The perceived impact of the COVID-19 pandemic on dental undergraduate students in the Italian region of Emilia-Romagna

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Abstract

Introduction: The outbreak and diffusion of the novel SARS-CoV2 coronavirus have caused an emergency status in the dental education system.

Materials and methods: An anonymous survey composed of 34 questions was delivered to students of the Master Degree Programme in Dentistry and Dental Prosthodontics of the Universities of Emilia-Romagna, the fifth Italian region most affected by the pandemic. The psychological impact of COVID-19 was assessed by means of the Generalised Anxiety Disorder-7 scale (GAD-7). Numerically recoded data were analysed using the Analysis of Variance (ANOVA), whilst to investigate the association between quantitative variables, the Pearson correlation coefficient (R) was computed.

Results: The questionnaire was completed by 399 students (75%) out of 532. Most students experienced difficulties in working at the thesis during the COVID-19 emergency. For over half of them, online teaching could only partially replace traditional face-to-face lessons. The negative impact on the study career was judged as particularly high by sixth-year students. Clinical training activities were considered as exposing to the risk of contracting COVID-19 infection by the majority of the students. The level of concern of contracting COVID-19 infections during future university activities was positively correlated to risk perception related to clinical training.

Conclusion: The results of this survey could be used to train students to a correct risk assessment. Students reported experiencing concern whilst thinking of COVID-19 and 6.5% of them showed symptoms related to high levels of anxiety. These data may guide Universities in trying to reduce students' anxiety by means of correct communication strategies.

Keywords
anxiety, coronavirus, COVID-19, dental undergraduate students, risk perception, survey
1 | INTRODUCTION

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by a newly discovered coronavirus that originated in Wuhan, the largest metropolitan area in China’s Hubei province, in December 2019. The virus that causes COVID-19 was initially called as 2019-nCoV and, subsequently, the task of expert of the International Committee on Taxonomy of Viruses (ICTV) termed it the syndrome coronavirus 2 (SARS-CoV-2).

Since the Covid-19 outbreak spread rapidly in several countries, the World Health Organisation (WHO) declared a pandemic public health emergency on 11 March 2020. As of November 1 2020, they have been confirmed more than 48 196 862 cases and 1 226 813 deaths globally.

The common human to human transmission routes of COVID-19 are represented by direct transmission (droplets release through exhalation, cough or sneeze) and contact transmission (contact with contaminated surfaces and oral, nasal and eye mucous membrane). The main symptoms are represented not only by fever, dry cough, shortness of breath and myalgia but also anosmia, ageusia, headache and, in few cases, diarrhoea have been reported.

The incubation period of COVID-19 has been estimated to be 1-14 days; it has been reported that even asymptomatic people can spread the virus, and, in this way, they may be fuelling the spread. Given the routes of transmission, dental professionals are at high risk of contagion due to frequent exposure to saliva, blood and aerosols and droplets production during the majority of dental therapies. Particularly, aerosols and droplets have a small size and they can remain in the air for a long period of time before settling on environmental surfaces of the dental setting or entering in the respiratory tract through inhalation.

Italy has seen a rapid expansion of the COVID-19 disease and, to date, have been confirmed 935 104 cases and 41 394 deaths. It is the eleventh country worldwide and the fifth in Europe by number of contagions and the sixth country in the world and the second in Europe, after the United Kingdom, to have the highest official numbers of deaths. At the time of the initial outbreak of the pandemic, northern Italy was mostly hit, and the Emilia-Romagna region was the third Italian region most affected by the pandemic. As of 23 February 2020, all the Italian Schools and Universities suspended teaching, training and laboratory activities and closed all facilities such as libraries and study rooms in order to avoid direct contacts between persons and to minimise the transmission between persons of different areas. In particular, since dentists and consequently dental students and dental chairside assistants were classified in the very high-risk category because of the potential of exposure to coronavirus through aerosol-generating procedure, all Dental Schools in Italy suspended clinical and preclinical activities except for dental emergencies, that could not involve students. Lectures, exams and graduation sessions were organised through distance education and even the training activities were supplied with e-learning methods such as complex clinical cases discussion, seminars and journal club.

The continuous spread of the pandemic, the restrictions imposed by the government with the DL 23/02/2020, along with the delays in the preparation of research theses due to the closure of dental clinics and laboratories were expected to have a negative impact on undergraduate students, which could experience higher levels of anxiety and stress. Besides, Dental Schools had to manage the students’ increasing anxiety related to the resumption of teaching and clinical activities and the modified perception of the risks associated with dental practice. It was therefore important to gain an insight on the impact of COVID-19 on students’ perceptions and psychological state. Based on these considerations, the purpose of this study was to investigate the perceived impact of the COVID-19 pandemic on the career of dental students, the emotions and concerns following the spread of the epidemics and the restrictive measures introduced by the Italian government, along with the students’ level of awareness about COVID-19, the level of concern of being infected during daily and university activities (teaching and training) and their perception of the likelihood of infection during clinical activities for dental practitioners and patients. Our analysis was focused on the students enrolled in the Universities of the Italian region Emilia-Romagna, that has been particularly hit by the pandemic.

2 | MATERIALS AND METHODS

2.1 | Sample

The target population consisted of the students enrolled in the Single Cycle Master Degree Programme in Dentistry and Dental Prosthodontics of the Universities of Modena and Reggio Emilia, Parma, Bologna and Ferrara. The total number of students was 532 and 399, whilst (75%) of them completed the survey. Given this sample size, the margin of error with a confidence level of 95% was 2%.

2.2 | Materials

Data were collected by means of an online structured anonymous survey composed of 34 questions. The survey was created using the free-access Google Forms application, and the link to the online survey was sent through Email by the administrative offices to all students. The survey took approximately 5 minutes to complete. Data were collected in the time period from 21 April to 5 May 2020.

The survey was composed of six sections (Table 1). The first section included questions aimed at gathering demographic data (age, sex, region of residence). The second was composed of questions aimed at gathering information related to the course of study (study year, number of exams to be taken to conclude the study course, completion of clinical traineeship hours), and at assessing whether students were working at the master thesis before COVID-19 outbreak and the entry into force of the DL 23/02/2020. For those who responded “yes,” further questions...
|   | Question                                                                 | Options                                                                 |
|---|-------------------------------------------------------------------------|-------------------------------------------------------------------------|
| 1 | Do you agree to participate in this survey?                            | Yes, No                                                                 |
| 2 | Age                                                                     | Please, digit a number                                                  |
| 3 | Sex                                                                     | Male, Female                                                            |
| 4 | Region of residence                                                     | Please, select a region from the list                                   |
|   | [One answer allowed]                                                    | [list of regions]                                                       |
| 5 | Study year                                                              | 1st, 2nd, 3rd, 4th, 5th, 6th, I did not complete the university exams within set time period |
|   | [One answer allowed]                                                    |                                                                        |
| 6 | How many exams do you still need to take to complete the qualification?| Please, digit a number                                                  |
|   | [One answer allowed]                                                    |                                                                        |
| 7 | Did you complete the clinical training hours?                          | Yes, No                                                                 |
|   | [One answer allowed]                                                    |                                                                        |
| 8 | Before the COVID-19 emergence were you working at your master thesis?   | Yes, No                                                                 |
|   | [One answer allowed]                                                    |                                                                        |
| 9 | Are you currently encountering difficulties in working at your master thesis? | Yes, No                                                                 |
|   | [One answer allowed]                                                    |                                                                        |
| 10| Which difficulties are you encountering?                               | Suspension of research laboratories/clinics attendance                  |
|   | [Multiple answers allowed]                                             | Closure of university libraries                                         |
|   |                                                                      | Difficulty in contacting the supervisor of the thesis                   |
|   |                                                                      | Concentration problems                                                  |
|   |                                                                      | Other [please, specify]                                                 |
| 11| Your master thesis is:                                                  | A compilation thesis                                                    |
|   | [One answer allowed]                                                    | A research thesis                                                       |
|   |                                                                      | Other [please, specify]                                                 |
| 12| Have you been thinking of changing your research thesis into a compilation thesis? | Yes, No                                                                 |
|   | [One answer allowed]                                                    |                                                                        |
| 13| Are you currently attending to distant learning lessons?               | Yes, No                                                                 |
|   | [One answer allowed]                                                    |                                                                        |
14. In your opinion, do distance learning lessons represent a valid substitute for traditional face-to-face lessons? [One answer allowed]

| Option       |
|--------------|
| Yes          |
| No           |
| Only partially |

15. Is COVID-19 emergency having a negative impact on your study career? [One answer allowed]

| Option       |
|--------------|
| Not at all   |
| Little       |
| Moderately   |
| A lot        |
| Extremely    |

16. In your opinion, can COVID-19 emergency have a negative impact on how you will be trained for your future career? [One answer allowed]

| Option       |
|--------------|
| Not at all   |
| Little       |
| Moderately   |
| A lot        |
| Extremely    |

17. In your opinion, will COVID-19 emergency change how students are trained for their future career? [One answer allowed]

| Option       |
|--------------|
| Yes, for the better |
| Yes, for the worse |
| No            |
| I do not know |

18. How does COVID-19 infection occur? [One answer allowed]

| Option                                                                 |
|------------------------------------------------------------------------|
| By touching contaminated objects and bringing hands to mouth, nose and eyes |
| Through faecal contamination                                            |
| Through plastic and steel surfaces contaminated for more than 5 days   |
| Through the droplets of breath (droplets)                              |
| I don't Know                                                            |

19. Do you know other past epidemics that have caused a large number of deaths? [One answer allowed]

| Option |
|--------|
| Yes    |
| No     |

20. Which past epidemics do you know that have caused a large number of deaths? [Please, specify at least one epidemic]

21. Did you contract COVID-19? [One answer allowed]

| Option       |
|--------------|
| Yes          |
| No           |
| I do not know |

22. Do you know someone who contracted COVID-19? [One answer allowed]

| Option             |
|--------------------|
| One or more relatives |
| One or more acquaintance |
| No                 |

23. How worried are you of contracting COVID-19 during your daily activities? [One answer allowed]

| Option       |
|--------------|
| Not at all   |
| Little       |
| Moderately   |
| A lot        |
| Extremely    |

(Continues)
|   |   |   |   |
|---|---|---|---|
| 24. Which risk prevention measures do you employ during daily activities? | None | Social distancing | Protective masks |
|   |   |   | Gloves |
|   |   |   | Handwashing with water and soap |
|   |   |   | Handwashing with disinfectants |
| 25. How concerned are you about one of your family members contracting COVID-19? | Not at all | Little | Moderately |
|   |   |   | A lot |
|   |   |   | Extremely |
| 26. In your opinion, how much can clinical training activities expose you to the risk of contracting COVID-19? | Not at all | Little | Moderately |
|   |   |   | A lot |
|   |   |   | Extremely |
| 27. In your opinion, how much can face-to-face lessons expose you to the risk of contracting COVID-19? | Not at all | Little | Moderately |
|   |   |   | A lot |
|   |   |   | Extremely |
| 28. How worried are you of contracting COVID-19 during your future university activities (i.e., lessons and training activities)? | Not at all | Little | Moderately |
|   |   |   | A lot |
|   |   |   | Extremely |
| 29. In your opinion, how likely is it that a dentist can contract COVID-19 during a dental service? | Not at all | Little | Moderately |
|   |   |   | A lot |
|   |   |   | Extremely |
| 30. In your opinion, how likely is it that a patient can contract COVID-19 during a dental service? | Not at all | Little | Moderately |
|   |   |   | A lot |
|   |   |   | Extremely |
| 31. During clinical activity, which measures do you think can prevent COVID-19 infection? | Telephone screening/anamnesis to identify possible critical cases |
|   |   | Reduction of number of patients in the waiting room |
|   |   | Body temperature measurement |
|   |   | Environmental aeration |
|   |   | Environmental sanitation |
|   |   | Disinfectant agents and surgical mask supply to all patients waiting in the waiting room |
|   |   | Use of personal protective equipment (respiratory masks, disposable gowns, double layered gloves, etc) |
|   |   | Other |

(Continues)
were included which assessed the type of thesis (compilation thesis, research thesis or other), whether they were encountering difficulties in completing it, which were the main difficulties and whether they had been thinking of opting in favour of a compilation thesis; in case, their thesis was experimental. The third section included questions assessing whether students were attending to distance learning lessons, and whether they considered this kind of lessons as a valid substitute for traditional lessons, as long as questions assessing the perceived impact of COVID-19 outbreak on the quality of their course of study and of their professional training. The fourth section was composed of questions assessing the students’ knowledge of the mode of transmission of COVID-19, their knowledge of other epidemics. The fifth section aimed at assessing students’ direct and indirect contact with COVID-19, their level of concern about contracting COVID-19 during daily activities, the level of concern about other family members contracting COVID-19 during daily activities, precautions and risk prevention measures used during daily activities, the perceived likelihood of contracting COVID-19 during clinical internships and university lessons and the level of concern of contracting COVID-19 during these activities. Furthermore, this section included questions assessing the students’ perception of infection likelihood for dentists and patients during dental services, which measures they believed could prevent the infection during dental services, which personal protective equipment (PPE) will be necessary to use in the future to prevent the infection during clinical activity. Finally, they were asked whether they had been thinking about changing degree course in the preceding 2 weeks.

The sixth section was aimed at assessing the psychological reactions to COVID and included questions regarding the feelings and emotions experienced by students whilst thinking at COVID-19 outbreak. We also assessed the presence of symptoms of anxiety by means of the Generalised Anxiety Disorder 7-item (GAD-7) scale, which is commonly used to assess the presence of general anxiety symptoms across various populations and settings. Specifically, we included seven items assessing how often, considering the last 2 weeks, individuals had been bothered by the following problems: (a) feeling nervous, anxious or on edge;
(b) not being able to stop or control worrying; (c) worrying too much about different things; (d) trouble relaxing; (e) being restless; (f) becoming easily annoyed or irritable and (g) feeling afraid as if something awful might happen.

2.3 | Ethical considerations

The survey was anonymous. Responders received the link to the survey by email and accessed it directly by clicking on the link. At the beginning of the survey participants were informed that their participation was voluntary, their responses were anonymous, and that they could drop out at any time. Then they were explicitly asked if they wanted to participate in the research study before starting the survey.

2.4 | Statistical analyses

Data were analysed using the SPSS version 26.0 statistical software. Descriptive statistics were applied to calculate frequencies and percentages, and the independence chi-square ($\chi^2$) test was applied to assess the association between variables.

For the questions with the following possible answers "not at all," "a little," "moderately," "a lot" and "extremely," response categories were assigned a score ranging from 0 to 4 (0 = "not at all," 4 = "extremely"). For the question, "Which of the following emotions (fear, anxiety, threat, concern, sadness, anger) do you feel when thinking about the Coronavirus?" response categories were assigned a score ranging from 0 to 4 (0 = "I do not feel it," 4 = "I feel it intensely"). For each of the 7 items of the GAD-7 scale, we assigned the scores 0, 1, 2 and 3 to the response categories "not at all," "several days," "more than half the days," and "nearly every day," respectively. The scores for each item were then summed to obtain a total score ranging from 0 to 21. Scores from 0 to 4, from 5 to 9, from 10 to 14 and from 15 to 21 are indicative of minimal, mild, moderate and severe anxiety, respectively. Numerically recoded data were analysed using the Analysis of Variance (ANOVA). When necessary, post hoc multiple comparisons were performed using the Bonferroni procedure. Furthermore, to investigate the association between quantitative variables, we computed the Pearson correlation coefficient (R). A p value of less than .05 was considered as statistically significant.

3 | RESULTS

3.1 | Demographic information

Of the total responders, 56.9% (n = 227) were females, 43.1% (n = 172) were males. Age ranged from 18 to 44 years (M = 23.45, SD = 3.26). The majority of the responders were residing in Emilia-Romagna (52.6%) and Veneto (19.3%), two of the Italian regions that have registered a higher number of COVID-19 cases in the period covered by the survey.12

3.2 | Study career and master thesis

Of the total number of responders, 18.3% (n = 73) were first-year, 11.5% (n = 46) were second-year, 16.3% (n = 65) were third-year, 16.5% (n = 66) were fourth-year, 16% (n = 64) were fifth-year and 20.8% (n = 83) were sixth-year students, whilst 0.5% (n = 2) were students who had not passed all the exams within the prescribed period of time ("fuori corso" students).

The majority of the responders (94%, n = 375) still had to finish the required hours of clinical training. At the time of the COVID-19 outbreak, 26.6% of them (n = 106) were working at the master thesis that was a research thesis for 92.5% of them (n = 98). The majority of students (79.2%, n = 84) experienced difficulties in working at the thesis during the COVID-19 emergency mostly due to suspension of the attendance to research laboratories and clinics imposed by the restrictions imposed by the Italian Government (89.3%, n = 75), concentration problems (35.7%, n = 30), difficulty in contacting the thesis supervisor (28.6%, n = 24) and closure of university libraries (17.9%, n = 15). Due to these problems, 44.9% (n = 44) of the students working at a research thesis declared that they had been thinking about moving to a compilation thesis.

3.3 | Impact of COVID-19 on study career and on how students are prepared for future career

At the time students completed the survey, 95.7% (n = 382) of them were attending to distant learning lessons. For 58.1% (n = 232) of them, online teaching could only partially replace traditional face-to-face lessons, whilst 21.8% (n = 87) considered it as a valid substitute.

The negative impact of COVID-19 on the study career was judged as moderate by 34.3% (n = 137) of students, as high by 19.3% (n = 77) and as extreme by 10.3% of them (n = 41). The number of responders who judged the negative impact as low was higher amongst first- (43.8%, n = 32), second- (37.0%, n = 17) and third-year (38.5%, n = 25) students, whilst the number of those who judged it as extreme was higher amongst sixth-year students (26.5%, n = 22), $\chi^2 = 81.12, df = 20, p < .001$ (Figure 1). To further assess whether the perception of the negative impact differed across study year, numerically recoded responses were submitted to a one-way ANOVA with year of study (from 1st to 6th) as between-participants factor. The analysis showed a significant effect of year of study, $F(5,391) = 7.04, p < .001$. Post hoc comparisons showed that the perceived level of negative impact of sixth-year students (M = 2.57, SD = 1.17) was significantly higher as compared to the levels reported by first-year (M = 1.81, SD = 1.21), second-year (M = 1.87, SD = 1.17) and third-year (M = 1.69, SD = 1.12) students. No difference emerged between fourth-year (M = 2.33, SD = 0.99) and fifth-year (M = 2.28, SD = 0.93) students.

The level of negative impact reported by third-year students was lower than those shown by fourth-, fifth- and sixth-year students,

12 Since the students who had not passed all the exams within the prescribed period of time were only two, we did not include their responses in the Analysis of Variance performed to assess differences between years of study.
whilst it did not differ from those reported by first- and second-year students.

For 36.6% \((n = 146)\) of students, COVID-19 could have a moderately negative impact on how they will be prepared for their future career, for 22.8% \((n = 91)\), the negative impact could be high, whilst for 14.8% \((n = 59)\), it could be extreme. The number of responders who judged the negative impact as low was higher amongst first- \((32.9\%, n = 24)\), second- \((37\%, n = 17)\) and third-year \((24.6\%, n = 16)\) students, whilst the number of those who judged it as extreme was higher amongst sixth-year students \((30.1\%, n = 25)\), \(\chi^2 = 76.89, df = 20, p < .001\). The ANOVA on recoded values confirmed that responses varied as a function of study year, \(F(5,391) = 9.121, p < .001\). Post hoc comparisons showed that first-year students judged the negative impact \((M = 1.94, SD = 1.15)\) as lower than fifth- \((M = 2.67, SD = 0.84)\) and sixth-year students \((M = 2.74, SD = 1.08)\) \((n = 377)\) of them. Only 10.8% \((n = 43)\) selected faecal contamination as a vehicle of infection, whilst 6.8% \((n = 27)\) selected plastic and steel surfaces contaminated for more than 5 days as a possible vehicle. Only 0.5% \((n = 2)\) acknowledged not to know how the infection occurs.

The majority of students \((92.5\%, n = 369)\) reported to know other past epidemics causing a large number of deaths. When asked to name at least one epidemic, most students named the Spanish flu, the avian flu, the Severe Acute Respiratory Syndrome (SARS) and the swine flu. Other, less reported, were the Middle East Respiratory Syndrome (MERS), cholera, typhus, plague and acquired immune deficiency syndrome (AIDS).

3.4 Knowledge on the COVID-19 infection

COVID-19 infection could occur through respiratory droplets for 96.5% \((n = 385)\) of students, and by touching contaminated objects and bringing hands to mouth, nose and eyes for 94.5% \((n = 377)\) of them. Only 10.8% \((n = 43)\) selected faecal contamination as a vehicle of infection, whilst 6.8% \((n = 27)\) selected plastic and steel surfaces contaminated for more than 5 days as a possible vehicle. Only 0.5% \((n = 2)\) acknowledged not to know how the infection occurs.

3.5 Concerns and risk perception

70.2% of students knew someone, either an acquaintance or more \((62.7\%, n = 250)\) or a relative or more \((7.5\%, n = 30)\), who contracted COVID-19 infection, but only 0.5% \((n = 2)\) reported having contracted it. 40.9% \((n = 163)\) of responders were little worried of contracting COVID-19 infection during their daily activities, 40.9% \((n = 163)\) were moderately worried, whilst only 2% \((n = 8)\) were extremely worried. Responses did not differ across study year, \(\chi^2 = 22.23, df = 20, p = .33\). Differently, 35.3% \((n = 141)\) were moderately concerned about one of their family members contracting COVID-19, 29.1% \((n = 116)\) were very concerned and 20.6% \((n = 82)\) were extremely concerned. Percentages did not differ across study year, \(\chi^2 = 21.20, df = 20, p = .38\).
The measures most employed to prevent the risk of infection were social distancing (95.5%, n = 381), protective masks (91.5%, n = 365) and handwashing with water and soap (89.2%, n = 356). Only 0.5% (n = 2) reported not to use precautions.

Clinical training activities were considered as exposing to the risk of contracting COVID-19 infection from a lot (29.6%, n = 118) to extremely (20.1%, n = 80), whilst for 39.3% (n = 157), the risk was moderate. Percentages varied as a function of year of study, $\chi^2 = 34.57$, $df = 20$, $p = .02$. The ANOVA showed a statistical significance of year of study, $F(5,391) = 4.38$, $p < .05$ with sixth-year students perceiving clinical training activities as riskier ($M = 2.92$, $SD = 0.95$) than first-year students ($M = 226$, $SD = 0.87$).

As regards face-to-face lessons, for 42.9% (n = 171) of students, the risk was moderate, for 21.8% (n = 87), it was high and for 7.3% (n = 29), it was extreme, whilst 25.3% (n = 101) considered the risk as low. Responses did not vary as a function of year of study, $\chi^2 = 23.41$, $df = 20$, $p = .27$. In line with these percentages, 39.3% (n = 157) were moderately worried of contracting COVID-19 infection during future university activities (ie, lessons and training activities), 13.3% (n = 53) were very worried, only 5.8% (n = 23) were extremely worried, whilst 35.3 (n = 141) were little worried. The level of concern of contracting COVID-19 infection during future university activities (ie, lessons and clinical training activities) was positively correlated to risk perception related to clinical training, $r = 0.58$, $p < .011$, and academic activities $r = 0.57$, $p < .001$.

As regards the perceived likelihood for dentists to contract COVID-19 during a dental service, 33.8% (n = 135) of responders considered it as quite likely, 35.3% (n = 141) as very likely and 19.3% (n = 77) as extremely likely. Only for 11.3% (n = 45) of responders, the risk of infection for dentists was considered as very low. Responses did not vary as a function of year of study, $\chi^2 = 23.59$, $df = 20$, $p = .26$. Interestingly, whilst 37.1% (n = 148) considered as quite likely that a patient can contract COVID-19 during a dental service, 15.5% (n = 62) considered it as very likely and only 8.8% (n = 35) as extremely likely. For 36.1% (n = 144), the risk of infection for patients was very low. The percentage of sixth-year students who chose the options "moderately" was lower as compared to the other study year, $\chi^2 = 36.56$, $df = 20$, $p < .05$.

Despite the concerns, only a small number of students (n = 40) had been thinking of changing the course of study in the preceding 2 weeks either sometimes (9%, n = 36), frequently (0.3%, n = 1) or always (0.8%, n = 3).

When asked which measures could be used to prevent COVID-19 infection during clinical practice, 96.5% (n = 385) of students chose the reduction of the number of patients in the waiting room, 93.9% (n = 375) the use of PPE (respiratory masks, disposable gowns, double-layered gloves, etc), 93.2% (n = 372) the sanitation of the environment, 86.2% (n = 344) the aeration of the environment, 81.2% (n = 324) the supply of disinfectant agents and surgical masks to all patients waiting in the waiting room, 81.2% (n = 324) telephone screening/anamnesis to identify possible critical cases. Body temperature measurement was chosen by 67.4% (n = 269) of students.

The majority of students (75.7%, n = 302) considered as necessary during procedures generating aerosol the combination of the following PPE: gloves, FFP2 or FFP3 mask, protective glasses/face shield, disposable gown and cap. The combination of gloves, surgical mask, protective glasses/face shield and disposable cap was chosen only by 2% (n = 8) of the students.
3.6 | Psychological reactions

As regards the emotions experienced when thinking about COVID-19, students mostly reported to feel concern and sadness (Table 2). As regards concern, 33.1% (n = 132) reported to feel it moderately, whilst 23.8% (n = 95) reported to feel it quite intensely. Only 7% (n = 28) felt concern intensely. As regards sadness, 30.3% (n = 121) reported to feel it moderately, 21.3% (n = 85) quite intensely and 11.5% (n = 46) intensely. The Chi-square test indicated differences between year of study for concern ($\chi^2 = 33.26$, df = 20, $p < .05$), sadness ($\chi^2 = 36.75$, df = 20, $p < .05$) and anger ($\chi^2 = 34.02$, df = 20, $p < .05$). A one-way ANOVA with year of study as the between-subjects variable showed that only the levels of sadness, $F(5,391) = 4.32$, $p = .001$, and anger, $F(5,391) = 3.28$, $p = .006$, differed across study years. Post hoc comparisons showed that third-year students showed a level of sadness ($M = 1.34$, SD = 1.12) lower than those of first- ($M = 2.18$, SD = 1.1) and sixth-year ($M = 2.17$, SD = 1.37) students and a level of anger ($M = 1.06$, SD = 1.21) lower than sixth-year ($M = 1.88$, SD = 1.47) students. Levels of fear, concern and anxiety did not differ across year of study ($p > 0.07$).

The overall mean GAD-7 score was 6.5 (SD = 4.6). Across year of study, only 6.5% (n = 26) of the students showed a GAD-7 score indicative of severe anxiety levels. The majority of them showed either minimal (37.1%, n = 148), mild (37.8%, n = 151) or moderate (18.5%, n = 74) anxiety. A one-way ANOVA with year of study as the between-subjects variable showed that the GAD-7 score varied across year of study, $F(5,391) = 4.57$, $p < .001$. Post hoc comparisons indicated the score shown by first-year students ($M = 8.3$, SD = 4.99) was significantly higher as compared to the scores of third- ($M = 5.6$, SD = 4.38), fourth- ($M = 6.0$, SD = 4.36) and fifth- ($M = 5.3$, SD = 3.91) year students, whilst it did not differ from that of second- ($M = 6.0$, SD = 4.45) and sixth- ($M = 7.3$, SD = 4.65) year students.

The GAD-7 score was positively correlated with the reported levels of fear, anxiety, concern, sadness and anger ($p < 0.01$). The strongest correlations were with the anxiety ($r = 0.54$, $p < .001$) and concern ($r = 0.42$, $p < .001$) levels. It was also positively correlated with the levels of concern of contracting COVID-19 during daily and university activities and the levels of concern about family members contracting COVID-19 and with the perceptions of risk likelihood.

### TABLE 2 Which of the following emotions do you feel when thinking about COVID-19? (n = 399)

| Emotions | I do not feel it | Lightly | Moderately | Quite Intensely | Intensely | Mean (SD) |
|----------|-----------------|---------|------------|----------------|-----------|-----------|
|          | N (%)           | N (%)   | N (%)      | N (%)          | N (%)     |           |
| Fear     | 108 (27.1)      | 168 (42.1) | 96 (24.1)  | 23 (5.8)       | 4 (1.2)   | 1.12 (0.91) |
| Anxiety  | 89 (22.3)       | 132 (33.1) | 113 (28.3) | 50 (12.5)      | 15 (3.8)  | 1.42 (1.08) |
| Concern  | 31 (7.8)        | 113 (28.3) | 132 (33.1) | 95 (23.8)      | 28 (7.0)  | 1.94 (1.05) |
| Sadness  | 72 (18.0)       | 75 (18.8)  | 121 (30.3) | 85 (21.3)      | 46 (11.5) | 1.89 (1.25) |
| Anger    | 124 (31.1)      | 96 (24.1)  | 82 (20.6)  | 52 (13.0)      | 45 (11.3) | 1.49 (1.35) |

4 | DISCUSSION

To date, little has been published that focused specifically on the perceived impact of the COVID-19 pandemic on dental undergraduate students. The results of the present study give an insight on the impact of COVID-19 on dental students attending the four universities of the Emilia-Romagna region, one of the Italian regions that, during the first outbreak of the pandemic, was amongst the most affected.

The undergraduate students of the Single Cycle Master Degree Programme in Dentistry and Dental Prosthodontics of the four Universities of the Emilia-Romagna region were involved in the online survey and the majority of responders not only studied but also resided in this region. The survey was sent to 532 students through the list of the Deans of the dental schools, and the response rate was 75%.

The survey was developed after reviewing literature about the psychological factors and reaction associated with distress amongst dentists. It was a structured anonymous multiple-choice questionnaire designed in Italian. It included questions on demographic characteristics of the responders and on the study career, along with questions aimed at assessing the perceived impact of COVID-19 on the study career, concerns and risk perception, the psychological impact of and psychological reactions to the pandemic. Most of the responders were sixth-year students, probably because they were more interested in the evolution of the pandemic considering the upcoming graduation. At the time of the outbreak, 26.6% of them were working at the master thesis and, considering that dental schools and research laboratories were closed, they found themselves in the situation of no longer being able to proceed with the research work. Furthermore, concentration problems and the difficulty in contacting the thesis supervisor aroused the awareness that maybe it was better moving to a compilation thesis with respect of a research one.

The closure of dental schools has created a shift to a completely virtual dental curriculum with students risking to be unable to complete their clinical training before the end of the academic year. Following the DL 23/02/2020, Italian Universities organised themselves promptly in only one week to provide online lectures. Only a minority of the responding students (21.8%), however, stated...
that online teaching could replace traditional face-to-face lessons. Indeed, online delivery of learning may not replace clinical instruction provided within dental schools. Moreover, as said, the transition from face-to-face to online lessons occurred quite fast in reaction to the restrictions imposed by the pandemic outbreak, and faculty members mostly adapted their courses to the new modality, without having the time to redesign them. In the case the emergency situation will protract or reoccur in the next months, degree courses will have to be carefully redesigned to exploit all the potential of online teaching and to assure a high level of effectiveness of teaching.

Importantly, the negative impact of COVID-19 on the study career was judged as moderate to extreme by the majority of the responders, whilst it was judged as low by only 28.8% of the responders. Importantly, the number of students who judged it as extreme was significantly higher amongst sixth-year students (26.5%) as compared to the level reported by first-year students (6.8%). This is probably due to the fact that in Italy during the sixth-year students are mostly engaged in clinical training activities and must attend few less lessons. During the lockdown, most of the dental schools continued to ensure dental emergency. Students, however, were not allowed to follow and carry out the clinical activity. Hence, sixth-year students might have realised that they might not be able to complete the hours of clinical training required to complete their course of study in the near future. As the time of the survey, students had no access to university facilities, including laboratories with manikins, and were hence unable to complete their clinical requirements. Most importantly, they did not know when clinical training activities would resume. For this reason, the number of students who judged the impact on how they will be prepared for their future career as extremely negative was higher amongst sixth-year students and decreased from the sixth to the first year.

In addition to assessing the perceived impact of COVID-19 on the current study career and on training for the future career, the survey aimed at assessing risk perception related to daily, university and clinical activities. Since risk perception could be affected, amongst several factors, by the level of knowledge of the new coronavirus, we included a question assessing students’ knowledge of the COVID-19 infection pathways. Only 0.5% of the students acknowledged not to know how the infection occurs, instead most of them correctly knew the routes of transmission. All students except 2 employed the correct risk prevention measures during daily activities and only 2% of the students were extremely worried of contracting COVID-19 during their activities, whilst most of them were little or moderately worried. Most of them, however, were worried for their family members. Students considered clinical training activities a condition characterised by an elevated to extreme risk of contracting COVID-19 infection; interestingly, we found a statistically significant difference across year of study, with sixth-year students perceiving clinical training activities as riskier as compared to first-year students. As stated before, during the sixth-year students are mostly engaged in clinical training activities and hence they may feel more involved and perceive themselves as more exposed.

For the majority of responders, the risk of contracting COVID-19 during face-to-face lessons was between moderate and high. Students were, however, from little to moderately worried of contracting COVID-19 infection during future university activities, and only few of them had been thinking of changing course of study.

Students considered dentists’ risk of contracting COVID-19 infection during dental activities from moderate (33.8%) to high (35.3%), whilst 19.3% considered it as extreme. It is interesting to note, however, that only 15.5% considered the patients’ risk of contracting the virus during dental service as high and only 8.8% as extreme. A similar discrepancy in risk perception for dental practitioners and patients has been found in a survey administered in a similar time period to dentists working in the Modena and Reggio Emilia districts of the Emilia-Romagna region, and it may derive from the assumption that dentists are more exposed to the risk of contracting the virus due to the continuous activity in which they perform therapies on many patients every day, whilst patients visit the dentist only for a few appointments. Consistently, studies on previous outbreaks of similar infections such as the severe acute respiratory syndrome (SARS) showed that exposed healthcare workers experienced fear of getting infected whilst treating an infected patient and of infecting family members. As indicated by recent studies, the COVID-19 pandemic has caused fear and anxiety not only amongst healthcare workers but also amongst the general population. Due to the nature of dental treatment procedures, dental patients may be particularly concerned of being infected and this may lead to delays in seeking treatment or even in avoiding necessary treatments. Dental practitioners may adopt operational protocols to reduce the risk of contagion for themselves and patients. However, as suggested by Campisi et al (2020), they should also consider and be prepared to manage the patient’s fear and concerns by improving empathic and communication skills. Similarly, the training of future dental practitioners should be focused on developing these skills.

Since it has been widely established that the primary route of transmission of COVID-19 is through droplets and aerosol and students showed to be aware of this, the majority of them considered as necessary during procedures generating aerosol the use of several PPE: FFP2 or FFP3 respiratory masks, protective glasses/face shield, disposable gown and cap. These protection systems protect the dentists from contracting the virus, but they are also likely to help reducing stress levels.

Measuring anxiety by the means of self-report questionnaires is useful and has been already performed amongst dental practitioners and patients.

When thinking of the COVID-19, most of the students reported feeling light-to-moderate levels of fear, anxiety, concern, sadness and anger. Only small percentages reported to experience those emotions in an intense way. Overall, only 6.5% of the responders showed a score to the GAD-7 scale indicative of a severe level of anxiety, whilst the majority of them showed minimal to mild levels of anxiety. These anxiety levels are slightly lower than those found in the survey administered to Italian dentists working in the
same geographical area. The levels of anxiety found in our study may be due to two main reasons. First of all, COVID-19 mortality rate varies with age. As of 17 March 2020, the case-fatality rate in the age range of our respondents (18-44 years) was less than 0.6%. Second, in the time period the survey was administered the number of deaths in Italy was already decreasing. It should be, however, noted that using the same scale to assess anxiety levels amongst medical students in China, Cao et al reported that 21.3% of the students were experiencing mild anxiety, 2.7% were reporting moderate anxiety, and only 0.9% were suffering from severe anxiety. Importantly, in our survey, the GAD-7 score was higher amongst first- and sixth-year students and was strongly associated with the level of concern of contracting COVID-19 infection during daily and university activity, the level of concern for family members getting infected and the perception of risk for themselves, for dentists and for patients.

5 | CONCLUSION

To conclude, students perceived the COVID-19 emergency as having a negative impact on their study career and on how they will be trained for the future career. The negative impact on the study career was judged as particularly high by sixth-year students mostly because of the suspension of clinical training activities which are the prevailing activities during the last year and may be necessary for the completion of a research thesis.

Even though students were little to moderately worried about contracting COVID-19 during future university activities, almost 50% of the responders judged clinical training activities as exposing to the risk of contracting COVID-19 infection and perceived the risk of infection for dentists as high. Insights on student’s concerns and perception of the risks associated with clinical dental activity could guide their future risk assessment training. Students reported experiencing concern whilst thinking of COVID-19 and 6.5% of them showed symptoms related to high levels of anxiety. As suggested by other studies, student’s anxiety about COVID-19 might be related to the effect of the epidemic on their study career. The present results underline the need for universities to implement correct communication modalities with the aim of reducing students’ anxiety about their study career.

ACKNOWLEDGEMENT

The Authors would like to thank all the students at the Universities of Modena and Reggio Emilia, Parma, Bologna and Ferrara – Italy.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose.

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**How to cite this article:** Generali L, Iani C, Macaluso GM, Montebugnoli L, Siciliani G, Consolo U. The perceived impact of the COVID-19 pandemic on dental undergraduate students in the Italian region of Emilia-Romagna. *Eur J Dent Educ*. 2021;25:621-633. [https://doi.org/10.1111/eje.12640](https://doi.org/10.1111/eje.12640)