Dental students’ academic performance before and after the Covid-19 pandemic: A retrospective analysis

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Abstract Delivering quality education to students with fair assessment strategies is a key indicator of an excellent educational institution. The present study explored the impact of the COVID-19 pandemic on the academic performance of dental students in terms of the evaluations/grades awarded to them before and during the pandemic. The targeted groups were dental students, studying in the third year of 2018–2019 and 2020–2021 academic years. The sample size included all male and female students who enrolled and completed the following courses: pre-clinical fixed prosthodontics (SDS333), pre-clinical removal prosthodontics (SDS323), clinical operative dentistry-1 (RDS313), and pre-clinical endodontics (RDS323). Evaluations for students who did not complete the requirements were not included in the statistical analysis. Paired sample statistics were used for comparisons between the different groups at p < 0.05. Results revealed statistically significant differences (p ≤ 0.05) for all the course pairs. It was found that students’ grades for all the courses during the pandemic year were higher compared to the grades before the pandemic. While female students demonstrated the highest mean difference (6.13) before and during the pandemic year for RDS323, males demonstrated the highest mean difference (8.14) for SDS323. However, both male and female students demonstrated the lowest mean difference (0.25 and 2.03, * Corresponding author at: Department of Prosthetic Dental Sciences, College of Dentistry, King Saud University, P. O. Box 60169, King Abdullah Road, Riyadh 11545, Saudi Arabia.
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1. Introduction

The coronavirus disease or COVID-19 pandemic was a major health concern over the last two years and continues to critically affect the daily lives of people. Its effects on the educational system have been well documented (Altawaijry et al., 2021). The pandemic was first detected in Wuhan City, China in December 2019. It was announced as a global emergency on January 30, 2020, and a global pandemic on March 11, 2020, by the World Health Organization (WHO) (Andersen et al., 2020; Hu et al., 2021).

Several restrictions, such as restrictions on travel and the closure of restaurants, cinemas, theaters, and other entertainment places were imposed to control and restrain the spread of the virus (Esposito et al., 2021). A critical limitation was the prevention of in-person education. To contain the spread of COVID-19, most governments worldwide decided to temporarily close educational institutions (Al-Tawfiq and Memish, 2020). Most of the private and government institutions operated online with minimal in-person duties. From preschool to higher educational institutes, distance learning platforms were used to prevent direct contact with individuals (Oçal et al., 2021).

The negative effects of the COVID-19 pandemic on the education system are well known. Healthcare education is no exception. The data obtained at different levels indicate the educational loss faced by the students and an increase in anxiety and depression. However, the long-term effects cannot be predicted (Alyoubi et al., 2021; Hoofman and Secord, 2021). Lectures were delivered through various online platforms, such as Zoom and Microsoft Teams. With the technologically enhanced approaches proving to have greater usefulness and higher acceptance by medical/dental students, the widening gap between special learners and socioeconomic conditions is no surprise (Farrokhi et al., 2021; Mahdy, 2020). Practical learning methods in the form of internship and pre-clinical practice, including medical, dental, and nursing professions, were severely affected by the pandemic and were forced to make radical changes (Farooq et al., 2020).

Dentists and dental students were considered among the extremely high-risk category by the US “Occupational Safety and Health Administration” because of their potential to get infected during aerosol-generating procedures. Most schools in the US suspended clinical teaching and declared policies for staying at home. Others applied social distancing in hands-on laboratories (Deery, 2020). The final challenge was ensuring the competency of the graduating students and their access to sufficient experience (Al Kawas et al., 2020).

Grading is critical for students’ learning and ensuring their academic success. This important component of the academic learning process was severely affected during the pandemic as direct supervision of important tasks became a challenge for the instructors/examiners (Farrokhi et al., 2021). This raised concerns regarding fair grading for accurately measuring students’ performance and helping the instructors to compare grades to the previous year. Higher grades in the pandemic year than the previous year may be related to cheating during online exams and the changes in the examination format. Conversely, lower grades could be attributed to autonomous learning as a less effective teaching method (Karadag, 2021). Thus, this study investigates the grade variations of the dental students, in selected dental courses, during the pandemic and pre-pandemic period.

The objective was to assess the effect of the COVID-19 pandemic on academic performance by evaluating and comparing the final grades awarded in various dental courses during the pandemic year with the pre-pandemic year.

2. Materials and methods

2.1. Study design and ethical approval

This retrospective study was conducted at College of Dentistry, King Saud University, Riyadh, KSA. The ethical approval was obtained from the IRB (Institutional Review Board of King Saud University) with the project number E-21–6107 and Research Center at College of Dentistry (CDRC No. IR0404).

2.2. Sample and study groups

The target groups were dental students in their third year of 2018–2019 and 2020–2021 academic years. The sample size comprised grades for all the male and female students who enrolled and completed the courses investigated in the study. The courses included in the present study were pre-clinical fixed prosthodontics (SDS333), pre-clinical removal prosthodontics (SDS323), clinical operative dentistry 1 (RDS313), and pre-clinical endodontics (RDS323). The total number of grades for students investigated was 1013 with 438 grades for females and 575 grades for males. The students who did not meet the requirements, who were not full-time third-year students, and who had dropped out for personal/health reasons were not included in the study. All personal information was kept confidential.

2.3. Data collection

The data for the present research was extracted from the “e-register” of the King Saud University grading system by an authorized faculty. Students’ grades were accessed without disclosing their identity to ensure that the obtained data could not be linked or traced back to the students. The collected data were tabulated in Microsoft Excel.

2.4. Statistical analysis

The SPSS software, version 21.0 (SPSS, Chicago, IL, USA), was used for statistical analysis. The collected data was
transferred from Microsoft Excel to SPSS. Mean and standard deviations were calculated using the software. The mean differences were calculated between the grades of the same courses before and during the pandemic. Paired sample statistics were used for the comparison between different groups. The probability for statistical significance was set at α < 0.05.

3. Results

In this research study, grades awarded to third-year dental students of two different disciplines and four courses, before and during the COVID-19 pandemic, were evaluated and compared.

Table 1 describes the paired sample statistics for the grades of female students of the pairs of the same courses before and during the pandemic year. The results revealed statistically significant differences in all the course pairs with p ≤ 0.05. The highest grades (91.16 ± 3.32) were noted for RDS323 for 2020–2021 and the lowest grades (84.98 ± 3.20) were noted for SDS333 for 2018–2019. In addition, it was noted that the grades of the students for all the courses during the pandemic year were higher than the pre-pandemic academic year. The highest mean difference (6.13) before and during the pandemic was noted for RDS323 and the lowest mean difference (2.03) was noted for SDS333.

Table 2 presents the paired sample statistics for the grades of male students of the pairs of the same courses before and during the pandemic year. The results revealed statistically significant differences in all the course pairs with p < 0.05, except for SDS333 (p = 0.216). The highest grades (90.18 ± 4.92) were noted for RDS323 for 2020–2021 and the lowest grades (78.26 ± 7.06) were noted for SDS323 for 2018–2019. The results were similar to Table 1, whereby the students received better grades in the pandemic year than in the pre-pandemic year. The highest mean difference (8.14) before and during the pandemic year was found for SDS323 and the lowest mean difference (0.25) was found for SDS333.

The differences in the grades of the male/female students for all the courses before and during the pandemic are presented in Fig. 1. Female students scored higher in RDS323 and RDS313 during 2020–2021 and 2018–2019, respectively. Male students scored higher in RDS323 and RDS313 during 2018–2019 and 2020–2021, respectively.

4. Discussion

During the COVID-19 pandemic, dental colleges and schools, like other universities, had to suspend in-person classes, pre-clinical laboratory exercises, and clinical exercises (Deery, 2020; Oçal et al., 2021; Vargas-Ramos et al, 2021). College administrations had to switch to online teaching methods to minimize the academic damage caused due to these suspensions (Al Kawas et al., 2020; Deery, 2020; Ullah et al., 2022). The present research investigated the impact of the COVID-19 pandemic lockdown on dental students’ academic performance in terms of the grades achieved before and during the pandemic year.

The results indicated that students’ grades during the pandemic year (2020–2021) were higher in comparison to the grades in the pre-pandemic academic year. This phenomenon, whereby higher grades are awarded for an equivalent task, can be termed “grade inflation” (Karadag, 2021). Hence, this study would be a useful addition to the dental literature, which presents important information about dental students’ grades during the pandemic. The overall grade difference or grade inflation during the pandemic year, compared to the pre-pandemic year, was noted to be 3.8 %. Several research studies have documented grade inflation for undergraduate students during the last few decades. The evidence proves that grade inflation increases up to 0.1 % every decade (Rojstaczer and Healy, 2010). In the United States, where the majority of studies on grade inflation are conducted, a significant increase is observed in the grades awarded over the past 50 years, from about 2.5 in 1960 to 3.1 in 2006 (Hernandez-Julian and Looney, 2016; Rojstaczer and Healy, 2010, 2012; Sonner, 2000). Grade inflation during the pandemic has been reported in some research studies. In a study of Turkish higher education by Karadag (2021), grade inflation of up to 9.21 % was reported, which could be the highest-ever grade inflation reported.

| Course | Academic Year | Mean | Standard Deviation | Standard Error Mean | Mean Difference | Correlation | *P-Value |
|--------|---------------|------|-------------------|---------------------|----------------|-------------|----------|
| Pair 1 | SDS333 (n = 57) | 2018–2019 | 84.98 | 3.20 | 0.44 | 2.03 | 0.96 | 0.000 |
|        | SDS333 (n = 52) | 2020–2021 | 87.01 | 3.80 | 0.52 |     |     |     |
| Pair 2 | SDS323 (n = 57) | 2018–2019 | 85.36 | 4.18 | 0.58 | 2.44 | 0.92 | 0.000 |
|        | SDS323 (n = 52) | 2020–2021 | 87.80 | 2.84 | 0.39 |     |     |     |
| Pair 3 | RDS313 (n = 57) | 2018–2019 | 85.28 | 5.09 | 0.70 | 2.39 | 0.88 | 0.000 |
|        | RDS313 (n = 53) | 2020–2021 | 87.67 | 8.46 | 1.16 |     |     |     |
| Pair 4 | RDS323 (n = 57) | 2018–2019 | 85.03 | 4.01 | 0.55 | 6.13 | 0.97 | 0.000 |
|        | RDS323 (n = 53) | 2020–2021 | 91.16 | 3.32 | 0.45 |     |     |     |

* P value was significant at P < 0.05.
Grade inflation during the pandemic can be attributed to multiple reasons, including the stress related to effective course content delivery and course management from instructors’ perspectives. From the students’ viewpoint, it could be due to the aim of acquiring the minimum required grades for passing a course and completing the assigned tasks. The importance of both views cannot be denied and are essential for achieving desired learning outcomes (Wang et al., 2021).

From a psychological viewpoint, a certain level of stress can be helpful and, at times, may act as a motivator to accomplish goals (Dhabhar, 2019). The positive effects of stress are often overlooked by students. The stressful situation may act as an opportunity and a source of motivation that could lead to a positive outcome and help students to accomplish their goals and be successful (Dhabhar, 2019). The pandemic-related stress had both positive/negative outcomes for students’

![Table 2](attachment:image.png)

**Table 2** Paired Samples Statistics for the Male Students.

| Course | Academic Year | Mean | Standard Deviation | Standard Error Mean | Mean Difference | Correlation | *P*-Value |
|--------|---------------|------|---------------------|---------------------|----------------|-------------|-------|
| SDS333 (n = 68) | 2018–2019 | 82.26 | 6.37 | 0.77 | 0.25 | 0.98 | 0.216 |
| SDS333 (n = 75) | 2020–2021 | 82.51 | 5.13 | 0.62 | | | |
| SDS323 (n = 69) | 2018–2019 | 78.26 | 7.06 | 0.85 | 8.14 | 0.97 | 0.000 |
| SDS323 (n = 73) | 2020–2021 | 86.40 | 4.08 | 0.49 | | | |
| RDS313 (n = 73) | 2018–2019 | 82.68 | 7.78 | 0.91 | 6.98 | 0.99 | 0.000 |
| RDS313 (n = 74) | 2020–2021 | 89.67 | 5.86 | 0.68 | | | |
| RDS323 (n = 69) | 2018–2019 | 88.53 | 4.39 | 0.52 | 1.65 | 0.95 | 0.000 |
| RDS323 (n = 74) | 2020–2021 | 90.18 | 4.92 | 0.59 | | | |

* P value was significant at P < 0.05.

![Fig. 1](attachment:image.png)

**Fig. 1** Comparison of the Final Grades of Female and male Students.
education worldwide (Gębska et al., 2021). Hence, according to the findings of the present study, pandemic stress had a positive impact on dental school students regarding their grades. This stress encouraged them to learn, study, and perform their best and the faculty to deliver the course content and accomplish the course objectives (Bhattacharjee and Ghosh, 2022).

It is important to note that during the pandemic there was a marked increase and advancement in the e-learning mode of education (Al Kawas et al., 2020; Deery, 2020; Farooq et al., 2020; Karadag, 2021; Mahdy, 2020). This may be because of the technical assistance provided by the university for the usage of Blackboard, Zoom, and Microsoft Teams (Gachanja et al., 2021). Even if students could not attend the class, they could take the exams, attend lectures, and submit assignments online. In addition, the student to faculty communication markedly improved.

Grade inflation could be further related to the efforts of the examiners (Kemp and Grieve, 2014). When the examiners were forced to switch to online teaching platforms, they may have graded higher to compensate for the unforeseen and unexpected negative errors. All these factors led to improved students’ grades during the pandemic year.

Despite the study results indicating higher grades during the pandemic year, certain students, individually, may have scored higher or lower grades due to the pandemic. Hence, it is important to discuss the reasons for the lower grades of individual students. One logical explanation could be the lack of reliable technology or technology knowledge. In addition, students or their family members getting detected with the virus could have affected their academic performance. Furthermore, economic factors could have affected the studies.

The study analysis was limited to selected courses with a difference in the students’ set and mode of teaching. Academic factors, including learning, teaching, and assessment strategies used in the online educational system, and the identification of faculty-related issues must be explored in future investigations. It will be of value to investigate and compare students’ performance in other courses, multicenter studies within the same country, and the present scenario concerning other countries. In addition, it would be interesting to explore the reasons for female students’ higher grades compared to male students, as discovered in the present study. Finally, we explored the academic impacts of the pandemic on students’ grades. The non-academic impacts, which may affect academic performance, must be explored and investigated.

5. Conclusion

An increase in students’ grades was noted during the pandemic year. Overall, female dental students’ grades were higher than male dental students. The higher grades of the dental students who participated in this study could be due to an increase in study hours, the positive impact of stress, and increased parental supervision. The instructors may have tried to grade higher to compensate for the unforeseen and unexpected negative errors.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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