



European Journal of Educational Research

Volume 13, Issue 1, 171 - 181.

ISSN: 2165-8714

<http://www.eu-jer.com/>

The Impact of COVID-19 on Educational Climate in Dental Students - A Cross Sectional Study

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Received: April 8, 2023 ▪ Revised: June 9, 2023 ▪ Accepted: July 4, 2023

Abstract: Students' perception of educational climate influences academic performance, and its analysis provides essential information to improve it. To evaluate the perception of 3rd and 5th grade students regarding educational climate, before and during the pandemic. A descriptive, cross-sectional study was performed involving dental students, who answered the Dundee Ready Education Environment Measure (DREEM) questionnaire. The overall DREEM and its 5 subscales were analyzed evaluating two period times, before and during the pandemic. There were statistically significant differences when comparing the results obtained by 3rd and 5th grade students, before and during the pandemic, with effect magnitude from high to very high. It is noteworthy that 3rd graders have more positive perceptions compared to 5th graders. The 3rd year students felt more strongly the difficulties inherent to the COVID-19 pandemic. While in the 3rd year the students had less Educational Climate during the pandemic, the 5th year student had better Educational Climate in this period, perhaps because they maintain the face-to-face clinical classes. A negative point is associated with the scarce support system for students with stress problems. COVID-19 pandemic affected the perception of the Educational Climate, with a significant difference between of 3rd and 5th year dental students.

Keywords: COVID-19, DREEM, educational climate.

To cite this article: Relvas, M., Cabral, C., Salazar, F., López-Jarana, P., Rocha, M., Costa, R., Monteiro, L., & Gonçalves, M. (2024). The impact of COVID-19 on educational climate in dental students - a cross sectional study. *European Journal of Educational Research*, 13(1), 171-181. <https://doi.org/10.12973/eu-jer.13.1.171>

Introduction

The COVID-19 pandemic started in March 2020 (World Health Organization, 2023). The rapid spread of SARS-COV-2 across the world, the high lethality rate and the lack of effective treatment have led governments to take a set of measures to mitigate the transmission of the disease (Batra et al., 2022).

In this context, several countries have adopted as a response strategy the implementation of social distancing measures, as well as home quarantine and school closures (Tang et al., 2021).

School closures have impacted 87% of students worldwide (Araújo et al., 2020), confronting the educational community with a new reality and the urgent need to adapt to it. Since the identification of the first positive case of COVID-19 and in line with the recommendations of the Directorate General of Health, several colleges have been forced to close their doors to protect the safety of the academic community and prevent the risk of contagion, suspending all on-site classes and replacing them with distance learning through digital platforms (Tang et al., 2021).

Theoretical and practical classes, as well as exams, are now taught by videoconference. Distance learning has posed significant challenges for students, with several studies advocating the negative impact on students' mental health, particularly college students (Cao et al., 2020; Marelli et al., 2021; Zhou et al., 2020). The COVID-19 pandemic, caused by

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SARS-CoV-2, has transformed the lives of higher education students around the world with implications for how students live, work, and study, affecting their physical, mental, and social well-being (Kaparounaki et al., 2020; Marelli et al., 2021).

Stress, feelings of uncertainty, depression and anxiety, sleep disturbances, worries about career and future, and fear were frequent during confinement (Marelli et al., 2021; Nijhuis et al., 2007; Zhou et al., 2020;).

To mitigate the effects of COVID-19 on students' education, schools and universities were required to take a set of measures, arising from the recommendations of the DGS (General Directorate of Health), with direct implications on the educational environment. The use of masks and visors, constant hand disinfection, distance between classmates and teachers, among others, were some of the recommended measures. In this sense, we cannot forget that the perception of the educational environment can influence the students' academic performance, as well as their satisfaction with the educational process, and its analysis can provide important information for its improvement (Nijhuis et al., 2007; Ostapczuk et al., 2012).

The perception of the educational environment is considered as the 'Educational Climate' (EC). The term EC has been described by Genn et al. as "the expression of the educational environment and the academic curriculum". Thus, EC is considered "everything that is happening in the classroom, in a department, in the faculty or the university" (Genn, 2001). Several qualitative and quantitative methodologies have been used to evaluate students' perception of EC (Ali, McHarg et al., 2012; Denz-Penhey & Murdoch, 2010; Gerzina et al., 2005; Marshall, 1978). In academic healthcare institutions, one of the most widely used and reliable instruments is the 'Dundee Ready Educational Environment Measure' (DREEM) (Roff et al., 1997). The DREEM was developed by a Delphi panel including 100 educators specializing in healthcare disciplines from 20 countries, and 1000 students.

DREEM is a quantitative measure of the educational environment, designed to analyze the educational environment specifically in medical universities or other health care fields (Herrera et al., 2010; Roff et al., 1997). It is a non-specific tool for a given culture, used universally, enabling its use in a variety of sociocultural contexts (Pimparyon et al., 2000; Roff et al., 2001). Therefore, it can be used to evaluate, diagnose, compare with different groups, enabling the analysis of the educational environment, highlighting the positive aspects, and eliminating or correcting the negative aspects (Mayya & Roff, 2004; Till, 2004).

The results will enable recommendations to be made about how students might be better supported in crisis situations in different economic, social, cultural, political, and institutional contexts (Denz-Penhey & Murdoch, 2010; Kossioni et al., 2012). There are several studies that have assessed dental students' perceptions, about the educational environment, but studies that have done so after a long period of confinement due to COVID are scarce. Thus, given the dearth of studies about the impacts of resuming face-to-face teaching the main objective of the present study was to evaluate the perception of 3rd and 5th year students (preclinical and clinical education) of Dental Medicine MSc of the University Institute of Health Sciences (IUCS) about the Educational Environment before and during the COVID-19 pandemic.

Methodology

Research Design

This is a descriptive, cross-sectional study in which data were collected using an assessment instrument, the DREEM questionnaire, applied a single time to each student (Ali, McHarg et al., 2012).

Sample

The sample was a convenience sampling based in 3rd and 5th year students of Dental Medicine MSc of IUCS. The sample is made up of 330 students from the Dental Medicine MSc of IUCS, the minimum age was 19 and the maximum age was 52 (25.07±5.78) year-olds. 74.8% (n=247) participants were between 19-25 years old and 25.2% (n=83) were between 26 and 52 years old. 35.2% (n=116) were male participants and 64.8% (n=214) female participants. Concerning nationality, 30% of the respondents were Portuguese, 16.4% Spanish, 41.8% French, 9.7% Italian, and 2.1% were from other nationalities (Table 1)

Table 1. Sociodemographic Characteristics of the Participant

Characteristics	N	%
Age		
19-25 years old	247	74.8
26-52 years old	83	25.2
Gender		
Male	116	35.2
Female	214	64.8
Nationality		
France	138	41.8
Portugal	99	30.0
Spanish	54	16.4
Italia	32	9.7
Other nationalities	7	2.1

Measures

For the sample collection, an online questionnaire was created with Lime Survey, composed of two parts: 1) Sociodemographic questions; 2) Questionnaire DREEM. The sociodemographic information collected from each participating student included age, gender, nationality, and the year of the course.

The DREEM, Dundee Ready Education Environment Measure, it's a questionnaire consisting of 50 closed-ended questions aimed at assessing the learning environment of educational institutions before and during the pandemic (De Oliveira Filho et al., 2005; Riquelme et al., 2009). Each of the 50 points falls into five different subscales related to different aspects of the students' perception: perception of learning (LP); perception of teachers (TP – perception that students have of the teachers); academic self-perception (AP); perception of atmosphere (AtmP) and social self-perception (SP) (Table 1). Each of the 50 questions is scored on a Likert-type scale, with five possible answers, expressing the degree of agreement with each statement (4 - strongly agree; 3 - agree; 2 – not sure; 1- disagree; 0 - strongly disagree) for most of the questions, except for 4, 8, 9, 17, 25, 35, 39, 48, and 50, which are scored inversely (Wang et al., 2009).

The DREEM scale provides scores for each domain, corresponding to the sum of the scores of the corresponding items, and for the total score, equivalent to the sum of the scores for each domain (De Oliveira Filho et al., 2005).

The maximum possible scores for the different domains are: LP: 48; TP: 44; AP: 32; AtmP: 48 and SP: 28 (Ali, McHarg et al., 2012).

Table 2. DREEM Subscales, Questions, and Specific Scores

Dimension	Questions	Maximum Score
Perception of Learning (LP)	1, 7, 13, 16, 20, 22, 24, 25, 38, 44, 47 and 48	48
Perception of Teachers (TP)	2, 6, 8, 9, 18, 29, 32, 37, 39, 40 and 50	44
Academic Self-Perception (AP)	5, 10, 21, 26, 27, 31, 41 and 45	32
Perception of Atmosphere (AtmP)	11, 12, 17, 23, 30, 33, 34, 35, 36, 42, 43 and 49	48
Social Perception (SP)	3, 4, 14, 15, 19, 28 and 46	28

The overall score is 200 points, and the closer the score is to this value, the more positive the student's perception of the educational environment (Foster Page et al., 2012; Hammond et al., 2012). The analysis of all the questionnaires was carried out using the average score of all the answers. The average score given to each question allows us to identify in greater detail the positive and negative points of each domain evaluated. The practical guide for the use of the DREEM survey proposed by McAller and Roff was used to analyze the scores (Hernández-Crespo et al., 2020; Roff et al., 1997).

The mean score assigned to each dimension was evaluated according to the practical guide for the use of the DREEM questionnaire proposed by McAleer and Roff. Questions with a mean score ≥ 3.5 are considered "excellent educational aspects"; with a mean score between 3.01 and 3.49 correspond to "positive educational aspects"; with a mean score between 2 and 3 correspond to "educational aspects to be improved"; and questions with a mean score < 2 reveal problem areas and, therefore, weak points of the educational environment that need intervention (Wang et al., 2009).

The DREEM was translated into Portuguese by two researchers with knowledge of both the English language and the area of education and psychology, followed by a back translation carried out by a specialized translator. Small adjustments were subsequently made to the first translation to maximize semantic equivalence. Then, in order to validate the instrument regarding clarity and understanding of the statements in each item, a pre-test was carried out: a questionnaire was administered to a convenience sample of 20 university students aged between 18 and 24 years (mean = 20.15; SD = 1.46) in the classroom. Students were asked to complete the questionnaire online and were further asked about the clarity and relevance of the questions, confirming the relevance of continuing the validation study. The validation study is in progress.

Procedures

The data was collected using an online survey in the Lime Survey between April 1, 2021 and May 30, 2021. The sample was collected using a 'snowball' method, where the principal investigator shared a link to the questionnaire with third- and fifth-year dental students, who then shared it with their colleagues via WhatsApp, Messenger, Instagram and Facebook.

Before starting the study, the proposal was submitted to the Ethics Committee of the IUCS with the reference nº CE/IUCS/CESPU-02/21, following the principals of the Declaration of Helsinki. After approval, the participants were invited by email to fill out the online questionnaire on a voluntary basis. Before starting the anonymous questionnaire, each participant signs the online informed consent to process the data derived from their anonymous responses, the first step prior to beginning the filling out of the survey form. The data obtained for this study were anonymous, and all ethical principles regarding data protection were strictly followed.

Statistical Analysis

Data were collected and further processed with the help of the statistical program SPSS (Statistical Package for Social Science) version 27 for Windows. The data of the global assessment of the EC (educational climate), of each subscale and of each item of the DREEM questionnaire were expressed as means and percentages in relation to their maximum score. Based on the methodology applied in previous studies, the percentages of respondents in each of the different categories of interpretation of the EC, the domains, and the individual items were calculated. The data were initially examined for normality with the Shapiro-Wilk test and given their normality, the analyzes were performed using parametric tests. To compare the results obtained in the overall EC assessment and in the different subscales between 3rd and 5th grade students, we used the independent t-test; to compare the results obtained in the overall EC assessment and in the different subscales, before and during COVID, for 3rd and 5th grade students, we used the dependent t-test. The magnitude of the effect was evaluated using Cohen's d, considering the following classification: Insignificant < 0.19; Small 0.20 - 0.49; Medium 0.50 - 0.79; Large 0.80 - 1.29; Very large 1.29 > 1.30 (Note: These values were presented by Cohen (1988, p. 40). Rosenthal (1996) added the classification of "very large"). The significance level was taken as .05.

Findings/Results

Total Score

According to Table 3, regarding the analysis of the questionnaire results before the pandemic, the average total score observed is 126.5 with a standard deviation of 24.46. The maximum score recorded is 185 and the minimum score is 26, for a total of 200 points. Regarding the results achieved during the pandemic, the average total score observed is 124.93 with a standard deviation of 21.46. In this case, the maximum score recorded is 183 and the minimum score is 15.

Table 3. Overall Educational Climate Before and During the Pandemic.

	Educational Climate - Before the Pandemic				Educational Climate - During the Pandemic			
	N	Minimum	Maximum	Mean ± SD	N	Minimum	Maximum	Mean ± SD
3rd Grade	163	111	185	146.07 13.27	163	105	183	141.07 12.53
5th Grade	167	26	151	107.05 16.5	167	15	146	109.19 16.09
Total	330	26	185	126.55 24.46	330	15	183	124.93 21.46

N =number; SD= standard deviation.

According to Table 4, regarding the results obtained before the pandemic, 225 (68.2%) of the participants scored between 101 and 150 points, which reveals a perception of the educational environment "more positive than negative", according to the DREEM interpretation guide proposed by McAleer and Roof (Roff et al., 1997). Regarding the data analyzed during the pandemic, 258 (78.2%) individuals had scores between 101 and 150 points, which shows a "more positive than negative" perception of the educational environment.

Table 4. Analysis of EC Before and During the Pandemic

Classification	N (%)	
	Before the pandemic	During the pandemic
"Very poor" 0-50 points	2 (0.6%)	2 (0.6%)
"There are many problems" 51-100 points	45 (13.6%)	34 (10.3%)
"More positive results than negative ones" 101-150 points	225 (68.2%)	258 (78.2%)
"Excellent" 151-200 points	58 (17.6%)	36 (10.9%)
Total	330 (100%)	

N=number; % = percent

Nevertheless, according to Table 5, it is possible to verify that regarding the results obtained from the surveys of 3rd year students, with respect to their opinion before the pandemic, 57 (35%) consider the educational environment "excellent" and 106 (65%) recognize that the EC is "more positive than negative". However, regarding the period "during the pandemic", only 36 (22.1%) students judge the EC to be "excellent" and 127 (77.9%) recognize that the EC is "more positive than negative". In opposition, according to Table 5 when considering the results obtained from the 5th grade respondents before the pandemic, only 1 (0.6%) student considers "excellent", 119 (71.3%) "more positive than negative", 45 (26.9%) "there are many problems" and 2 (1.2%) "very poor". Regarding the period during the pandemic, 131 (78.4%) students consider the EC "more positive than negative" and 34 (20.4%) report that "there are many problems".

Table 5. Distribution of the Total Score 3rd Year and 5th Grade Before and During pandemic

		Before the pandemic		During the pandemic	
		N	%	N	%
3rd year	Excellent	57	35.0	36	22.1
	More positive results than negative ones	106	65.0	127	77.9
	Total	163	100.0	163	100.0
5th year	Excellent	1	0.6	0	0
	More positive results than negative ones	119	71.3	131	78.4
	There are many problems	45	26.9	34	20.4
	Very poor	2	1.2	2	1.2
	Total	163	100.0	163	100.0

N=number; % = percent

3rd Year Students' Perception of the Educational Climate

According to Table 6, we found that the perception of the educational climate of 3rd year dental students had higher mean values before the pandemic, compared to the pandemic, in all subscales, and these differences were statistically significant. The greatest difference concerns the perception of learning (LP), with a mean value of 35.67 ± 3.56 before the pandemic and 33.91 ± 3.65 during the pandemic, these differences being statistically significant ($t = 8.45$; $p < .001$). The smallest difference is related to the perception of atmosphere with a mean value of 34.69 ± 3.68 before the pandemic and 33.99 ± 3.72 during the pandemic, these differences being statistically significant ($t = 3.53$; $p < 0.001$).

Regarding the educational climate in general, we found higher mean values before the pandemic (146.07 ± 13.27), compared to during the pandemic (141.07 ± 12.35), with these differences being statistically significant ($t = 8.32$; $p < .001$).

As for the magnitude of the effect, we found that the subscales Perception of Teachers, Academic Self-Perception, Perception of Atmosphere and Social Perception are small, with values ranging between 0.28 and 0.45. As for the subscales Perception of Learning and Educational Climate, the magnitude of the effect is moderate ($d = 0.66$ and $d = 0.65$).

5th Grade Students' Perception of the Educational Climate

According to Table 6, we verified that 5th year dental students' Perceptions of their Teachers have higher mean values before the pandemic (21.63 ± 3.34) than during the pandemic (20.95 ± 3.97), with these differences being statistically significant ($t = 2.25$; $p = .026$).

In relation to the Perception of Learning, they showed higher mean values during the pandemic (27.10 ± 5.46), compared to before the pandemic (24.71 ± 4.31), and these differences were statistically significant ($t = 6.96$; $p < .001$). Regarding the Perception of Atmosphere, they show higher mean values during the pandemic (26.49 ± 4.86) compared to before the pandemic (25.34 ± 5.17), with these differences being statistically significant ($t = -2.61$; $p = .01$). Regarding Academic Self Perception and Social Perception, there were no statistically significant differences before and during the pandemic.

As for Educational Climate, we found higher mean values during the pandemic (109.19 ± 16.08), compared to before the pandemic (107.50 ± 16.57), with these differences being statistically significant ($t = -2.06$; $p = .041$).

Regarding the magnitude of the effect, we found that in the Educational Climate, as well as in all subscales, except for the Perception of Learning, the effect is insignificant. In the Perception of Learning, the effect size is moderate ($d = 0.50$).

Table 6. Comparison of the Different Subscales of the EC in 3rd and 5th Years Dental Students

	3rd year (N=163)		5th year (N=167)	
	Mean ± SD	p	Mean ± SD	p
TP Before	29.87±4.35	< .001	21.63±3.34	.026
TP During	28.97±4.30		20.95±3.97	
LP Before	35.67±3.56	< .001	24.71±4.31	< .001
LP During	33.91±3.65		27.10±5.46	
AP Before	24.35±2.83	< .001	20.11±5.57	ns
AP During	23.56±2.80		19.64±3.56	
AtmP Before	34.69±3.68	< .001	25.54±5.17	.01
AtmP During	33.99±3.72		26.49±4.86	
SP Before	21.49±2.67	< .001	15.51±2.73	ns
SP During	20.63±2.62		15.01±2.61	
EC Before	146.07±13.27	< .001	107.50±16.57	.041
EC During	141.07±12.35		109.19±16.08	

N=number; SD= standard deviation; TP= perception of teachers; LP= perception of learning; AP= academic self-perception; ATmP=perception of atmosphere; SP= social perception; EC= educational climate; ns (non significant); p > .05

Comparison Between 3rd and 5th Year Dental Students' Perceptions of the Educational Climate Before and During the Pandemic

The data in Table 7 reveal that before the pandemic, 3rd year dental students have higher mean values in the overall educational climate and in all subscales compared to 5th year students, and these differences are statistically significant. The greatest differences are found in the subscales Perception of Learning by the student (mean difference = 10.96) and perception of atmosphere (mean difference = 9.15). The results during the pandemic go in the same direction, with 3rd grade students showing higher mean values in the global educational climate and in all subscales, compared to 5th grade students, with these differences being statistically significant. The greatest differences occur in the subscale perception of teachers (mean difference = 8.02) and analogously to before the pandemic in the subscale Perception of the Atmosphere (mean difference = 7.51). About the magnitude of the effect, it ranged from high to very high, both before the pandemic and after the pandemic.

Table 7. Comparison of the Different Subscales of the EC among 3rd and 5th Year Dental Students

	3rd year (N=163)		5th year (N=167)	
	Mean ± SD		Mean ± SD	p
TP Before	29.87±4.35		21.63±3.34	< .001
LP Before	35.67±3.56		24.71±4.31	< .001
AP Before	24.35±2.83		20.11±5.57	< .001
AtmP Before	34.69±3.68		25.54±5.17	< .001
SP Before	21.49±2.67		15.51±2.74	< .001
EC Before	14.07±13.27		107.50±16.58	< .001
TP During	28.97±4.29		20.95±3.97	< .001
LP During	33.91±3.65		27.10±5.46	< .001
AP During	23.56±2.80		19.64±3.56	< .001
AtmP During	33.99±3.72		26.49±4.86	< .001
SP During	20.63±2.62		15.01±2.61	< .001
EC During	141.07±12.35		109.19±16.09	< .001

N=number; SD= standard deviation; TP= perception of teachers; LP= perception of learning; AP= academic self-perception; ATmP= perception of atmosphere; SP= social perception; EC= educational climate.

Discussion

In this study, we applied the DREEM questionnaire to 3rd and 5th year students of the MSc in Dental Medicine MSc of IUCS, to assess the educational environment before and during the pandemic and compare the different perceptions between preclinical and clinical students. This could be important to detect the positive and negative aspects of the in-situation, subsequently promoting possible changes that enhance the satisfaction and success of IUCS students. There was a good adherence to the survey with a response rate of 74.1% of the academic population of the IUCS, like other previous studies (Prashanth & Ismail, 2018; Said et al., 2009). This fact may be indicative that students are concerned about the EC in the institution and could be able to cooperate with the institution for the improvement of EC conditions (Whittle et al., 2007).

In the present study, the mean total score of the questionnaire, before the pandemic, was 126.5, showing a positive response regarding the EC of the MSc in dental medicine of the IUCS. The total DREEM score at our educational institution when compared to the other studies conducted in Germany (Rotthoff et al., 2011), India (Thomas et al., 2009), Pakistan (Ali, Raja et al., 2012), Spain (Hernández-Crespo et al., 2020) and Malaysia (Said et al., 2009), was higher. In contrast, when compared to studies in the universities of New Zealand (Foster Page et al., 2012) and Oman (Prashanth & Ismail, 2018), our institution shows lower total DREEM values, which shows that although IUCS shows positive results, there is always an opportunity for improvement to meet the needs of students. As for the comparative analysis of the DREEM subscales, we can see that similarly to the overall score, the IUCS presents positive values. About social perception and perception of learning, the IUCS showed optimistic results, like the results obtained in Oman and New Zealand (Foster Page et al., 2012; Prashanth & Ismail, 2018).

Regarding the Academic Self-Perception their own and the Perception of the Atmosphere, the IUCS showed interesting values, allowing us to conclude that the students consider that they are prepared to practice their profession in the future and find in the teaching institute an organized place, and in addition, it provides a calm and relaxed environment during theoretical classes and clinical activity.

In opposition, regarding the Perception that students have of the Teachers, our institution has one of the lowest values compared to the other countries (Foster Page et al., 2012; Prashanth & Ismail, 2018; Rotthoff et al., 2011), but is still considered to be "going in the right direction". These values could be explained by the fear of the students to talk openly with the teachers during the classes, thus inhibiting the sharing of knowledge, which may negatively influence the learning process.

When comparing the values obtained before the pandemic, between preclinical and clinical students, we found that both the overall DREEM values and the values of the different subscales were higher in the preclinical students than in the clinical students, and these differences were statistically significant and with high or very high magnitude of effect. These results may be because 5th year students, since they are in the final phase of the course, may show higher levels of anxiety than third-year students. Malau-Aduli et al. re-ports that the transition from pre-clinical to clinical practice, despite being reported by students as an exciting learning phase due to changes in the context and responsibilities, is also a source of stress and anxiety among medical students, which may be related to perceptions of preparation for the clinical part (Malau-Aduli et al., 2020).

The stress factor is the factor that most influences the results obtained from the DREEM questionnaire. The MSc in dental medicine could be a very intense course and at the same time, very stressful, with numerous theoretical and practical assessments, which cause anxiety in students. This is particularly pronounced during the various stages of training, whether preclinical or clinical, however, it is higher when it comes to caring for the health of "flesh and blood" patients rather than phantoms with artificial teeth.

As for the period during the pandemic, the results obtained for 3rd year students were lower, however, still a "more positive than negative" response to the overall EC.

Third-year students felt the differences inherent to the COVID-19 pandemic most notably, with distinct results obtained before and during the pandemic with statistically significant differences. These values can be explained by the fact that they were completely unable to have face-to-face classes at the university, with all classes being held at a distance, through digital platforms. Therefore, they were consequently unable to be physically with friends, professors, causing a negative impact on the students' lives. Negative feelings of frustration, anxiety, anger, and boredom ended up being more frequent in the lives of these students, causing a more negative view of the EC during the pandemic.

It should be noted that the greatest difference in this group of students was reflected in the perception of learning, with lower mean scores during the pandemic compared to before the pandemic. This result may be justified by the negative view of these students, which made them consider that education did not help them develop skills for their future as dentists. In this sense, the study developed by Jum'ah et al. (2021) states that although video conferences and educational blogs are an asset in disseminating theoretical knowledge, we cannot neglect that clinical courses are designed primarily to ensure students' competence in routine medical-dental procedures. These clinical skills and expertise cannot be optimally obtained without a supervised patient treatment experience, and significant disruption of the educational process can adversely affect the development of students' competencies (Jum'ah et al., 2021).

In contrast, the impact of COVID-19 on 5th year students during the pandemic turned out to be less significant, and in comparison, to the period before the pandemic, higher values were registered. These values may be justified by the fact that, despite the pandemic situation, the teaching activity continued, with face-to-face classes at the CESPU Clinical Unit. Despite all the imposed rules, 5th year students, when attending face-to-face classes, end up having the opportunity to socialize with their course mates, with the teachers and assistants at the clinic, or even with the patients, thus promoting a better perception of the educational environment at the faculty.

The COVID-19 pandemic caused a drastic change in the students' lives, causing a rather negative impact on the students' lives. However, despite this negative view, 5th year students started seeing patients in the clinic for the first time, after a long 3 years of pre-clinical teaching, perceiving the fear of making mistakes and the responsibility that this implies and

in opposition to the fulfilment of being able to perform what they have learned during their course in the educational institution.

Another hypothesis that may explain these values is the fact that students attended internships in hospital clinics and community oral health clinics, thus providing re-sources that increase students' self-confidence and strengthen their social relationships among students, teachers, and patients. This assumption is supported by the results obtained in the LP subscale, since mean values for the perception of learning during the pandemic were higher than those obtained before the pandemic.

Recommendations

The results of this study are significant because they provide new insights into the perception of the educational environment at periods of high stress and uncertainty, such as during the COVID-19 pandemic. COVID posed new challenges in terms of learning, testing the capacities of students and teachers, while at the same time allowing some practical lessons to be drawn. Firstly, it is of paramount importance to know and continuously improve the overall educational environment. Emphasis on the relationships and interactions with others inherent in the educational environment can help students to have a greater sense of belonging to the university and internship sites, which can translate into higher levels of motivation, involvement, eagerness for new learning and emotional well-being. On the other hand, the overall DREEM and specific subscale scores can be used as a periodic assessment tool to gather feedback on areas of the educational environment that warrant further attention or ongoing efforts to improve the overall educational environment.

Despite the pandemic, the consistently high scores across all domains of the DREEM suggest that disruptive changes in learning during such an atypical period may lead to positive adaptations as well as improvements in the educational environment and pedagogy.

In the future this type of studies should be carried out in several universities, so that different groups of students can be compared. It would be interesting to compare the sequelae of COVID, conducting the same questionnaire at the current moment (post-COVID) thus allowing to compare the educational climate. The promotion of education activities for all student and practitioners directed to potential diseases crisis should be implemented to reduce possible impact of these situations on student's population.

Conclusion

This study reports a significant difference between of 3rd year dental students and 5th regarding the perception of the educational climate. During the pandemic, 3rd graders' scores were overall lower than the time before the pandemic, yet there was a "more positive than negative" response to the overall EC. Third year students felt most acutely the difficulties inherent in the COVID-19 pandemic. The impact of SARS-CoV-2 on 5th year students during the pandemic was less significant compared to the period before the pandemic. These results confirm that an impact of COVID-19 in students' education could be possible, suggesting the design of measures to mitigate the effects of COVID pandemic on the student's education.

Limitations

We acknowledge some limitations on this study including the nature and subjectivity of a questionnaire relatively small sample of cases and potential students representativity issues. It would be interesting in the future to extend the participant in a national design, and, also to other countries to compare the same questionnaire within different geographic locations.

Ethics Statements

The study has been performed in accordance with the Declaration of Helsinki. The ethical committee for the University Institute of Health Sciences (IUCS), approved this noninterventional study for the information with CE/IUCS/CESPU-02/21 reference.

Conflict of Interest

The authors declare that they have no competing interests.

Funding

This study was funded by the authors' own institutions.

Authorship Contribution Statement

Relvas & Rocha: Data collection/analysis/interpretation, drafting the article, approval of the article. Gonçalves: Data analysis/interpretation, critical revision of the article, approval of the article. Salazar: Data analysis/interpretation, drafting the article, approval of the article. López-Jarana & Monteiro: Concept/design, statistics, drafting the article, approval of the article. Cabral: Statistics, approval of the article. costa: Concept/design, statistics, critical revision of the

article, approval of the article. Relvas & Costa: Concept/design, statistics, critical revision of the article. All authors have read and approved the manuscript.

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