Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

What is the rate of COVID-19 infection in a population seeking oral health care?

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ABSTRACT

Background. Although rates of COVID-19 have remained low among US dentists, the authors aimed to determine the risk of there being COVID-19 in patients seeking oral health care.

Methods. The authors performed a retrospective chart review of all emergency department consultations from June 1, 2020, through December 31, 2020. They used Pearson correlation coefficients to compare rates with citywide prevalence ($P < .05$).

Results. The authors located 203 encounters with 149 tests and 10 cases of COVID-19. Cases were strongly correlated with the citywide positivity rate ($r = 0.9147$; $P = .0039$). All patients who tested positive were asymptomatic and afebrile, and one-half (50%) visited a dentist within a week of consultation.

Conclusions. The rate of COVID-19 in a population seeking oral health care reflects the community positivity rate. Asymptomatic or presymptomatic patients pose risks to providers, staff members, and other patients.

Practical Implications. Dentists should remain vigilant during the ongoing COVID-19 pandemic, even with vaccination rollout. The Centers for Disease Control and Prevention maintains an accessible website with easy access to each state's positivity rate and caseload.

Key Words. SARS-CoV-2; COVID-19; dentistry; clinical protocols; diagnostic challenge; disease transmission; emergencies.

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In December 2019, a novel coronavirus was detected in China.[1] On January 8, 2020, the Chinese Center for Disease Control and Prevention announced a novel coronavirus as the causative pathogen, spreading initially from the Huanan Seafood Wholesale Market in Wuhan, China.[1] On January 30, the World Health Organization raised global concerns about the virus[2] and later gave the disease the name COVID-19.[3] The virus soon spread across the globe, and by March 11 the World Health Organization declared COVID-19 a global pandemic.[4] As of January 2021, the world has experienced the first year of the COVID-19 pandemic, with more than 100 million confirmed cases and more than 2 million deaths.[5] By the time of this article's publication, these numbers undoubtedly will have increased.

The transmission of COVID-19 is primarily person to person.[6] The virus can achieve high concentrations in respiratory fluid and saliva and be released in aerosols and droplets—small and large particles, respectively—during coughing, sneezing, and talking, as well as during medical procedures.[5] In addition, the virus that causes COVID-19 may persist on inanimate surfaces for multiple days, although the efficiency of this transmission plays a less important role.[5,7]

A major difficulty that has emerged regarding the high rates of community spread has been the presymptomatic and asymptomatic populations.[8] People who are presymptomatic and asymptomatic may have COVID-19 and spread it to others without any knowledge, and researchers estimate that the incubation period for COVID-19 is approximately 4.6 through 5.1 days.[9-11] Some researchers have suggested that 50% of COVID-19 cases have been contracted from the population of people who are asymptomatic or presymptomatic.[12]

Health care professionals have been a high-risk population during the COVID-19 pandemic, with dental professionals affected during the initial spread of COVID-19 in China, Italy, and other

This article has an accompanying online continuing education activity available at: http://jada.ada.org/ce/home.

countries across the world.[13] Dental professionals regularly perform aerosol-generating dental procedures, and these are a well-recognized source of the transmission of infectious diseases.[14]

In the United States, the American Dental Association and the Centers for Disease Control and Prevention (CDC) have created practice guidelines for dentists.[15,16] A 2020 web-based survey of dental providers in the United States found that 99.7% were using enhanced infection protocols, including various patient-screening questions, temperature checks, disinfection, physical barriers, and masks.[17] The 16.6% of dentists responding to the survey stated they had been tested for COVID-19, and an estimated 0.9% of US dentists have or have had COVID-19.[17] This rate appears to be similar to the rate found in the Netherlands (0.9%) and China (1.1%).[18,19]

Nearly all oral health care in the United States is provided in a private practice setting, and few of these practices have the resources or ability to perform same-day COVID-19 testing for patients or staff members. As practices begin to increase production levels, possible patient-patient or patient-provider transmissions are a growing and valid concern.[20] As national and global trends showed an increasing number of cases during the fall and winter of 2020, the likelihood of transmission in the dental setting may increase, even as the nationwide vaccine program commences.[5]

Dental professionals in oral surgery and hospital-based dentistry are in a position to aid the understanding of risk pertaining to COVID-19 in the dental practice setting. Patients who require emergency oral health care often seek treatment at hospitals and emergency departments (ED) when unable to access care in alternative settings. Many hospital systems have the capabilities to perform routine, rapid COVID-19 testing for patients depending on the protocols and practices in place at each institution.

Oral health care providers have little information on rates of positivity for COVID-19 in the patient population seeking oral health care. We sought to identify the rate of COVID-19 positivity among patients seeking oral health care and compare this rate with the citywide positivity rate, number of tests performed, and number of positive cases in Chicago, Illinois. We performed a retrospective review of all ED consultations at the College of Dentistry at the University of Illinois at Chicago (UIC) from June 2020 through December 2020 to determine the rate of COVID-19 in a population in need of oral health care.

METHODS

To address the research purpose, we performed a retrospective cohort study. The study population was composed of all patients who sought treatment at the UIC ED from June 1, 2020, through December 31, 2020. This project was granted institutional review board exemption by the UIC Office for the Protection of Research Subjects (protocol 2020-1516).

Patients were included in the study if they met the following criteria:

- sought treatment at the UIC ED from June 1 through December 31, 2020;
- received an order for a consultation for oral and maxillofacial surgery service;
- underwent a consultation completed by a member of UIC oral and maxillifacial surgery service.

Exclusion criteria included a consultation request that was made for a patient already admitted to hospital for more than 24 hours.

We identified patients by 2 means. First, we reviewed a consultation log maintained by the UIC Department of Oral and Maxillofacial Surgery. Second, we performed a chart query through the electronic medical record system at the hospital for all notes with the title "consult" or orders with the word "consult." We combined these results and removed duplicate encounters. We conducted hand reviews of all remaining charts for data extraction.

We obtained demographic data (age, sex) from the encounter file at time of consultation. We determined the reason for consultation (infection, trauma, other) from a review of notes and associated procedure codes. Infections included any fascial space abscess, including vestibular abscess. Trauma included all dentoalveolar trauma, as well as fractures of the mandible, maxilla, orbit, or zygomaticomaxillary complex. We grouped the remaining maladies as other. We defined a recent encounter with a community dentist as within 7 days from the time of consultation at UIC, and it had to be clearly identified in the note details. Any discrepancy was discussed with and resolved by another faculty surgeon.

We included COVID-19 testing if the laboratory order was performed within 24 hours from the time of the patient's arriving at the ED. Over 12 months, multiple modalities were used at UIC to

ABBREVIATION KEY

CDC: Centers for Disease Control and Prevention.
ED: Emergency department.
UIC: University of Illinois at Chicago.

Table 1. Patient demographics (N = 203).

CHARACTERISTIC	DATA
Age, Y (Range [Standard Deviation])	41.4 (1-99 [18])
Sex, No. (%)	
Female	106 (52)
Male	97 (48)
Reason for Consultation, No. (%)	
Infection	126 (62.1)
Trauma	39 (19.2)
Other	38 (18.7)
Test Performed, No. (%)	149 (73.3)
Test Result, No. (%)	
Positive	10 (6.7)
Negative	139 (93.3)
Recent Dental Visit, No. (%)	72 (35.5)

determine presence of COVID-19 infection. We included all means of molecular testing, including various nucleic acid amplification tests, polymerase chain reaction tests, and antigen testing on samples from either nasopharyngeal swabs, saliva, or blood.

We reported all testing results as detected or not detected and considered them positive or negative, respectively. We computed descriptive statistics (mean, frequency, range) for each study variable. We performed statistical analysis to measure the association between variables of interest with the Pearson correlation coefficient with a significance level of P value below .05.

RESULTS

After a review of surgical logs and the emergency medical records, we identified 203 consultations that met the inclusion criteria (Table 1). Most patients had infections (62.1%), followed by trauma (19.2%) and other maladies (18.7%). Of the 203 consultations, 149 patients (73.3%) were tested for COVID, and 10 positive test results (6.7%) were identified. Of the 203 consultations, 72 records (35.5%) included a clear description of a recent dental visit, and in 55 (76.4%) of these cases the patients came to the ED with infectious etiology. Other common symptoms included bleeding, temporomandibular joint pain, sialadenitis, and oral lesions.

Table 2 and the figure show the consultations by month from June through December 2020. Table 3 compares our results with the citywide COVID-19 cases and positivity rate in Chicago. Using the Pearson correlation, we found the COVID-19 cases at UIC were correlated significantly with the citywide positivity rate ($r = 0.9147$; $P = .0039$) and total tests performed ($r = 0.8098$; $P = .0273$) and correlated strongly with total cases ($r = 0.7450$) but not significantly ($P = .0547$).

We provide the details for each COVID-19 case at UIC in Table 4. On review, we found that all 10 patients with COVID-19 who sought treatment at the ED were asymptomatic. No patients reported any positive responses to the ED COVID-19 screening examination (for example, constitutional symptoms or recent travel or contacts), and all 10 patients were afebrile. Five of the 10 patients (50%) reported visiting a dental office within 7 days of their visit to the ED, with 2 additional patients stating they had a future dental appointment within 4 weeks to address their symptoms.

DISCUSSION

Our study provides an initial assessment of the risk of there being COVID-19 infection among a population seeking oral health care. Our results show that the risk of there being COVID-19 infection in a population seeking oral health care reflects the current positivity rate in the geographic area of the practice (that is, city, county, or state).

Table 2. Consultations at University of Illinois at Chicago from June through December 2020.

MONTH	EMERGENCY DEPARTMENT CONSULTATIONS, NO.	TESTS PERFORMED, NO. (%)	POSITIVE TESTS, NO. (%)	DENTIST VISIT, NO. (%)
June	20	16 (80.0)	0 (0.0)	8 (40.0)
July	45	34 75.6)	0 (0.0)	10 (22.2)
August	37	24 (64.9)	1 (4.2)	14 (37.8)
September	21	16 (76.2)	0 (0.0)	7 (33.3)
October	42	29 (69.0)	4 (13.8)	19 (45.2)
November	23	16 (69.6)	3 (18.8)	10 (43.5)
December	15	14 (93.3)	2 (14.3)	4 (26.7)
Totals	203	149 (73.4)	10 (6.7)	72 (35.5)

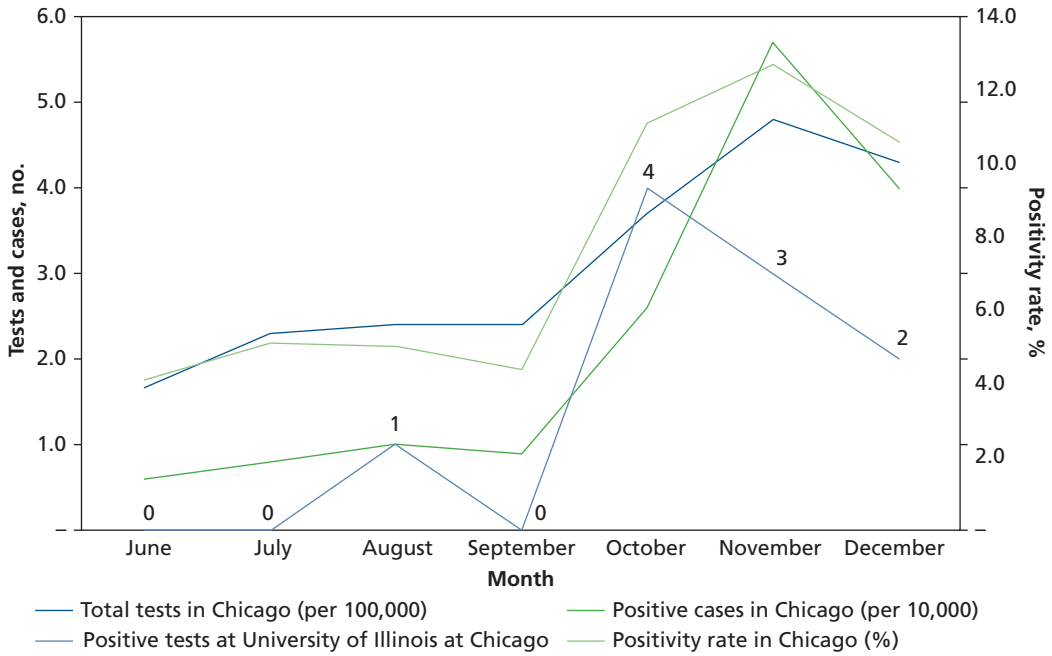

Figure. A month-to-month comparison of the number of COVID-19 tests (dark blue) and cases (dark green) and positivity rate (light green) in Chicago, Illinois, from June through December 2020 compared with the number of positive cases at University of Illinois at Chicago over the same period (light blue).

Understanding the risk of there being infection and the mitigation of that risk are critical to the delivery of oral health care. Oral health care providers must exercise caution as they progress into future stages of this global pandemic and ensure that lessons are cultured for the future. A total of 90% of the COVID-19 cases we detected occurred from October through December 2020 when the average positivity rate in Chicago was over 10% and the citywide number of cases ranged from 26,347 through 57,457. Before this period, from June through September 2020, citywide cases ranged from 6,311 through 9,980 with a positivity rate of 4.1% through 5.1%, and during that time we detected only 1 case of COVID-19 at UIC.

We know of 1 article in 2021 that looked at COVID-19 infections in an asymptomatic population of children seeking oral health care.[21] Lamberghini and colleagues[21] also performed their study at UIC, and they found a positivity rate of 2.3% among 921 children who were tested from May 2020 through August 2020 when the average citywide positivity rate was 5.1% in Chicago.[22] Our study focused on COVID-19 cases in the months after this study, when a marked rise in positivity rate occurred in Chicago. The positivity rate in our cohort was 6.7%, and this reflects the

Table 3. Cases of COVID-19 at University of Illinois at Chicago compared with the citywide rate.

COVID-19 DASHBOARD: CHICAGO, CITYWIDE				
Month	Positivity Rate,* %	Total Tests Performed,† No.	Cases Detected,‡ No.	COVID-19 CASES AT UNIVERSITY OF ILLINOIS AT CHICAGO, NO.
June	4.1	167,123	6,311	0
July	5.1	233,898	8,272	0
August	5.0	237,651	9,980	1
September	4.4	241,189	9,166	0
October	11.1	368,638	26,347	4
November	12.7	484,618	57,457	3
December	10.6	433,536	39,540	2

* $r = 0.9147$; $P = .0039$. † $r = 0.8098$; $P = .0273$. ‡ $r = 0.7450$; $P = .0547$.

Table 4. Details from cases of COVID-19 at University of Illinois at Chicago.

PATIENT	AGE, Y	SEX	MONTH	REASON FOR CONSULTATION	DIAGNOSIS	RECENT DENTAL VISIT	COVID-19 SYMPTOMS	TEMPERATURE, °C
1	30	Male	August	Trauma	Fracture	No	None	36.8
2	29	Male	October	Trauma	Gunshot wound	No	None	37.3
3	34	Female	October	Infection	Fascial space	Yes	None	37.0
4	19	Female	October	Infection	Vestibular	No	None	36.1
5	59	Female	October	Infection	Vestibular	Yes	None	36.8
6	27	Male	November	Infection	Fascial space	Yes	None	37.0
7	27	Male	November	Infection	Fascial space	Yes	None	37.3
8	27	Male	November	Infection	Fascial space	Yes	None	36.5
9	45	Male	December	Infection	Vestibular	No	None	36.5
10	55	Female	December	Other	Cancer	No	None	37.0

rise in cases during the fall and winter of 2020 in Chicago. These findings further emphasize the relationship between the positivity rate in the community and the positivity rate in patients seeking oral health care.

Estrich and colleagues[17] found that 91.1% of dentists reported providing emergency oral health care during the COVID-19 pandemic. Of our own ED cohort, at least one-third of patients had recently been to a dentist. We expect that the actual rate was much higher, given that we relied on a retrospective chart review of provider notes. We did find that among the 10 cases of COVID-19 at UIC School of Dentistry, one-half of the patients had seen a dentist within a week, and 2 others stated they had an appointment within the next month. Many other notes during this review detailed the difficulties patients had with accessing oral health care during the pandemic owing to closures or long waits. Regardless, these data show a shared population moving throughout the community for oral health care.

With the rollout of a nationwide vaccine program, oral health care providers, like most people in the US, likely hope the end of this pandemic is near. However, it is clear from observation of other countries that second and third waves of the virus, and the development of viral variants with possible resistance, are possible, and precautions should remain high.[23] Some studies suggest that resurgence of COVID-19 could extend into 2024.[6] Oral health care providers can apply lessons from this pandemic not only to future pandemics but also to the prevention and mitigation of seasonal pathogens as well. When community spread is high, the risk to oral health care providers, staff members, and patients is also high.

Perhaps the most significant finding of our study is that in all 10 COVID-19 cases, the patients were asymptomatic when they sought treatment in the ED. These patients likely included presymptomatic cases as well as asymptomatic cases. Presymptomatic transmission may account for 44% of COVID-19 transmission, and a study has shown that infectiousness peaks approximately 2 days before symptom onset.[12] In our study, all 10 patients who had COVID-19 were afebrile as well, and they did not report recent contact on screening questionnaires, displaying the importance of universal precautions even with other appropriate measures in place. Studies in 2020 supported this finding, with approximately 70% through 76% of COVID-19—positive patients being afebrile (< 38 °C).[24,25] A more specific clinical finding may be anosmia, or the loss of one's sense of smell.[26]

The March 2020 CDC guidelines to postpone elective procedures led to the closure of many practices. In May through August 2020, more practices reopened and increased patient volumes.[20] However, around November 2020, dentists actually saw a smaller patient volume, perhaps in response to the increased spread of COVID-19 in the fall of 2020.[20] The economic burden of this pandemic is shared.

Although rates of infection among dentists may be low, certainly all practices have had to cope with patients or staff members reporting a recent illness or a positive COVID-19 test. Dealing with these unknown risks to themselves, staff members, and other patients can be frustrating for oral health care providers. Our data show that the risk of encountering a patient with COVID-19 is high when community spread is high and low when community spread is low.

Oral health care providers should be aware of the current COVID-19 status of their geographic area. The CDC maintains an up-to-date COVID-19 map of each state and county in the United States, which provides the number of cases and deaths, as well as a 7-day average rate.[27] Links to each state's public health department are also provided.

The primary limitation of our study is bias from the study population. The demographics and socioeconomic status of patients at a public hospital are not identical to the status at a private dental practice. Our cohort was limited to ED visits and included diagnoses that may be beyond the practice of most general dentists. Even with the inclusion of 7 months of data and 203 patient encounters, we found only 10 cases of COVID-19.

CONCLUSIONS

Dentists should maintain an up-to-date knowledge about the current disease prevalence in their communities. The results of our study show that patients in need of oral health care will have a rate of COVID-19 infection that reflects the rate in the geographic region at that time. ■

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