Scientific Research Report

COVID-19 Morbidity Among Oral Health Professionals in Brazil

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ABSTRACT

Background: We evaluated and compared the cumulative incidence of confirmed COVID-19 cases between oral health professionals and the general population in Brazil.
Methods: Secondary data from notification of laboratory unconfirmed and confirmed cases of COVID-19 in the National data system for 41 epidemiological weeks were analysed and compared between oral health professionals (dentist + oral health technicians/assistants) and the general population. The cumulative incidences of COVID-19 were obtained by the ratio of the total number of confirmed cases to the total Brazilian population or the population of oral health professionals registered with the Federal Council of Dentistry and adjusted by age. The incidences were then compared.
Results: The age-standardised cumulative incidences were 18.70/1000 for oral health professionals and 17.71/1000 for the population, with a ratio of 1.05. The highest incidences were observed in the states of Roraima (67.05/1000), Tocantins (58.81/1000), and Amazonas (58.24/1000). In 14 states, the age-standardised cumulative incidences were higher among oral health professionals than in the general population. There was a decrease in the number of new cases between the 29th and 30th epidemiological weeks in both populations.
Conclusions: COVID-19 infections among oral health professionals was similar to that of the general population. However, the cumulative incidence was 5% higher among oral health professionals, varying among Brazilian states.
Practical implications: Infection control practices might help lower the risk of contamination in dental settings.

Introduction

The coronavirus disease (COVID-19) was declared a Public Health Emergency of International Concern by the World Health Organisation on January 30, 2020. On March 11, COVID-19 was characterised as a pandemic following the disease's rapid spread outside China.[1] In Brazil, the first suspected case of COVID-19 was announced on February 25, 2020, and on March 20, the community transmission of COVID-19 was recognised throughout the Brazilian territory.[2] On October 23, Brazil had 5,323,630 confirmed cases,[3] the third highest number in the world,[4] with 155,900 cumulative deaths from the disease.[3] Due to its contagion dynamics, this disease is of particular concern among asymptomatic and presymptomatic people who can unknowingly spread the virus through the nose and mouth.[5,6]

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Health care professionals are, in general, at a high risk for infection.[7] The condition is aggravated in the dental office due to the proximity of the staff to the patient, frequent exposure to saliva and other body fluids, handling of sharp instruments, and aerosol generation.[5,8-10] Therefore, dental boards and scientific associations in many countries, including Brazil, have recommended the suspension of elective dental care, maintaining emergency care only.[11-14] International organisations have published guidelines on how to control the spread of the disease among oral health care providers.[14-16] In Brazil, oral health professionals (OHPs) have been appointed to the COVID-19 fast-track multidisciplinary teams for rapid screening and diagnostic testing for COVID-19.[17]

However, the occurrence of COVID-19 among OHPs is not well known, and studies concerning the differential risk between OHPs and the general population are lacking.[10] The information on the number of cases and disease morbidity among dental staff is greatly needed to subsidise effective actions from public health agencies and managers of private and public services, concerning information on the conduct of care, provision of personal protective equipment, and collective protection strategies, training opportunities, and physical and mental health support to workers and their families. This study evaluated and compared the cumulative incidence of confirmed COVID-19 cases observed in OHPs and the general population in Brazil.

Methods

Data on laboratory unconfirmed and confirmed cases of COVID-19 available in the national system website (e-SUS VE Notifica system)[18] from the Ministry of Health of Brazil were analysed. The e-SUS VE system was implemented on March 27, 2020, to register clinical signs and symptoms of COVID-19 and results of diagnostic testing for COVID-19 of all suspected cases. The confirmed cases were those with laboratory evidence (positive result) in the notification. The data were obtained on October 10, 2020, and included all laboratory unconfirmed and confirmed cases reported since the first record (January 1, 2020) with information on test results.

The variables obtained were the report date, Brazilian state, sex, age, occupation, and diagnostic test (type and result). Age was stratified into ≤19 years, 20-29, 30-39, 40-49, 50-59, 60-69, and ≥70 years. OHPs were classified as dentists or oral health technicians/assistants according to the Brazilian Occupation Classification from the Ministry of Labor. Diagnostic test types were rapid antibody test, rapid antigen test, reverse transcription polymerase chain reaction (RT-PCR), or other (enzyme-linked immunosorbent assay, chemiluminescence immunoassay, or electrochemiluminescence). If results of the rapid test and RT-PCR were available, the recommendation is to consider the one from the RT-PCR.

Data analysis

Cumulative incidence of the COVID-19 tests: This was calculated by dividing the total number of laboratory unconfirmed and confirmed cases by the estimated Brazilian population for 2020 from the Brazilian Institute of Geography and Statistics[19]

and the OHPs registered in the Federal Council of Dentistry[20] and multiplying by 1000.

Number of confirmed COVID-19 cases: The disease evolution was assessed by analysing the number of new and cumulative confirmed COVID-19 cases for both the general population and OHPs during the epidemiological weeks (EWs) 1 to 41, from the first record date (January 1, 2020) until the date of data extraction (October 10, 2020).

Crude cumulative incidence of confirmed COVID-19 cases: This estimates the risk of an individual in the population to develop the disease during a specific period.

The cumulative incidence of confirmed COVID-19 cases in the general population (per 1000 inhabitants) was obtained by dividing the number of confirmed cases by the population at risk, that is, the Brazilian population. The age-specific cumulative incidence was calculated for age groups established by the Brazilian Institute of Geography and Statistics for 2020.[19]

The cumulative incidence of confirmed COVID-19 cases in the OHPs (per 1000 OHPs) was obtained by dividing the number of confirmed cases by the total number of registered OHPs.[20] The age-specific cumulative incidence was indirectly estimated from the number of professionals enrolled per year in the Regional (for Sao Paulo) or Federal Councils of Dentistry, considering 24 years as the average age of graduation from Dentistry.[21]

Age-standardised cumulative incidence of COVID-19 cases: The standardisation by age considers the different age composition in the populations, allowing comparisons of COVID-19 incidences among Brazilian states.

The age-standardised cumulative incidence of confirmed COVID-19 cases in OHPs and the general population was calculated for each Brazilian state. The direct standardisation method recommended by the World Health Organisation was used.[22] Finally, the ratio between the age-standardised cumulative incidences of COVID-19 for OHPs and the general population was calculated for Brazil and by state, which provided an estimate of the risk of COVID-19 among OHPs.

Since these were open-access secondary data, no approval was necessary from the Institutional Review Board.

Results

The e-SUS VE Notifica database contained 13,291,343 records with information on the test results. The percentage of records with missing data was 0.03% for date of notification (n = 3,858), 4.06% for health professional and occupation (n = 539,338), 0.10% for type of test (n = 13,782), 0.07% for age (n = 9,960), and 1.05% for sex (n = 139,807).

Figure 1 shows the cumulative incidence of the COVID-19 test in the general population and among OHPs in each state. Twenty-one per 1000 OHPs were tested for COVID-19, with variations among states. In the general population, the cumulative incidences ranged from 4.01 to 154.78 per 1000 inhabitants.

From 12,752,005 valid records for occupation, 48,301 were dentists (n = 31,666, 65.10% were women) or oral health technicians/assistants (n = 16,635, 93.24% were women). Considering all types of tests, the proportions of positive results in the general population and OHPs were 33.85% and 21.67%,
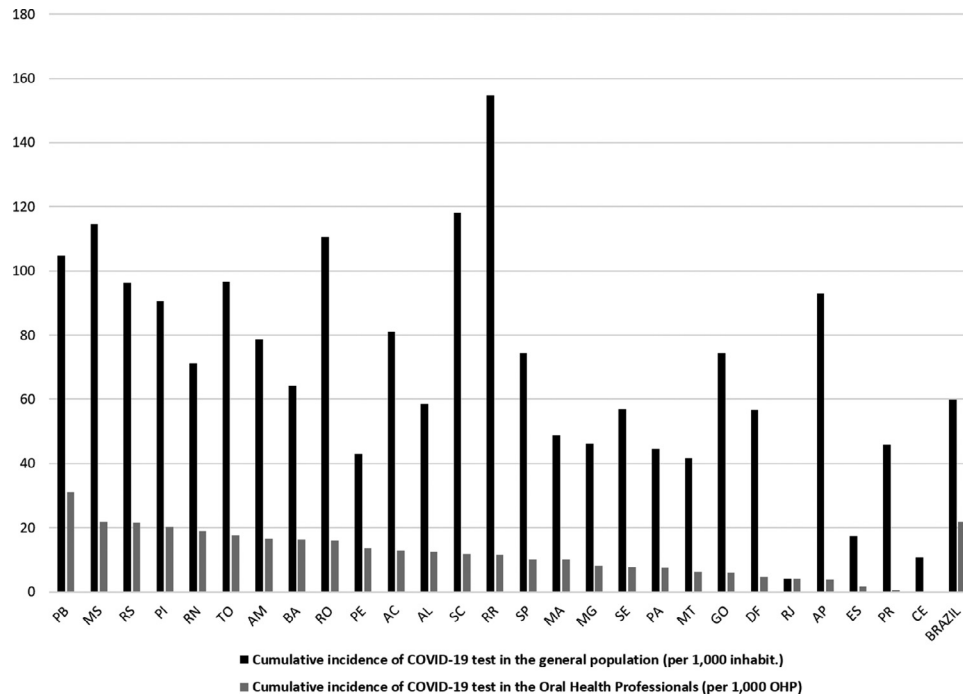
Fig. 1 – Cumulative incidence of the COVID-19 test in the general population and oral health professionals by state in Brazil from January 1 to October 10, 2020.

*CE data for the Brazilian Classification of Occupation were not available. PB, Paraíba; MS, Mato Grosso do Sul; RS, Rio Grande do Sul; PI, Piauí; RN, Rio Grande do Norte; TO, Tocantins; AM, Amazonas; BA, Bahia; RO, Rondônia; PE, Pernambuco; AC, Acre; AL, Alagoas; SC, Santa Catarina; RR, Roraima; SP, São Paulo; SE, Sergipe; PA, Pará; MT, Mato Grosso; GO, Goiás; DF, Distrito Federal; RJ, Rio de Janeiro; AP, Amapá; ES, Espírito Santo; PR, Paraná; CE, Ceará. Source: e-SUS VE.

respectively (Table 1 and 2, Supplementary data). Among OHPs, 21.19% and 22.62% of dentists and oral health technicians/assistants, respectively, had positive results, with large variations among states. The state of Ceará had no record in the Brazilian Occupation Classification for OHPs.

Figure 2 shows the number of new and cumulative confirmed COVID-19 cases in the general population (Figure 2a, 2b) and among OHPs (Figure 2c, 2d) according to EW. The curves were similar, and slower growth in the number of cases was

observed among OHPs, with the first cases reported after EW 12. Between EW 29 and 30, there was a decrease in the number of new cases, both in the general population and among OHPs.

The age-standardised cumulative incidences were 18.70 per 1000 registered OHPs and 17.71 per 1000 inhabitants in the general population (Table 1). The ratio between these two incidences was 1.05.

The age-standardised cumulative incidence of confirmed COVID-19 cases among OHPs by Brazilian state is shown in

Table 1 – Age-specific cumulative incidence and crude and age-standardised cumulative incidence of confirmed COVID-19 cases in the general population and in oral health professionals in Brazil from January 1 to October 10, 2020.

Age groups (years)	General population (per 1000 inhabitants)	Oral health professionals (per 1000 registered oral health professionals)
<19	6.36	-
20-29*	23.13	14.38
30-39	32.46	19.20
40-49	31.99	27.55
50-59	27.21	35.51
60-69	21.51	18.02
70 +	19.28	7.00
Cumulative incidence of COVID-19 (per 1000)	19.39	20.31
Age-standardised cumulative incidence of COVID-19 (per 1000)	17.71	18.70

For oral health professionals, 55 patients aged <20 years were added in the category 20-29 years old to estimate the age-specific cumulative incidence. Data were obtained in the e-SUS VE system.

Table 2 – Age-standardised cumulative incidence of confirmed COVID-19 cases in the general population and oral health professionals and respective ratios for Brazilian states.

Brazilian states	Age-standardised cumulative incidence of COVID-19 General population (per 1000 inhabitants)	OHPs (per 1000 OHPs)	Ratio between age-standardised cumulative incidence for general population and OHP
Roraima	70.00	67.05	0.96
Amapá	54.31	24.14	0.44
Acre	35.01	48.27	1.38
Piaui	34.18	34.96	1.02
Rondônia	32.70	42.93	1.31
Goiás	32.21	15.25	0.47
Tocantins	30.85	58.81	1.91
Paraíba	30.69	35.02	1.14
Santa Catarina	30.69	23.87	0.78
Amazonas	29.17	58.24	1.99
Alagoas	26.10	40.90	1.57
Distrito Federal	24.45	18.82	0.78
São Paulo	21.84	21.27	0.97
Sergipe	21.45	28.18	1.31
Mato Grosso do Sul	21.14	32.05	1.52
Rio Grande do Norte	19.72	34.30	1.74
Maranhão	19.67	29.82	1.52
Rio Grande do Sul	19.19	16.54	0.86
Pará	18.59	17.48	0.94
Bahia	17.88	26.58	1.49
Mato Grosso	15.69	17.36	1.11
Pernambuco	13.40	28.13	2.10
Rio de Janeiro	13.06	11.21	0.86
Minas Gerais	11.28	14.13	1.25
Paraná	5.53	0.83	0.15
Espírito Santo	4.74	1.65	0.35
Ceará*	3.91		0

Data from January 1 to October 10, 2020.

* Data not available for occupation. Data from the e-SUS VE system. OHP, oral health professional.

Table 2. The highest cumulative incidences were observed in the states of Roraima (67.05/1000 OHPs), Tocantins (58.81/1000 OHPs), and Amazonas (58.24/1000 OHPs). The cumulative incidences among OHPs were higher than that in the general population in 14 states (ratio > 1).

In the general population, the cumulative incidences of confirmed COVID-19 cases were 20.49 in men (per 1000 men population) and 21.39 in women (per 1000 women population), and age-standardised cumulative incidences were 19.49 and 20.00, respectively. The cumulative incidence by sex among OHPs could not be calculated as the data by sex were not available. The data used to calculate cumulative incidences were shown in Tables 3 to 5 (Supplementary data).

Discussion

The results presented were based on laboratory unconfirmed and confirmed cases of COVID-19 registered in the national information system. A lower cumulative incidence of testing for COVID-19 was observed among OHPs compared to the general population. This result reflects the reality of low testing in the country, being considered as one of the lowest-testing countries in the world. In April 2021, Brazil appeared as the 131st in number of SARS-CoV-2 RT-PCR exams per million inhabitants.[23] Mass testing has been deemed an efficient strategy for controlling the spread of COVID-19 and proved to be adequate in several countries around the world.[24-26] In Brazil, despite national legislation[27] establishing the prioritisation of COVID-19 testing among health professionals, universal testing was not performed, contributing to the observed low testing records among OHPs. A previous study with 3,122 Brazilian dentists in May 2020 reported that testing was more frequent in dentists who had seen patients with COVID-19 in their offices. Although 90% feared contracting the disease at work, only 8% indicated they had been tested for COVID-19.[28] Our findings highlight the importance of offering mass testing of OHPs and improvement of the educational campaigns to motivate monitoring of serological status in professional practice.

The evolution of COVID-19 among OHPs was similar to that observed in the general population. The crude and age-standardised cumulative incidences of confirmed COVID-19 cases were also similar between the 2 populations. This similarity between incidences is consistent with a recent finding by an American study that estimated a prevalence of 0.9% (95% confidence interval, 0.5 to 1.5) of confirmed or probable COVID-19 infection among dentists. According to that study, the likely source of SARS-CoV-2 transmission was identified through contact tracing by a health agency or clinic in only 5
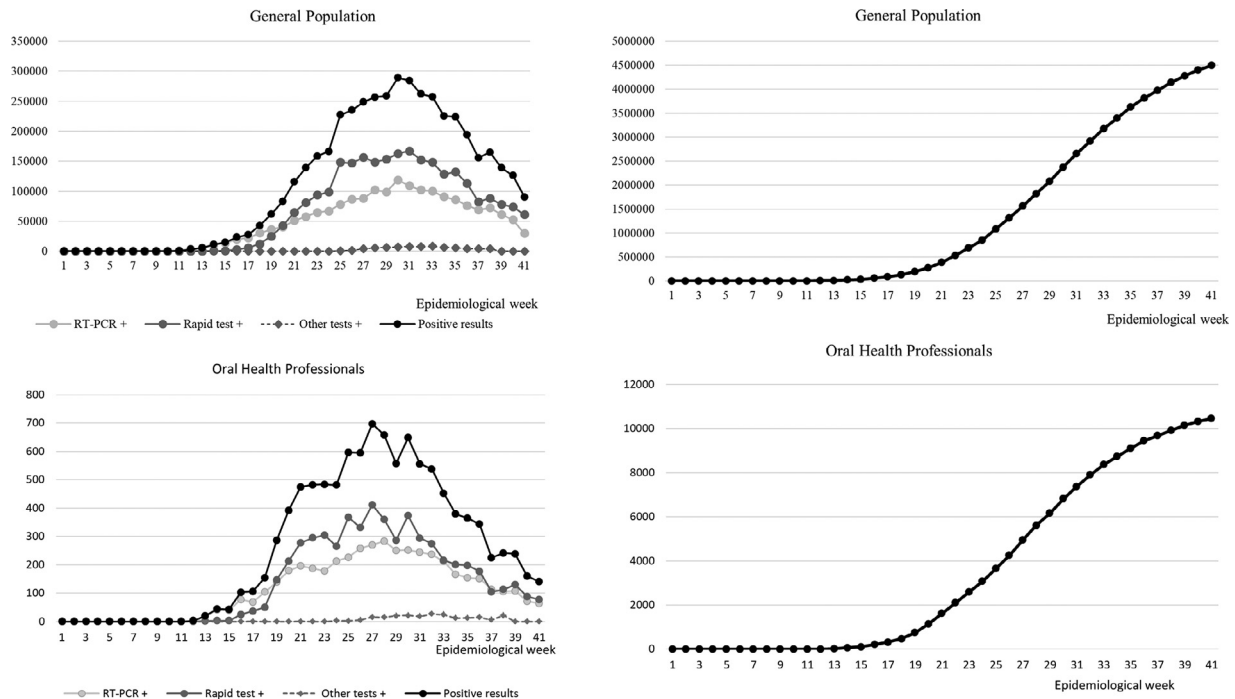
Fig. 2 – Number of new and cumulative confirmed COVID-19 cases in the general population and in oral health professionals in Brazil from January 1 to October 10, 2020. Data from the e-SUS VE system.

cases, of which none had a dental practice as a source of transmission. According to the authors, the risks associated with nonclinical activities and community spread might pose the most substantial risk for the exposure of dentists to COVID 19.[10] Additionally, infection prevention and control procedures recommended by the Centers for Disease Control and Prevention for dental offices in the US contributed to the reduced risk of developing an infection during oral health care delivery. Similarly, another web-based study found a prevalence of 1.1% positive test results among Brazilian dentists.[28] Another previous online survey with a French dental professional population showed a prevalence of laboratory-confirmed COVID-19 cases of 1.9% for dentists and 0.8% for dental assistants.[29]

In Brazil, the similarity observed in the incidences of confirmed COVID-19 cases between the general population and OHPs can be attributed to the adherence of OHPs to the guidelines issued by the Federal Council of Dentistry and the Ministry of Health and Education for clinical practice during the pandemic. The recommendations included the suspension of elective consultations, maintenance of emergency and urgency care in public and private services,[17,30,31] and canceling of all in-person undergraduate and graduate academic activities. National surveys indicated great adherence by professionals to the guidelines,[12,28,32,33] following the trend in several other countries in the world that adopted similar strategies for the pandemic.[34,35] Another aspect is the effectiveness of infection control practices in dental offices. Previous research has shown that the vast majority of professionals (91%) follow official regulatory standards in their new routines and have made substantial efforts to cope with the latest clinical requirements.[32]

Most of the professionals (95.5%) reinforced biosafety protocols in dental offices, such as the use of face shields and single-use disposable personal protective equipment, improved suction efficiency to avoid aerosols/droplets dispersion, mouth rinsing before dental procedures, rubber dam isolation, and increased time between dental care appointments.[12] The present study findings, then, reinforce that infection control practices must be kept as an approach to prevent the spread of SARS-COV-2 in dental offices.

The 5% higher cumulative incidence of confirmed COVID-19 cases among OHPs compared to the general population should be a warning sign of the increased risk of infection of this professional category in Brazil, although the differential risk compared to the general population and whether dental practice increases the risk of COVID-19 is not well established. However, the aerosol produced during the delivery of dental procedures can contain infectious material and might be a potential vector for patient-to-practitioner and patient-to-patient transmission.[5,8,9,36] Although cases of COVID-19 among dental professionals at the School and Hospital of Stomatology, Wuhan University, Wuhan, China, have been reported, whether these infections were due to community transmission or transmission associated with oral health care delivery is unknown.[9] The higher incidence among OHPs found in our study cannot be directly attributed to a higher risk of infection in dental practice. However, it highlights the importance of protective measures during dental care and the continuous monitoring of cases, besides the generation of scientific evidence on COVID-19 and associated factors in OHPs. Besides, the results of this study can provide information to health authorities about the infection status of OHPs,

considering the need for attention to specific risk groups. The protection of OHPs must be a public health strategy in the control of the pandemic.

There was a wide variation in the age-standardised cumulative incidence of confirmed COVID-19 cases in Brazilian states, both in the general population and among OHPs. The different testing rates make it difficult to compare the effect of different containment strategies in the national territory or even discuss differential risks between populations. However, hypotheses could be raised, such as the different timing of infection introduction in states, the speed with which states responded to COVID-19,[37,38] and different protocols for dental care in response to COVID-19 dynamics,[39,40] as occurred in other countries.[41] The disease dynamics in each state could also influence the decisions of offering dental care. A national study showed that dentists from states with greater case and death rates had higher odds of being fearful of contracting the disease. For each additional 1000 cases or 100 deaths, the odds of stopping work or providing emergency care increased by 36% and 58%, respectively.[42]

Social inequalities can also explain the regional differences in the cumulative incidences of COVID-19.[38,43,44] The North region of Brazil (Roraima, Amapá, Rondônia, Acre, Tocantins, and Amazonas), which has the greatest social inequality condition in the country, had the highest age-standardised cumulative incidences of COVID-19 cases. Studies carried out in Brazil have shown a higher Social Distancing Index in neighborhoods with better living conditions, higher incidence of COVID-19 in cities with lower Human Development Index, and higher mortality in the most vulnerable regions of the country and within more vulnerable social groups. In this context, it is worth highlighting the statement by Horton[45] about COVID-19 being a syndemic due to the interaction between biological and social factors. The author highlighted that a purely biomedical solution for COVID-19 would not be sufficient to protect the most vulnerable populations. Policies and programmes focused on reversing the profound disparities in our societies will be needed.[45]

Some limitations of this study should be considered. The high number of missing records for test type and result caused an underreporting of cases. However, 72.26% of the data was analysed, characterising the disease occurrence among health professionals. In this sense, the information about occupation is an advantage of this national information system. In addition, influenza syndrome cases are classified according to public or private care systems (primary care units, doctor offices, clinics, care centers, emergency care, among others). The implementation of the e-SUS VE system took place gradually during the pandemic, and this process can lead to errors. Besides, the test type is defined by notification flow, and the result must be entered after serological confirmation. It is believed that the missing records might be due to the failure to update serological confirmation by health facilities. The Osvaldo Cruz Foundation evaluated the consistency between the epidemiological data released by the states' Health Secretariats and those obtained in the e-SUS VE in August 2020 and found that the number of confirmed cases according to the e-system was 10% lower than that observed in the states.[46] According to the Ministry of Health guidelines, the e-SUS VE does not present data for states and municipalities that have their own COVID-19 reporting systems and, therefore, data for these locations could be inconsistent. Finally, one state did not have data on occupation; thus, incidences were not estimated for the two categories.

Conclusions

The evolution of COVID-19 among OHPs was similar to that observed in the general population in Brazil. However, the cumulative incidence of confirmed COVID-19 cases was 5% higher among OHPs, with large variations among Brazilian states.

Conflict of interest

None disclosed.

Acknowledgements

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.identj.2021.05.005.

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