4 (40)	0	7 (30)	.760	
Obesity	3 (50)	7 (41)	5 (33)	15 (39)	1 (33)	0	1 (17)	1 (10)	0	3 (13)	.028	
Asthma	2 (33)	3 (18)	1 (7)	6 (16)	0	0	2 (33)	0	1 (33)	3 (13)	.769	
COPD	1 (17)	0	1 (7)	2 (5)	1 (33)	0	0	0	0	1 (4)	.872	
Active cancer	1 (17)	0	2 (13)	3 (8)	0	1 (100)	1 (17)	3 (30)	0	5 (22)	.047	
Other	5 (83)	7 (41)	10 (67)	22 (58)	2 (67)	0	6 (100)	8 (80)	2 (67)	20 (87)	.017	
Exposure history, n (%)	2 (33)	1 (6)	5 (33)	8 (21)	2 (67)	0	0	3 (30)	1 (33)	6 (26)	.650	
No known exposure but at-risk, n (%)	3 (50) ^{b,c}	2 (12) ^{a,d}	2 (13) ^b	7 (18)	1 (33) ^b	0	2 (33) ^{b,e}	1 (10) ^b	1 (33) ^b	4 (17)	.919	

Week 1 for Froedtert Health started on 23 April, 2020.

Week 1 for University of Wisconsin Health started on 5 April, 2020.

Abbreviations: COPD, chronic obstructive pulmonary disease; IQR, interquartile range; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

^aStatistical significance for SARS-CoV-2-positive test was calculated based on the difference between the total number of tests performed and positive tests. For the demographic characteristics, statistical significance was calculated based on the difference between the total number of SARS-CoV-2-positive tests and the number of events for each variable.

^bLiving in a skilled nursing facility or other assisted living facility.

^cWork as a home care registered nurse.

^dPositive cases at work.

^eOne case where family members had symptoms but were not confirmed cases.

cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea or vomiting, or diarrhea. This study was approved by the institutional review boards at both institutions.

RESULTS

From April 6, 2020, to June 04, 2020, a total of 11 654 asymptomatic patients were tested for SARS-CoV-2, and 61 (0.52%) were positive (Froedtert Health, 38; UW Health, 23). The percentage of positivity did not appear to increase over time (Figure 1). Among the total cohort, the median age was 42, interquartile range 37, and 27 (42%) were men. Demographic characteristics by hospital are shown in Table 1. The majority of positive subjects were white (41/64; 64%) and non-Hispanic (59/64, 88%). Approximately one-third of positive patients (38%) were tested in the emergency department. Hypertension (33%) and obesity (30%) were the most frequent comorbidities among SARS-CoV-2-positive patients. Patients were followed-up 14 days after testing and 7 patients (11.5%) of 61 originally deemed to have asymptomatic infections developed symptoms consistent with COVID-19.

DISCUSSION

During the study period, we observed a low prevalence of asymptomatic SARS-CoV-2 infections in these 2 academic health systems in South Wisconsin. Even though both sites had a prevalence of 1% or less, Froedtert had higher prevalence of asymptomatic infections (1% vs 0.3%; $P < .001$). This low prevalence of asymptomatic infections has been recently reported in other areas with high COVID-19 rates, such as Boston and Philadelphia [4, 5]; however, these 2 studies included pregnant women and children. In contrast, 2 hospitals in New York City

reported a prevalence of SARS-CoV-2 asymptomatic infections of 14% among women admitted for delivery [6]. Our results suggest that the prevalence of asymptomatic infections in individuals undergoing preadmission or preoperative screening may not be predictable based on the incidence of COVID-19 in the region. These data could bring into question the need to screen all asymptomatic patients in certain regions; however, in addition to guiding isolation precautions, these screening tests also serve as sentinel data for changes in the epidemiology of the virus. Our conclusions are hindered because of possible selection bias of the population surveyed. Additionally, rather than asymptomatic infections, these positive results could represent patients who previously experienced COVID-19 and are now long-term shedders. Further studies are needed to determine the interplay between the prevalence of asymptomatic infections and COVID-19 in a region.

Notes

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