



Dental care and risk of developing severe COVID-19

Atención odontológica y el riesgo de complicación por COVID-19

Leopoldo Javier Díaz Arizmendi^{1, a} , Ana Laura de Jesús García^{1, b} , Antonio Eduardo Pérez Ramírez^{1, b} ,
Ulises Velázquez Enríquez^{2, c} , Elizabeth Sánchez Gutiérrez^{1, d} , Gustavo Durán-Arías^{3, e} 

ABSTRACT

During the COVID-19 pandemic, dental care was recommended only in urgent and severe pain cases. Reduced dental appointments may affect the financial situation of dentists, especially those who are not financially secure. Due to economic necessity, dentists are required to provide care despite the risk of being infected with SARS-COV-2. **Objective:** To describe the frequency of dental care and the risk of complications due to COVID-19 among dentists in Ixtlahuaca, State of Mexico, Mexico. **Material and methods:** Cross-sectional study, non-probabilistic sampling carried out from August to September 2020. A survey was carried out through social networks to identify the frequency of dental care. **Results:** The sample consisted of 121 dentists with an average age of 32.3 years. Women comprised most of the sample (74.4%). Dentists had a medium risk of suffering complications due to COVID-19 (92.5%). Private practice dentists performed more non-urgent treatments during the red and orange epidemiological risk periods, showing statistically significant differences ($p \leq 0.05$). Unhealthy weight was present in 30% of the sample. **Conclusions:** Dentists have a medium risk of becoming seriously ill from COVID-19. The risk is associated with unhealthy weight. Dentists performed non-urgent treatments despite government recommendations. Private practitioners performed a greater number of non-urgent treatments. Dentists provide care despite epidemiological risk related to COVID-19 due to economic necessity.

Keywords: dental care, COVID-19, SARS-CoV-2 (MeSH)

RESUMEN

Durante la pandemia por la COVID-19 la atención odontológica fue recomendada solo en casos de urgencia y dolor. La reducción de citas dentales puede afectar la economía de los dentistas, principalmente la de aquellos que no cuentan con seguridad financiera. Los odontólogos por necesidades económicas requieren brindar atención a pesar del riesgo de ser infectados por SARS-COV-2. **Objetivo:** Describir la frecuencia de la atención odontológica y el riesgo de complicación por COVID-19 en odontólogos de Ixtlahuaca, Estado de México, México. **Material y métodos:** Estudio transversal, muestreo no probabilístico desarrollado desde agosto hasta septiembre de 2020. Se aplicó un cuestionario por redes sociales para identificar la frecuencia de la atención odontológica. **Resultados:** La muestra estuvo conformada por 121 odontólogos; el promedio de edad fue de 32,3 años. La mayor parte de la muestra estuvo conformada por mujeres (74,4 %). Los odontólogos mostraron un riesgo medio a desarrollar complicaciones por COVID-19 (92,5 %). Los odontólogos de práctica privada realizaron más tratamientos no urgentes durante el

¹ Ixtlahuaca University, Ixtlahuaca, State of Mexico, Mexico.

² State of Mexico Autonomous University, Toluca, State of Mexico, Mexico.

³ State of Mexico Health Institute, Toluca, State of Mexico, Mexico.

^a Doctor of Health Sciences, Research Institute and Health Studies.

^b Dental surgeon

^c Doctor of Health Sciences, Director of School of Dentistry

^d MSc, Director of School of Dentistry

^e MD, Director of Capasits Toluca Hospital

semáforo epidemiológico rojo y naranja, mostrando diferencias estadísticamente significativas ($p \leq 0,05$). El 30 % de la muestra presentó un peso no saludable. **Conclusiones:** Los odontólogos tienen un riesgo medio a enfermarse gravemente por COVID-19. El riesgo se encuentra asociado al peso no saludable. Los odontólogos realizaron tratamientos no urgentes a pesar de las recomendaciones gubernamentales. Los profesionales de práctica privada realizaron una mayor cantidad de tratamientos no urgentes. Los dentistas brindan atención a pesar del riesgo epidemiológico por COVID-19 debido a las necesidades económicas.

INTRODUCTION

During the COVID-19 pandemic, dental practice was described as a risky SARS-CoV-2 transmission route (1). Most guidelines worldwide recommended suspending non-urgent dental treatments (2-4). There was no mandatory suspension in Mexico as it was in Israel, United Kingdom, Denmark, Portugal, Poland, and Norway (5). Nevertheless, during the pandemic, there was a lower frequency of dental care that could affect the economy and financial security of dentists, mainly of those in the private health sector lacking health or financial security (6).

Previous studies have reported that healthcare workers such as dentists may have comorbidities as obesity, diabetes mellitus, and arterial hypertension. They may also have risky health behaviors, including alcohol consumption, smoking, and sedentary lifestyles (7-9). These conditions have been described as risk factors regarding the development of complications from COVID-19 (4, 10). However, due to economic needs, dental professionals must provide dental care despite the risk of being infected with SARS-CoV-2 and developing severe illness.

In response to the COVID-19 pandemic, the Mexican government implemented a traffic light monitoring system. This public health system focuses on the use of public spaces and the COVID-19 risk in the population. The traffic light has four categories: Red corresponds to a very high (maximum) COVID-19 risk, orange to high risk, yellow to medium risk, and green to low risk (11). The government regulates social and economic activities according to this system. Dental care should be provided during green and yellow periods according to the traffic light system. During orange and red periods, only urgent treatment should be provided (12). The objectives of this project were: i) To determine the risk of dentists developing severe COVID-19; and ii) to describe the frequency of dental care during orange and red COVID-19 periods.

MATERIAL AND METHODS

A cross-sectional study was performed; the sample consisted of dentists who worked in Ixtlahuaca, State of Mexico, Mexico. Non-probabilistic sampling was performed according to the following dentist inclusion criteria: i) Engagement in clinical care; ii) engagement in social networks; and iii) willingness to participate. A survey with 22 questions was designed to determine the frequency of dental care during the red and orange periods of the COVID-19 traffic light monitoring system. The survey asked for: i) Descriptive data, academic level, and economic activities (two questions on nominal scale); ii) frequency of dental treatments during orange and red periods (16 questions on Likert scale with four answer options); iii) risk of severe COVID-19; age, sex, health condition, and weight (four questions in nominal scale).

Dental treatments were split into two groups: Urgent treatments and non-urgent treatments. Urgent treatments refer to treatments that prompt attention due to pain, infection, or trauma: dental pulp infection, periapical and facial abscesses, jawbone infections, and dental or facial trauma. Procedures considered urgent were: endodontic treatment, the tooth drainage due to infection, oral surgery, dental extraction, facial abscess drainage; and tooth or facial trauma treatment. Non-urgent treatments refer to those with no pain or no compromised vital physiological function. Procedures considered were: dental restoration, use of composites or amalgam, dental prosthesis, dental implants, orthodontic treatment, aesthetic dentistry, tooth whitening, gum surgery, preventive treatment, teeth cleaning, pit and fissure sealants, and fluoride application.

Economic backgrounds were surveyed and divided into two main groups: i) Private health dentists; and ii) dentists with medical and social security. The first group refers to dentists obtaining economic resources from private practice without medical or social security from government or private institutions. The

second group refers to dentists who obtain financial resources from private practice, government or private institutions, or universities, with medical and social security. The survey was rated and approved by eight health science researchers. Cronbach's alpha was used to assess internal consistency and had a value of 0.787.

The COVID-19 health complication calculator (HCC) developed for the Mexican Social Security Institute was used to determine the risk of developing severe COVID-19. The calculator considers sex, age, weight, and health condition: hypertension, diabetes, chronic obstructive pulmonary disease, kidney failure, and immunosuppression (cancer treatment, AIDS, or systemic lupus). HCC provides results as medium risk and high risk (13). The survey was disseminated among dentists working in Ixtlahuaca through social networks using Google Surveys, asking them to share it with their peers. The survey did not ask for any personal data, such as name or e-mail. The study was performed from August to September 2020. During this period, the COVID-19 traffic lights were red and orange in Ixtlahuaca, State of Mexico. This project was approved by the University of Ixtlahuaca's Research Committee and followed the guidelines established at the WMA Declaration of Helsinki.

Results were analyzed using IBM SPSS Statistics 23 provided by Ixtlahuaca University. Categorical variables (sex, academic level, health condition, weight perception, economic activities, and risk of severe COVID-19) were expressed in frequency and percentage for the descriptive analysis. Age was expressed as mean value and standard deviation. Ordinal variables (dental treatments during specific COVID-19 traffic light periods) were expressed as mean values. The Kolmogorov-Smirnov test showed statistical significance ($p \leq 0.05$). Thus, a non-parametric statistical test was performed. The comparison of categorical and ordinal variables was analyzed using the Mann-Whitney U test. For the comparison among categorical variables, Pearson's chi-squared test was performed. Finally, a Wilcoxon

test was performed to determine the frequency of non-urgent treatments among dentists in orange and red traffic light periods. For all tests, a confidence level of 95% and $p \leq 0,05$ were considered for statistical significance.

RESULTS

The study included 121 participants with an average age of 32.2 ± 8.5 years. Most were women: 74.4%. Dentists with just university degree were the 61.2% of the sample. Most of the dentists surveyed reported being healthy (95.5%). Comorbidities, hypertension, diabetes, and immunosuppression-related diseases corresponded to 4.1% of the sample. Participants who reported a healthy weight accounted for 66.9% of the total. Overweight corresponded to 29.8%. Dentists were divided into two main groups according to their economic backgrounds: i) private health dentists, i.e., those engaged in private practice, without medical or social security from government or private institutions; and ii) dentists with medical and social security (Table 1).

Participants showed a medium risk of developing severe COVID-19 (92.5%). There were no statistical differences between private health dentists and those with medical or social security (Table 2). The analysis of dental treatments during COVID-19 traffic light periods determined that private health dentists did more urgent and non-urgent treatments during orange and red traffic light periods than their peers (Table 2 shows frequency of dental treatments as mean values). However, statistical differences were found when the Mann-Whitney U test was performed to compare non-urgent treatments done by private health dentists and their peers during orange and red traffic light periods. In addition, both groups of dentists did more non-urgent treatments during orange than red traffic light periods, showing a statistical difference when performing a Wilcoxon test (Figure 1). Men reported a statistically significant ($p = 0.047$) greater risk of COVID-19 complications than women (Figure 2).

Table 1. Relationship between dentists' economic background and sex, age, academic level, health condition, and weight perception.

Variables		Private health system	Dentists with medical and social security	Total
N=		51 (42.1%)	70 (57.9%)	121 (100%)
Age		30.8 ± 7.3	33.5 ± 9.1	32.3 ± 8.5
Sex	Men	9 (17.6%)	22 (31.4%)	31 (25.6%)
	Women	42 (82.4%)	48 (68.6%)	90 (74.4%)
Academic level	University degree	35 (68.6)	39 (55.7%)	74 (61.2%)
	Post degree	16 (31.4%)	31 (44.3%)	47 (38.8%)
health condition	Hypertension	0	1 (1.4%)	1 (0.8%)
	Diabetes	0	1 (1.4%)	1 (0.8%)
	Immunosuppression	0	3 (4.3%)	3 (2.5%)
	Healthy	51 (100%)	65 (92.9%)	116 (95.9%)
Weight perception	Underweight	2 (3.9%)	1 (1.4%)	3 (2.5%)
	Healthy weight	36 (70.6%)	45 (64.3%)	81 (66.9%)
	Overweight	13 (25.5%)	23 (32.9%)	36 (29.8%)
	obese	0	1 (1.4%)	1 (0.8%)

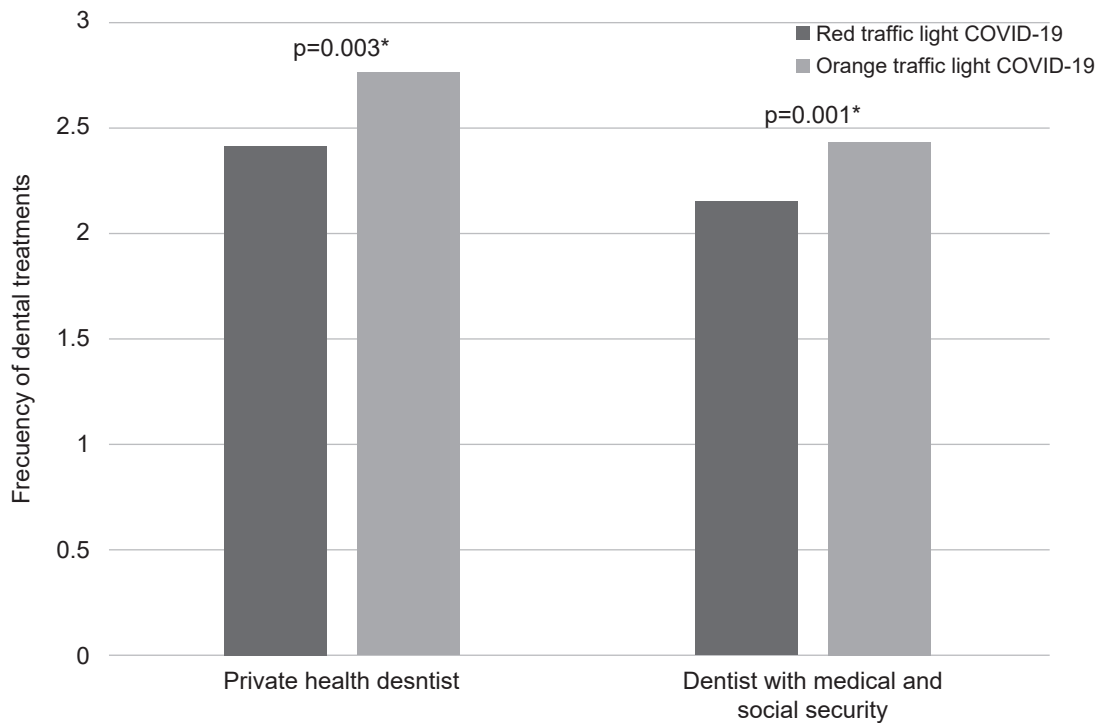
Table 2. Analysis between dentists' economic backgrounds and treatments during traffic light monitoring system periods and risk of developing severe COVID-19.

Variables		Private health system	Dentists with medical and social security	p≤0.05
Treatments during red traffic light period	Urgent treatments	2.67	2.61	0.69 ^a
	Non-urgent treatments	2.4	2.15	0.043 ^{*a}
Treatments during orange traffic light period	Urgent treatments	2.83	2.71	0.483 ^a
	Non-urgent treatments	2.76	2.43	0.01 ^{*a}
Risk of severe COVID-19	Medium	49 (96.1%)	63 (90%)	0.18 ^b
	High	2 (3.9%)	7 (10%)	

^a Mann-Whitney U test/ ^b Pearson's chi-squared test

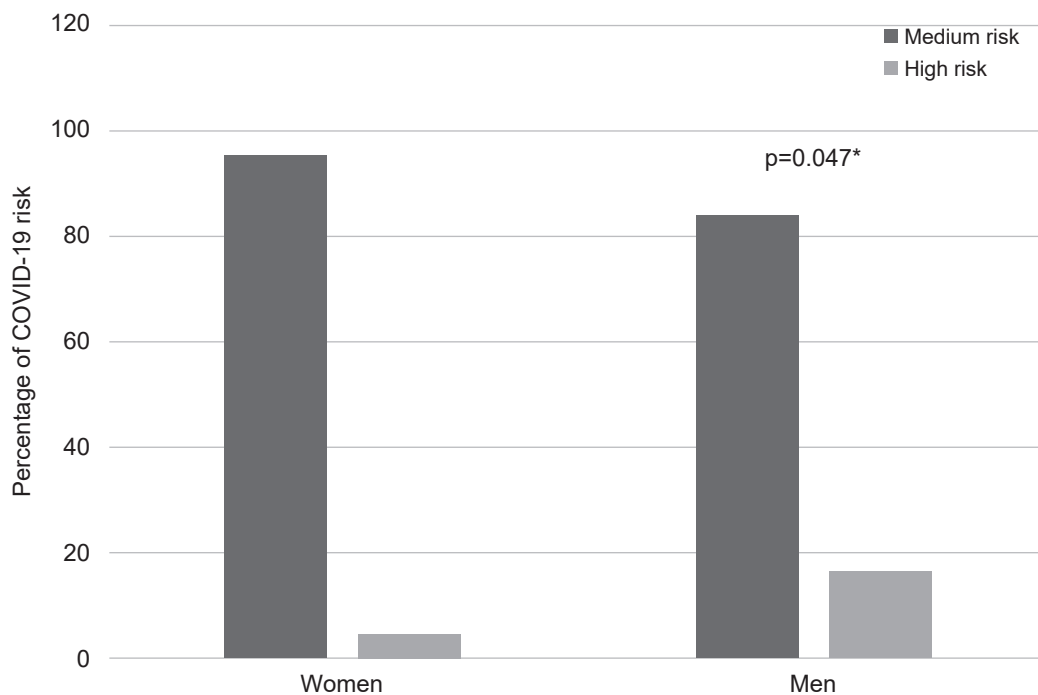
* Statistical significance

Figure 1. Frequency of non-urgent treatments during orange and red traffic light periods.



* Statistical significance, Wilcoxon test

Figure 2. Risk of severe COVID-19 broken down by sex



* Statistical differences, Pearson's chi-squared test

DISCUSSION

This study aimed to determine the risk of dentists developing severe COVID-19. Participants in this study showed a medium risk. These findings are similar to those previously reported. As health workers, dentists are at risk of being infected by SARS-CoV-2 and of getting seriously ill due to COVID-19 complications (9, 14).

COVID-19 complications risk factors reported are age older than 65 years, men sex, and having health conditions such as diabetes mellitus, hypertension, immunosuppression, obesity, and overweight (4, 10). In this study, the average age of participants was 32.2. They were reported being healthy, and most were women. Although participants enrolled in this study were mostly young and lacked comorbidities, a third of them did not have a healthy weight. Mexico has one of the highest obesity rates in the world, mainly children (15). SARS-CoV-2 mortality associated with obesity is 1.42 times more than their absence (16). According to the National Health and Nutrition Survey, 59.05% of Mexicans aged 20 to 30 have an unhealthy weight (15). In our results, the risk of developing severe COVID-19 and SARS-CoV-2 mortality is associated with unhealthy weight. Further studies should develop health campaigns to promote healthy behaviors among Mexican dentists.

This research was developed during two COVID traffic light periods (red and orange) and before the start of the vaccination campaign. Mexicans felt unsafe with a new disease that lacked effective preventive healthcare or medical treatment (17). Most Mexican dentists have not financial security in the private health sector. Therefore, they must provide dental care in order to obtain economic resources. This study hypothesized that economic needs lead dentists to keep providing health care despite the risk of infection with COVID-19 and the government's recommendations to provide only urgent treatment during orange and red traffic light periods (12). As expected, private sector dentists did more urgent and non-urgent treatments during both epidemiological traffic light periods. International COVID-19 guidelines suggest that dental care must be provided only in urgent cases (2, 4). In the study, urgent treatments were more frequent during both epidemiological traffic light periods.

At the beginning of the pandemic, the lockdown and guidelines by the Mexican health system urging people to stay at home were stricter, with malls and

universities closed and rules in place to prevent crowding (18). Mexican people kept strict quarantine for three months, resulting in economic loss and mental disorders such as anxiety (17, 18). During this period, most dental clinics were closed (8). In our results, these facts explain why dental treatments were more prevalent during the orange than during the red traffic light period.

A limitation of this study is that the sample does not represent all Mexican dentists. Behaviors in the provision of dental care despite the risk of being infected could differ in other country regions. In addition, the survey was disseminated through social networks, which may explain why participants enrolled in this study were relatively young and had few comorbidities. Sampling an elder population might lead to different results. The study design is another limitation: Long-term studies should be carried out.

Dental care was modified and restricted due to the COVID-19 pandemic. The dental community had to avoid SARS-CoV-2 transmission. However, dentists and nurses are at risk of being infected and getting seriously ill with COVID-19. In our results, Mexican dentists reported a medium risk of developing severe COVID-19. The risk was associated with unhealthy weight. There is no difference in the risk of severe COVID-19 among private health dentists and dentists with medical and social security. Due to financial necessity, dentists provide non-urgent treatments during orange and red traffic light periods, despite government recommendations. Both groups of dentists did more non-urgent treatments during orange than during red traffic light periods. During the COVID-19 pandemic, private health dentists did more treatments than those who did not work in the private sector. Economic needs lead dentists to continue providing health care despite the risk of being infected with SARS-CoV-2 and developing severe illness. As previously reported, women have a lower COVID-19 risk (19, 20).

Conflict of interests: The authors have no conflict of interest regarding this report.

Ethical approval: This project has a retrospective cross-sectional design. There are no interventions or modifications in the physiological, psychological or social variables of participants. The surveys applied did not identify sensitive aspects of behavior and there was no direct contact with the participants (the surveys were applied electronically). In accordance with Article

17 of the Mexican Regulations of the General Health Law on Health Research, this research corresponds to “research without risk,” so it does not require approval by the Ethics Committee. Instead, this project has been approved by the University of Ixtlahuaca’s Research Committee. This research followed the guidelines of the Declaration of Helsinki.

Funding: None

Author participation: All authors contributed to the preparation of this manuscript.

Acknowledgments: We thank Julio C. Bermudez-Barajas, professor at the University of Ixtlahuaca, for support in this research.

Corresponding author:

Author: Ph.D. Leopoldo Javier Díaz-Arizmendi

Address: Ixtlahuaca-Jiquipilco, San Pedro, Ixtlahuaca de Rayón, Estado de México 50740.

Tel: (+55) 712 283 1012

E-mail: cdleojavierdiaz@gmail.com

REFERENCES

1. Wadia R. Transmission routes of COVID-19 in the dental practice. *Br Dent J* [Internet]. 2020; 228(8): 595. Available from: <https://www.nature.com/articles/s41415-020-1547-1>
2. Coulthard P. Dentistry and coronavirus (COVID-19) - moral decision-making. *Br Dent J* [Internet]. 2020; 228(7): 503-505. Available from: <https://www.nature.com/articles/s41415-020-1482-1>
3. Natapov L, Schwartz D, Domb Herman H, Markovich DD, Yellon D, Jarallah M, et al. Risk of SARS-CoV-2 transmission following exposure during dental treatment-A national cohort study. *J Dent* [Internet]. 2021; 113: 103791. Available from: <https://www.sciencedirect.com/science/article/pii/S0300571221002141?via%3Dihub>
4. Villani FA, Aiuto R, Paglia L, Re D. COVID-19 and dentistry: prevention in dental practice, a literature review. *Int J Environ Res Public Health* [Internet]. 2020; 17(12): 4609. Available from: <https://www.mdpi.com/1660-4601/17/12/4609>
5. Nemeth O, Orsos M, Simon F, Gaal P. An experience of public dental care during the COVID-19 pandemic: reflection and analysis. *Int J Environ Res Public Health* [Internet]. 2021; 18(4): 1915. Available from: <https://www.mdpi.com/1660-4601/18/4/1915>
6. Villarim NLDS, Muniz IDAF, Perez DEDC, Martelli Junior H, Machado RA, Cavalcanti YW, et al. Evaluation of the economic impact of COVID-19 on Brazilian private dental clinics: A cross-sectional study. *Work* [Internet]. 2022; 71(1): 79-86. Available from: <https://content.iospress.com/articles/work/wor210989>
7. Poulsen K, Cleal B, Clausen T, Andersen LL. Work, diabetes and obesity: a seven year follow-up study among Danish health care workers. *PLoS One* [Internet]. 2014; 9(7): e103425. Available from: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0103425>
8. Trujillo-Olea F, Fernández-Niño JA, Salmerón J, Gallegos-Carrillo K. Prospective patterns of modifiable health risk behaviors and the utilization of healthcare services in the “Health Workers Cohort Study” in Mexico. *PLoS One* [Internet]. 2018; 13(12): e0208172. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6283603/>
9. Antonio-Villa NE, Bello-Chavolla OY, Vargas-Vázquez A, Fermin-Martínez CA, Márquez-Salinas A, Pisanty-Alatorre J, et al. Assessing the burden of COVID-19 amongst healthcare workers in Mexico City: a data-driven call to action. *Clin Infect Dis* [Internet]. 2021; 73(1): e191-e198. Available from: <https://academic.oup.com/cid/article/73/1/e191/5912602?login=false>
10. Bello-Chavolla OY, Bahena-López JP, Antonio-Villa NE, Vargas-Vázquez A, González-Díaz A, Márquez-Salinas A, et al. Predicting mortality due to SARS-CoV-2: a mechanistic score relating obesity and diabetes to COVID-19 outcomes in Mexico. *J Clin Endocrinol Metab* [Internet]. 2020; 105(8): dgaa346. Available from: <https://academic.oup.com/jcem/article/105/8/2752/5849337?login=false>
11. Mexican government. Semáforo COVID-19 [Internet]. 2022 [cited 2022 Aug 27]. Available from: <https://coronavirus.gob.mx/semaforo/>
12. Mexican Social Security Institute/ Mexican government. Para prevenir enfermedades durante la pandemia por COVID-19, es fundamental mantener la salud bucal: IMSS, “Acercando el IMSS al Ciudadano” [Internet]. 2021 [cited 2022 Aug 27]. Available from: <http://www.imss.gob.mx/prensa/archivo/202102/062>
13. Mexican Secretariat of Health. Calculadora de complicación de salud por COVID -19 [Internet]. Mexican government. 2022 [cited 2022 Mar 6]. Available from: <https://www.imss.gob.mx/covid-19/calculadora-complicaciones>
14. Sarapultseva M, Hu D, Sarapultsev A. SARS-CoV-2 seropositivity among dental staff and the role of aspirating systems. *JDR Clin Trans Res* [Internet]. 2021; 6(2): 132-138. Available from: <https://journals.sagepub.com/doi/10.1177/2380084421993099>
15. Mexican Secretariat of Health. Encuesta Nacional de Salud y Nutrición 2020 sobre COVID-19. Resultados nacionales [Internet]. Mexican government. 2021 [cited 2022 Mar 29]. Available from: <https://www.>

- insp.mx/avisos/reporte-completo-resultados-nacionales
16. Hernández-Galdamez DR, González-Block MÁ, Romo-Dueñas DK, Lima-Morales R, Hernández-Vicente IA, Lumbreras-Guzmán M, et al. Increased risk of hospitalization and death in patients with COVID-19 and pre-existing noncommunicable diseases and modifiable risk factors in Mexico. *Arch Med Res* [Internet]. 2020; 51(7): 683-689. Available from: <https://www.sciencedirect.com/science/article/pii/S0188440920307220?via%3Dihub>
 17. González Ramírez MT, Quezada Berumen L, Landero Hernández R. Longitudinal study of the psychological impact of the contingency response to COVID-19 in Mexico. *Universitas Psychologica* [Internet]. 2020; 19. Available from: <https://revistas.javeriana.edu.co/index.php/revPsycho/article/view/31231>
 18. González Ramírez MT, Landero Hernández R, Quezada Berumen L. Tolerancia al estrés y satisfacción con la vida como predictores del impacto por el confinamiento debido al COVID-19. *Ansiedad y Estrés* [Internet]. 2021; 27(1): 1-6. Available from: <https://www.ansiedadyestres.es/ref/2021/27-1-6>
 19. Raimondi F, Novelli L, Ghirardi A, Russo FM, Pellegrini D, Biza R, et al. COVID-19 and gender: lower rate but same mortality of severe disease in women—an observational study. *BMC Pulm Med* [Internet]. 2021; 21(1): 96. Available from: <https://bmcpulmed.biomedcentral.com/articles/10.1186/s12890-021-01455-0>
 20. Vahidy FS, Pan AP, Ahnstedt H, Munshi Y, Choi HA, Tiruneh Y, et al. Sex differences in susceptibility, severity, and outcomes of coronavirus disease 2019: Cross-sectional analysis from a diverse US metropolitan area. *PLoS One* [Internet]. 2021; 16(1): e0245556. Available from: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0245556>

Recibido 08-31-2022

Aceptado 12-27-2022