# Impact of COVID-19 on the future career plans of dentists

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## Abstract

**Background.** It is important to complement the scientific literature with the data regarding the impact of the coronavirus disease 2019 (COVID-19) pandemic on the social, work and health practices as well as on the daily life of dentists, and to promote adequate public policies.

**Objectives.** The aim of the study was to explore the impact of the COVID-19 pandemic on the career plans of dentists in Colombia.

**Material and methods.** As part of global research on the impact of COVID-19 on dentistry, a cross-sectional survey was administered via digital media to dentists in Colombia. The validated questionnaire included inquiries regarding sociodemographic variables, the perception of the risk of contagion with COVID-19 and the impact of COVID-19 on the dentists' career plans. The variables were summarized in absolute and relative frequencies, and a binomial logistic regression analysis was carried out to evaluate the impact of COVID-19 on career plans according to the independent variables.

**Results.** A total of 5,370 dentists answered the survey (women: 3,878; median age: 45 years; response rate: 16.85%). Most of the dentists (96%) believed that COVID-19 infection was a risk for them and 81.96% reported that the COVID-19 pandemic had some impact on their career plans, including reducing working hours (77.96%), retiring early (26.54%) and changing their career away from dentistry (18.15%). The regression model showed that older adults (*OR* = 1.62; 95% *CI*: 1.16, 2.26), general practitioners (*OR* = 1.21; 95% *CI*: 1.02, 1.44), private practice owners (*OR* = 2.33; 95% *CI*: 1.94, 2.79), private practice associates (*OR* = 2.20; 95% *CI*: 1.84, 2.63), and those with 'very probable' risk perception (*OR* = 4.29; 95% *CI*: 1.35, 13.60) had a significantly greater chance of the pandemic having an impact on their future career plans.

**Conclusions.** The pandemic has had a great impact on dentists' career plans. Dentists who are most fearful of the risk of contagion, those who are older and those who have their private practice are thinking about reducing working hours, retiring early or changing their career.

**Keywords:** COVID-19, dentists, career choice, social perception, SARS-CoV-2

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## Introduction

Coronavirus disease 2019 (COVID-19) is a viral respiratory infection evoked by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that is spread through direct contact with the surfaces infected with fomites, droplets or aerosols.[1] Airborne transmission via aerosol-generating activities has also been suggested.[2] New evidence has shown that the principal mode of COVID-19 transmission is via the inhalation of droplets/aerosols from the infected source rather than through the contaminated surfaces.[3] COVID-19 is a highly contagious disease that can have a severe course or even cause death. Due to the rapid spread of the virus around the world, the World Health Organization (WHO) declared COVID-19 a pandemic in March 2020, generating lockdowns and restriction policies that have brought economic and political instability as well as social devastation in many countries.[4] The risk of contagion with COVID-19 among dental healthcare workers (DHCWs) is having a tremendous impact on dentistry around the world. Fontana et al. found that DHCWs were vulnerable to the threat of COVID-19 and its psychological impact to the same extent as other essential workers.[5]

The dental profession is considered high-risk due to contact with the potentially contaminated saliva or blood carrying diverse pathogens, such as the hepatitis B virus (HBV), the hepatitis C virus (HCV) and the human immunodeficiency virus (HIV) responsible for acquired immunodeficiency syndrome (AIDS), as a result of occupational accidents.[6] Contagion with SARS-CoV-2 through direct contact with the infected patient while performing dental procedures is possible. In addition, using a high-speed handpiece and water may generate aerosols, and result in contagion with COVID-19.[7] Dentists' anxiety and fear of possible contagion, the governmental restrictions regarding elective dental procedures, and lockdown isolation have created a financial impact and uncertainty in the context of dentists' future career plans.[8,9] Such fear can cause mental health problems and post-traumatic stress disorder symptoms, which may change future career objectives in terms of work patterns or retirement plans among DHCWs.[10]

Dentistry is a liberal profession that entails particular employment conditions, practice settings, remuneration, and social status in each country, and the career prospects may also vary.[11,12] Lo Sasso et al. found variations in job satisfaction among dentists with different practice settings (individual practice, small-group practice or large-group practice).[13] On the other hand, Campus et al. conducted a study on the promotion and development of young professionals in Switzerland.[14] They found that a significantly low percentage of dentists held a negative view of their professional future; the majority of young dentists were satisfied with their career prospects.[14] Janulyte et al. found that Lithuanian general dentists and dental specialists planned to retire beyond the official retirement age or to emigrate to work in other countries.[15] Gallagher et al. found that among final-year dental students at King's College of London, UK, the factors influencing their long-term career plans were related to personal considerations, such as the standard of living, work–life balance and financial security.[16] Nashleanas et al. observed that although the majority of dental students in the United States hoped to pursue specialty training after dental school, their high educational debts made them choose to practice general dentistry immediately after graduation.[17]

To the best of our knowledge, no studies on changes in dentists' career plans due to the COVID-19 pandemic are available in the literature. Such information is important for implementing adequate public policies; it may also alert dental associations and dental schools of the potential problems the COVID-19 pandemic can bring to the dental profession so that appropriate actions could be undertaken to avoid negative consequences to the oral health of the population. Therefore, the aim of the current study was to explore the impact of the COVID-19 pandemic on the career plans of Colombian dentists.

## Methods

This cross-sectional study was based on the data collected from an anonymous survey on the impact of the COVID-19 pandemic on dentistry in Colombia. The protocol of the study was approved by the Ethics Committee of Fundación Universitaria CIEO – UniCIEO, Bogota, Colombia (No. 101, file 62). All respondents completed an informed consent form that was embedded on the 1st page of the questionnaire; participation in the study was completely voluntary. The study fully complied with the World Medical Association (WMA) Declaration of Helsinki, and reporting followed the STROBE (STrengthening the Reporting of OBservational studies in Epidemiology) guidelines.

The questionnaire was part of a global survey conducted by the Collaborative Group for COVID-19, an organization to which the authors of this study are affiliated.[18] The Colombian version of the questionnaire had 31 questions, 21 from the global core questionnaire and 10 additional questions on the impact of COVID-19 on future career planning, teledentistry and the management of ventilation systems (the questionnaire is available from the corresponding author on reasonable request). As some of the questions were originally in English, a systematic approach to translation and adaptation was implemented. It consisted of 5 steps: forward translation; expert panel discussion; backward translation; a pre-test; cognitive briefing; and consensus on the final version. The survey was validated in terms of appearance, content validity and reproducibility in a pilot test. Thirty dentists who work in Colombia were recruited using simple random

sampling and invited to participate in the pilot test. Of these, 10 were asked to assess face validity ("Does the test 'look like' a measure of the construct of interest?") and semantic comprehension, and the remaining 20 were asked to assess test–retest reliability (the repeated application of the instrument at 4–7-day intervals).

The sample was collected by convenience sampling from the initial population of 31,872 dentists certified to work in Colombia in 2019.[19] Using the OpenEpi software, v. 3.01 (https://www.openepi.com) on the data from the pilot study, the required sample size of 2,341 subjects was obtained. A 99.9% confidence level was considered, and an estimated prevalence of 70% for the impact of COVID-19 on future career planning was given to establish an estimate within ±3% of this value. The inclusion criteria were dentists working in Colombia. Surveys with errors in the information record were excluded.

The self-administered online questionnaire was distributed from June 19 to July 24, 2020. The survey link was distributed through digital media (Facebook groups, WhatsApp messages, e-mails, and institutional invitations) to several dental schools and dental associations in Colombia. The Google Forms settings were adjusted to disallow missing or incomplete answers, and modified to remove access to the link after a response was submitted. To control information bias, in the institutional databases, the questionnaire was forwarded by e-mail only to the dentists who had not previously opened the mail. Additionally, in the introduction and the final part of the survey, a warning sign reminded the respondents not to fill out the questionnaire again if it had already been submitted. No incentives were offered to the participants.

The following independent variables were assessed: demographics – sex, age, and work locality; specialty and practice setting; self-reported COVID-19 testing and contagion; the perception of confidence and of the risk of contagion; and the implementation of preventive measures in the practice (4 categories: DHCW measures, disinfection, patient measures, dental office measures) and the use of personal protective equipment (PPE). The preventive measures and the elements of PPE are detailed in Table 1. Age was determined as a continuous variable; however, for the statistical analysis, it was re-categorized into 4 age groups: young adult (22–35 years); adult (36–45 years); mature adult (46–59 years); and older adult (60 years and above). The work locality variable was categorized using the CEPAL (Economic Commission for Latin America and the Caribbean) classification according to the territorial agglomeration index: urban provinces (97–673 inhabitants per km$^2$); intermediate provinces (15–277 inhabitants per km$^2$); and rural provinces (0–127 inhabitants per km$^2$).[20]

The dependent variable was 'the impact of the COVID-19 pandemic on career plans'. This variable offered 6 multiple-choice options: consider retiring early; reduce working hours; move from the current practice location; change the career away from dentistry; move to a non-clinical dental position; and no impact on career plans. For the statistical analysis, this variable was dichotomized into 'impact' and 'no impact'.

## Statistical analysis

The data was collected in an Excel file provided by Google Forms. Anonymous data analyses were performed by one of the researchers (S.P.P.R), and checked for consistency and quality. The statistical analysis was performed using Stata Statistical Software: Release 16 (StataCorp, College Station, USA). The variables were summarized in absolute and relative frequencies. Additionally, a binomial logistic regression analysis was carried out to evaluate the probability of the impact of the COVID-19 pandemic on career plans according to the independent variables. Variables with a $p$-value ≤0.20 in the bivariate analysis were included in the logistic regression model (the backward stepwise procedure). The quality of the model adjustments was analyzed with the log of the likelihood and the Akaike information criterion (AIC). The model with the lowest values of the likelihood ratio (LR) and AIC was selected. The significance level was set at 5%.

# Results

Test–retest reliability was high, with a kappa coefficient ranging from 0.91 to 0.96 (confidence interval (*CI*): 0.77, 0.96). In total, 5,375 completed surveys were obtained; 5 were discarded due to errors in the information record, leaving 5,370 viable surveys. With a total of 31,872 dentists registered to work in the Colombian territory, the corresponding response rate of the survey was 16.85%.

The descriptive statistics of the sample are presented in Table 2. Women accounted for 72.22% of the sample, and almost half of the respondents were above the age of 45. More than 80% worked in urban provinces (81.71%), more than 90% were general practitioners (41.94%) or clinical specialists (48.21%), and 80.58% worked in a private practice (as an owner or an associate). At the time of conducting the survey, 8.53% of the respondents had been tested for COVID-19 and 0.61% were COVID-19 positive. Fully 96% of the respondents believed that COVID-19 infection was a risk for dentists and 58.98% of them believed that the risk of COVID-19 transmission in the dental practice was higher than the risk associated with going to a supermarket. Of the 81.96% respondents who reported that the COVID-19 pandemic had some impact on their career plans, 26.54% considered retiring early, 77.96% thought about reducing working hours, 9.27% about moving from the current practice location, 18.15% about changing their career away from dentistry, and 16.02% considered moving to a non-clinical dental position. Adherence to biosecurity procedures was between 97.12% and 99.21%, and the frequency of the use of some form of PPE was 100%.

**Table 1.** Categories of preventive measures against coronavirus disease 2019 (COVID-19) infection

| Category | Preventive measures |
|---|---|
| DHCW measures | taking the temperature of all staff and excluding those with a temperature above 37.5°C |
| | handwashing for the clinical staff before and after each procedure |
| Disinfection | disinfecting surfaces with 70% alcohol |
| | disinfecting surfaces with 0.5% sodium hypochlorite |
| | other common clinical disinfectants |
| | disinfecting surfaces several times a day (bells, door handles, POS credit card readers, the waiting room, and the reception) |
| | disinfecting all elements and surfaces in the clinical area several times a day |
| | removing all disposable protective items and disinfecting non-disposable protective items |
| Patient measures | checking the patient's state of health before giving an appointment |
| | postponing appointments for people who are elderly or have systemic pathologies |
| | taking the patient's temperature on arrival |
| | hand washing/sanitizer gel for patients before entering the clinical area |
| | maintaining at least a 1-meter distance between patients |
| | offering the patient a mask while they are waiting |
| | disposable shoe covers over the patient's shoes |
| | preoperative mouthwash with 1% hydrogen peroxide |
| | preoperative mouthwash with 0.12–0.20% chlorhexidine |
| | preoperative mouthwash with 0.20–1.00% povidone iodine |
| | preoperative mouthwash with 0.05-0.10% cetylpyridinium chloride |
| | using a dilution of mouthwash |
| Dental office measures | phone triage |
| | spacing appointments |
| | erecting protective dividing screens |
| | ventilating the clinical area and the waiting room frequently |
| | ventilating the clinical area for at least 10 min between patients |
| | removing magazines and books from the waiting area |
| | leaving coats, bags or other personal objects outside the clinical area |
| | using rotary instruments with a non-return valve |
| PPE | surgical mask |
| | FFP2, FFP3 or N95 mask |
| | silicone respirator |
| | disposable scrub cap |
| | non-disposable fluid-resistant coat |
| | disposable fluid-resistant coat |
| | sterile disposable fluid-resistant coat |
| | protective overall |
| | protective glasses or faceshield |
| | safety glasses or visor |
| | sterile disposable gloves |
| | disposable shoe covers |
| | rubber dam |
| | checking the patient's state of health before giving an appointment |

DHCW – dental healthcare worker; PPE – personal protective equipment; POS – point of sale.

**Table 2.** Sociodemographic characteristics and the questionnaire answers ($N = 5,370$ unless marked otherwise)

| Variable | | | Absolute frequency (*n*) | | Relative frequency (%) | |
|---|---|---|---|---|---|---|
| Categorical variables | sex ($N = 5,369$; other: $n = 1$) | male | 1,491 | | 27.77 | |
| | | female | 3,878 | | 72.22 | |
| | age (categorized) | young adult (22–35 years) | 1,341 | | 24.97 | |
| | | adult (36–45 years) | 1,488 | | 27.71 | |
| | | mature adult (46–59 years) | 2,111 | | 39.31 | |
| | | older adult (≥60 years) | 430 | | 8.01 | |
| | work locality | urban | 4,388 | | 81.71 | |
| | | intermediate | 510 | | 9.50 | |
| | | rural | 466 | | 8.68 | |
| | | NA – unemployed | 6 | | 0.11 | |
| | specialty | general practitioner | 2,252 | | 41.94 | |
| | | clinical specialist | 2,589 | | 48.21 | |
| | | public health | 470 | | 8.75 | |
| | | other | 59 | | 1.10 | |
| | | – | yes | no | yes | no |
| | practice setting | private practice (owner) | 2,401 | 2,969 | 44.71 | 55.29 |
| | | private practice (tenant/associate) | 1,926 | 3,444 | 35.87 | 64.13 |
| | | public or private sector salaried employee | 1,637 | 3,733 | 30.48 | 69.52 |
| | | academic/research worker | 723 | 4,647 | 13.46 | 86.54 |
| | | administrative worker | 372 | 4,998 | 6.93 | 93.07 |
| | Have you ever been tested for COVID-19? | yes | 458 | | 8.53 | |
| | | no | 4,912 | | 91.47 | |
| | What was the result of your COVID-19 test? | COVID-19 positive | 33 | | 0.61 | |
| | | COVID-19 negative | 425 | | 7.91 | |
| | | NA – I have not been tested | 4,912 | | 91.47 | |
| | Have you undertaken any course (with/without certification) on COVID-19? | yes | 3,498 | | 65.14 | |
| | | no | 1,872 | | 34.86 | |
| | Do you think that you know enough about COVID-19? | yes | 3,699 | | 68.88 | |
| | | no | 1,671 | | 31.12 | |
| | Do you believe that there is a real risk for a dentist of contracting COVID-19 at work? | very likely | 3,719 | | 69.26 | |
| | | likely | 1,431 | | 26.65 | |
| | | unlikely | 207 | | 3.85 | |
| | | very unlikely | 13 | | 0.24 | |
| | Do you believe that the risk of COVID-19 transmission in the dental practice is | higher than the risk associated with going to a supermarket? | 3,167 | | 58.98 | |
| | | comparable to the risk associated with going to a supermarket? | 732 | | 13.63 | |
| | | lower than the risk associated with going to a supermarket? | 1,471 | | 27.39 | |
| | How sure are you that you can avoid becoming infected with COVID-19 whilst working? | very confident | 493 | | 9.18 | |
| | | reasonably confident | 2,961 | | 55.14 | |
| | | not so confident | 1,603 | | 29.85 | |
| | | not at all confident | 313 | | 5.83 | |
| | How has the COVID-19 pandemic influenced your career plans (dichotomous) | impact on career plans | 4,401 | | 81.96 | |
| | | no impact on career plans | 969 | | 18.04 | |

| Variable | | | Absolute frequency (*n*) | | Relative frequency (%) | |
|---|---|---|---|---|---|---|
| | | – | yes | no | yes | no |
| Categorical variables | How has the COVID-19 pandemic influenced your career plans (multiple options) | consider retiring early (*N* = 4,401) | 1,168 | 3,233 | 26.54 | 73.46 |
| | | reduce working hours (*N* = 4,401) | 3,431 | 970 | 77.96 | 22.04 |
| | | move from the current practice location (*N* = 4,401) | 408 | 3,993 | 9.27 | 90.73 |
| | | change the career away from dentistry (*N* = 4,401) | 799 | 3,602 | 18.15 | 81.85 |
| | | move to a non-clinical dental position (*N* = 4,401) | 705 | 3,696 | 16.02 | 83.98 |
| | | no impact on career plans | 969 | 4,401 | 18.04 | 81.96 |
| | DHCW measures (*N* = 4,168) | yes | 4,048 | | 97.12 | |
| | | no | 120 | | 2.88 | |
| | disinfection (*N* = 4,168) | yes | 4,092 | | 98.18 | |
| | | no | 76 | | 1.82 | |
| | patient measures (*N* = 4,168) | yes | 4,135 | | 99.21 | |
| | | no | 33 | | 0.79 | |
| | dental office measures (*N* = 4,168) | yes | 4,135 | | 99.21 | |
| | | no | 33 | | 0.79 | |
| | PPE (*N* = 4,282) | yes | 4,282 | | 100.00 | |
| | | no | 0 | | 0.00 | |
| Continuous variable | age [years] *Me* (min–max) | 45 (22–82) | | | | |

NA – not applicable; COVID-19 – coronavirus disease 2019; *Me* – median; min – minimum; max – maximum.
Note: The questions on the implementation of preventive measures and PPE were answered only by the dentists in clinical practice, working under the conditions of isolation during the COVID-19 pandemic.

The bivariate analysis results are shown in Table 3. Evidence was found ($p < 0.05$) of associations between the impact of the COVID-19 pandemic on career plans and age group, specialty, practice setting, COVID-19 testing, the probability of contagion, and confidence with regard to contagion. Higher frequencies of impact were observed in older adults (87.44%), general practitioners (83.26%), private practice owners (86.34%), non-tested dentists (82.31%), dentists who thought that contagion was very probable (83.25%), and those who were not very confident that they could avoid being infected (84.59%).

The logistic regression model (Table 4) provides the odds ratio (*OR*) of significant variables to predict the chance of the COVID-19 pandemic having an impact on future career plans (yes/no) and a 95% *CI* for the *OR*. The final model showed that mature adults (*OR* = 1.23; 95% *CI*: 1.01, 1.48), older adults (*OR* = 1.62; 95% *CI*: 1.16, 2.26), general practitioners (*OR* = 1.21; 95% *CI*: 1.02, 1.44), private practice owners (*OR* = 2.33; 95% *CI*: 1.94, 2.79), private practice associates (*OR* = 2.20; 95% *CI*: 1.84, 2.63), and those with 'very probable' risk perception (*OR* = 4.29; 95% *CI*: 1.35, 13.60) had a significantly greater chance of the pandemic having an impact on their future career plans ($p < 0.05$). Meanwhile, for those in academic/research (*OR* = 0.73; 95% *CI*: 0.59, 0.90) and administrative positions (*OR* = 0.62; 95% *CI*: 0.47, 0.83), there was a significantly lower chance of the disease impacting their future career plans ($p < 0.05$).

## Discussion

The ongoing changes in the dentistry field caused by the COVID-19 pandemic are a challenge for private practices, public dental healthcare systems, dental schools,[11,21,22] scientific associations, and decision-makers responsible for health policies to overcome the potential negative impact of the current pandemic on the future career plans of dentists around the world.[11,21–23] The results of the present survey provide relevant information about the possible factors associated with the impact of the COVID-19 pandemic on the career plans of dentists in Colombia.

**Table 3.** Bivariate analysis of the impact of the COVID-19 pandemic on dentists' career plans (*N* = 5,370 unless marked otherwise)

| Categorical variable | | How has the COVID-19 pandemic influenced your career plans? | | | | *p*-value |
|---|---|---|---|---|---|---|
| | | impact (*N* = 4,401) | | no impact (*N* = 969) | | |
| Sex (*N* = 5,369; other: *n* = 1) | male | 1,209 (81.09) | | 282 (18.91) | | 0.296 |
| | female | 3,192 (82.31) | | 686 (17.69) | | |
| Age (categorized) | young adult (22–35 years) | 1,066 (79.49) | | 275 (20.51) | | 0.001* |
| | adult (36–45 years) | 1,210 (81.32) | | 278 (18.68) | | |
| | mature adult (46–59 years) | 1,749 (82.85) | | 362 (17.15) | | |
| | older adult (≥60 years) | 376 (87.44) | | 54 (12.56) | | |
| Work locality | urban | 3,600 (82.04) | | 788 (17.96) | | 0.909 |
| | intermediate | 415 (81.37) | | 95 (18.63) | | |
| | rural | 380 (81.55) | | 86 (18.45) | | |
| Specialty | general practitioner | 1,875 (83.26) | | 377 (16.74) | | <0.001* |
| | clinical specialist | 2,147 (82.93) | | 442 (17.07) | | |
| | public health | 333 (70.85) | | 137 (29.15) | | |
| | other | 46 (77.97) | | 13 (22.03) | | |
| Practice setting | – | yes | no | yes | no | – |
| | private practice (owner) | 2,073 (86.34) | 2,328 (78.41) | 328 (13.66) | 641 (21.59) | <0.001* |
| | private practice (tenant/associate) | 1,649 (85.62) | 2,752 (79.91) | 277 (14.38) | 692 (20.09) | <0.001* |
| | public or private sector salaried employee | 1,264 (77.21) | 3,137 (84.03) | 373 (22.79) | 596 (15.97) | <0.001* |
| | academic/research worker | 563 (77.87) | 3,838 (82.59) | 160 (22.13) | 809 (17.41) | 0.002* |
| | administrative worker | 248 (66.67) | 4,153 (83.09) | 124 (33.33) | 845 (16.91) | <0.001* |
| Have you ever been tested for COVID-19? | yes | 358 (78.17) | | 100 (21.83) | | 0.027* |
| | no | 4,043 (82.31) | | 869 (17.69) | | |
| What was the result of your COVID-19 test? | COVID-19 positive | 28 (84.85) | | 5 (15.15) | | 0.079 |
| | COVID-19 negative | 330 (77.65) | | 95 (22.35) | | |
| | NA – I have not been tested | 4,043 (82.31) | | 869 (17.69) | | |
| Have you undertaken any course (with/without certification) on COVID-19? | yes | 2,859 (81.73) | | 639 (18.27) | | 0.562 |
| | no | 1,542 (82.37) | | 330 (17.63) | | |
| Do you think that you know enough about COVID-19? | yes | 3,013 (81.45) | | 686 (18.55) | | 0.156 |
| | no | 1,388 (83.06) | | 283 (16.94) | | |
| Do you believe that there is a real risk for a dentist of contracting COVID-19 at work? | very likely | 3,096 (83.25) | | 623 (16.75) | | <0.001* |
| | likely | 1,151 (80.43) | | 280 (19.57) | | |
| | unlikely | 146 (70.53) | | 61 (29.47) | | |
| | very unlikely | 8 (61.54) | | 5 (38.46) | | |
| Do you believe that the risk of COVID-19 transmission in the dental practice is | higher than the risk associated with going to a supermarket? | 2,627 (82.95) | | 540 (17.05) | | 0.066 |
| | comparable to the risk associated with going to a supermarket? | 585 (79.92) | | 147 (20.08) | | |
| | lower than the risk associated with going to a supermarket? | 1,189 (80.83) | | 282 (19.17) | | |
| How sure are you that you can avoid becoming infected with COVID-19 whilst working? | very confident | 382 (77.48) | | 111 (22.52) | | 0.002* |
| | reasonably confident | 2,406 (81.26) | | 555 (18.74) | | |
| | not so confident | 1,356 (84.59) | | 247 (15.41) | | |
| | not at all confident | 257 (82.11) | | 56 (17.89) | | |
| DHCW measures | yes | 3,344 (82.61) | | 704 (17.39) | | 0.072 |
| | no | 98 (81.67) | | 22 (18.33) | | |
| Disinfection | yes | 3,383 (82.67) | | 709 (17.33) | | 0.251 |
| | no | 59 (77.63) | | 17 (22.37) | | |
| Patient measures | yes | 3,418 (82.66) | | 717 (17.34) | | 0.134 |
| | no | 24 (72.73) | | 9 (27.27) | | |
| Dental office measures | yes | 3,417 (82.64) | | 718 (17.36) | | 0.299 |
| | no | 25 (75.76) | | 8 (24.24) | | |
| PPE | yes | 3543 (82.74) | | 739 (17.26) | | NA |
| | no | 0 (0.00) | | 0 (0.00) | | |

Data presented as absolute (relative) frequency (*n* (%)). * statistically significant.

**Table 4.** Logistic regression model for the predictor variables for the chance of the COVID-19 pandemic having an impact on dentists' future career plans

| Variable | | *OR* crude | | *OR* full model | | *OR* final regression model | |
|---|---|---|---|---|---|---|---|
| | | *OR* (95% *CI*) | *p*-value | *OR* (95% *CI*) | *p*-value | *OR* (95% *CI*) | *p*-value |
| Sex | male | 1 | – | – | – | – | – |
| | female | 1.08 (0.93, 1.26) | 0.296 | – | – | – | – |
| Age (categorized) | young adult (22–35 years) | 1 | – | 1 | – | 1 | – |
| | adult (36–45 years) | 1.12 (0.93, 1.35) | 0.222 | 1.31 (1.05, 1.64) | 0.015* | 1.10 (0.90, 1.34) | 0.332 |
| | mature adult (46–59 years) | 1.25 (1.05, 1.48) | 0.013* | 1.48 (1.19, 1.85) | <0.0001* | 1.23 (1.01, 1.48) | 0.030* |
| | older adult (≥60 years) | 1.80 (1.31, 2.46) | <0.0001* | 2.02 (1.34, 3.06) | 0.001* | 1.62 (1.16, 2.26) | 0.004* |
| Work locality | urban | 1 | – | – | – | – | – |
| | intermediate | 0.95 (0.75, 1.21) | 0.710 | – | – | – | – |
| | rural | 0.96 (0.75, 1.23) | 0.791 | – | – | – | – |
| Specialty | clinical specialist | 1 | – | 1 | – | 1 | – |
| | general practitioner | 1.02 (0.88, 1.19) | 0.759 | 1.32 (1.09, 1.60) | 0.005* | 1.21 (1.02, 1.44) | 0.028* |
| | public health | 0.50 (0.40, 0.62) | <0.0001* | 1.56 (1.04, 2.34) | 0.028* | 0.92 (0.69, 1.22) | 0.577 |
| | other | 0.72 (0.39, 1.35) | 0.320 | 3.15 (0.92, 10.74) | 0.067 | 1.26 (0.66, 2.42) | 0.475 |
| Practice setting | private practice (owner) | 1.74 (1.50, 2.01) | <0.0001* | 1.92 (1.48, 2.47) | <0.0001* | 2.33 (1.94, 2.79) | <0.0001* |
| | private practice (tenant/associate) | 1.50 (1.29, 1.74) | <0.0001* | 1.94 (1.52, 2.47) | <0.0001* | 2.20 (1.84, 2.63) | <0.0001* |
| | public or private sector salaried employee | 0.64 (0.56, 0.74) | <0.0001* | 0.83 (0.66, 1.04) | 0.112 | – | – |
| | academic/research worker | 0.74 (0.61, 0.89) | 0.002* | 0.84 (0.65, 1.07) | 0.166 | 0.73 (0.59, 0.90) | 0.003* |
| | administrative worker | 0.41 (0.32, 0.51) | <0.0001* | 0.63 (0.41, 0.97) | 0.035* | 0.62 (0.47, 0.83) | 0.001* |
| Have you ever been tested for COVID-19? | no | 1 | – | 1 | – | – | – |
| | yes | 0.77 (0.61, 0.97) | 0.028* | 0.28 (0.05, 1.44) | 0.129 | – | – |
| What was the result of your COVID-19 test? | COVID-19 negative | 1 | – | 1 | – | – | – |
| | COVID-19 positive | 1.58 (0.59, 4.21) | 0.790 | 1.71 (0.54, 5.34) | 0.355 | – | – |
| | NA – I have not been tested | 1.31 (1.03, 1.67) | 0.160 | 0.33 (0.06, 1.69) | 0.185 | – | – |
| Have you undertaken any course (with/without certification) on COVID-19? | yes | 0.96 (0.83, 1.10) | 0.562 | – | – | – | – |
| | no | 1 | – | – | – | – | – |
| Do you think that you know enough about COVID-19? | no | 1 | – | – | – | – | – |
| | yes | 0.90 (0.77, 1.04) | 0.156 | 0.91 (0.75, 1.09) | 0.305 | – | – |
| Do you believe that there is a real risk for a dentist of contracting COVID-19 at work? | very unlikely | 1 | – | – | – | 1 | – |
| | very likely | 3.11 (1.01, 9.52) | 0.047* | 3.50 (1.06, 11.62) | 0.040* | 4.29 (1.35, 13.60) | 0.013* |
| | likely | 2.57 (0.83, 7.91) | 0.100 | 3.23 (0.97, 10.71) | 0.055 | 3.14 (0.98, 10.01) | 0.052 |
| | unlikely | 1.50 (0.47, 4.75) | 0.495 | 1.98 (0.58, 6.80) | 0.275 | 1.68 (0.51, 5.54) | 0.389 |

| Variable | | *OR* crude | | *OR* full model | | *OR* final regression model | |
|---|---|---|---|---|---|---|---|
| | | *OR* (95% *CI*) | *p*-value | *OR* (95% *CI*) | *p*-value | *OR* (95% *CI*) | *p*-value |
| Do you believe that the risk of COVID-19 transmission in the dental practice is | comparable to the risk associated with going to a supermarket? | 1 | – | – | – | – | – |
| | higher than the risk associated with going to a supermarket? | 1.22 (0.99, 1.49) | 0.053 | 1.07 (0.83, 1.38) | 0.611 | – | – |
| | lower than the risk associated with going to a supermarket? | 1.05 (0.85, 1.32) | 0.611 | 0.91 (0.69, 1.19) | 0.475 | – | – |
| How sure are you that you can avoid becoming infected with COVID-19 whilst working? | not at all confident | 1 | – | – | – | – | – |
| | very confident | 0.75 (0.52, 1.07) | 0.115 | 0.75 (0.47, 1.20) | 0.234 | – | – |
| | reasonably confident | 0.94 (0.70, 1.28) | 0.713 | 1.02 (0.69, 1.53) | 0.888 | – | – |
| | not so confident | 1.20 (0.87, 1.65) | 0.271 | 1.37 (0.90, 2.07) | 0.136 | – | – |
| DHCW measures | no | 1 | – | – | – | – | – |
| | yes | 1.06 (0.67, 1.70) | 0.789 | – | – | – | – |
| Disinfection | no | 1 | – | – | – | – | – |
| | yes | 1.37 (0.80, 2.37) | 0.253 | – | – | – | – |
| Patient measures | no | 1 | – | – | – | – | – |
| | yes | 1.79 (0.83, 3.87) | 0.139 | 1.67 (0.75, 3.74) | 0.143 | – | – |
| Dental office measures | no | 1 | – | – | – | – | – |
| | yes | 1.52 (0.68, 3.39) | 0.303 | – | – | – | – |
| PPE | no | 0 | – | – | – | – | – |
| | yes | 1 | – | – | – | – | – |

*OD* – odds ratio; *CI* – confidence interval; * statistically significant.

The sample in the present study was composed predominantly of women (72%), which is in line with the preponderance of female dentists in Colombia (75%). Age and work localities were also representative of the population of dentists registered to work in Colombia.[19]

On June 19, 2020, when we began administering the survey, 63,276 people had tested positive for COVID-19 in Colombia and 2,045 deaths were reported due to the disease. By the end of the survey, on July 24, 2020, the number of cases had risen to 233,451 and 7,975 deaths.[24] As of July 24, 2020, there were 33 reported cases of dentists infected with COVID-19 in the country.[25] According to our results, the respondents self-reported that only 8.53% of them (458 dentists) had been tested for COVID-19, and of those, 7.21% (33 dentists) were COVID-19 positive. Similar results were obtained by Fontana et al., who reported 6% of the surveyed DHCWs were tested and 4% were positive for COVID-19.[5]

In the current survey, 96% of the dentists perceived COVID-19 as a real risk for dentists and 58.98% of the respondents believed that the risk of COVID-19 transmission in dental practice was higher than that of going to a supermarket. However, 64.32% (reasonably confident or very confident) were optimists about the possibility of avoiding COVID-19 infection while working. These results suggest that even though the respondents were aware of the risk from face-to-face dental procedures, they felt safe in some way. This may be due to the perception of security afforded by strict adherence to biosecurity procedures (97.12% to 99.21%) and the use of PPE reported by 100% of those surveyed. Fontana et al. found that DHCWs were significantly less fearful than non-dental healthcare providers and non-healthcare essential workers.[5]

Regarding the impact on career plans, in the present study, 81.96% of the dentists reported that the COVID-19 pandemic had some impact on their career plans; 77.96% of the respondents considered reducing working hours, 26.54% retiring early and 34.17% leaving face-to-face patient care, either through changing the career away from dentistry (18.15%) or moving to a non-clinical dental position (16.02%). However, we did not find statistically significant differences according to sex with regard to the impact of COVID-19 on future career plans. Without a doubt, the COVID-19 pandemic has been one of the most catastrophic events in the recent history

of humanity, and it still causes uncertainty about personal and professional future.[22] Sinjari et al. surveyed 440 Italian dentists in the Abruzzo region during the COVID-19 outbreak and found that 66.6% reported apprehension about their professional future.[26] The high percentage of dentists who considered reducing working hours or leaving face-to-face patient care could be due to diverse factors, such as higher stress they face at work, the fear of spreading the infection to their families, or the financial burden of additional PPE and biosecurity products to perform dental procedures.[9]

We also found significant differences ($p < 0.05$) showing that those whose career plans were most impacted by the COVID-19 pandemic were older adults (87.44%), general practitioners (83.26%), private practice owners (86.34%), non-tested dentists (82.31%), dentists that perceived the risk of contagion as very probable (83.25%), and those with little confidence in avoiding becoming infected in the dental practice (84.59%). Many authors have reported the aging of the dental workforce around the world.[15,27] Our sample, which included dentists aged 22–82 years, showed that many people working in the dental healthcare system in Colombia are older. Since age is considered a risk factor for disease severity and death from COVID-19,[28] this could be the cause of the high number of dentists who considered retiring early. General dentists and private practice owners might be more impacted, because they may perceive that both their safety and their financial situation are compromised by the current pandemic. These findings are similar to those of Lo Sasso et al., who found that the income of the dentists working in individual private practices was lower than that of those working in small and large groups.[13] As for our result that non-tested dentists were more affected than those who had been tested for COVID-19, this finding could be due to the fact that testing may alleviate stress and anxiety.[5] Also, the most affected group were those who considered themselves more at risk of contagion and less confident of avoiding it. This could be explained by the state of anxiety and fear that many dentists around the world are facing, which may overwhelm them and impact their career plans.[8]

In our study, we also evaluated which factors were the best predictors for the probability of the pandemic having some impact on career plans. The regression analysis confirmed the impact of COVID-19 on dentists' career plans. Being over 60 years old (*OR* = 1.62; 95% *CI*: 1.16, 2.26), being a general practitioner (*OR* = 1.21; 95% *CI*: 1.02, 1.44), being a private practice owner (*OR* = 2.33; 95% *CI*: 1.94, 2.79) or associate (*OR* = 2.20; 95% *CI*: 1.84, 2.63), and having the perception of contagion as very probable (*OR* = 4.29; 95% *CI*: 1.35, 13.60) were significant risk factors for career plans being impacted by COVID-19. Dentists in academic/research (*OR* = 0.73; 95% *CI*: 0.59, 0.90) or administrative positions (*OR* = 0.62; 95% *CI*: 0.47, 0.83) had a significantly lower probability of their future career plans being impacted ($p < 0.05$).

## Limitations

The limitations of the present study are the potential bias that self-administered surveys and cross-sectional studies carry, and the fact that the survey was conducted in the context of the particular situation of the country with regard to the COVID-19 outbreak at the moment the dentists answered the survey, affecting their responses about future plans. These limitations could influence the results; thus, caution is recommended in generalizing these findings. It is also important to take into account that at the time of the survey, the COVID-19 vaccine was not available globally. It would be interesting to know if vaccination has changed the perception of dentists toward their current career plans.

# Conclusions

The COVID-19 pandemic has affected the career plans of dentists, with the impact being greater among older clinicians, dentists with a privately owned practice and dentists with a greater perception of the risk of contagion.

## Ethics approval and consent to participate

The study was approved by the Ethics Committee of Fundación Universitaria CIEO – UniCIEO, Bogota, Colombia (No. 101, file 62). All respondents provided informed written consent for the participation in the study.

## Data availability

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Consent for publication

Not applicable.


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