Original Research

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Assessing Anxiety and Satisfaction Levels among Dental Students during Online Learning amid the COVID-19 Pandemic: A Cross-Sectional Study

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Abstract:

Introduction:
The covid-19 pandemic led to widespread adoption of online learning. In April 2020, the higher education commission (hec) of Pakistan released policy guidance on online readiness with three levels: basic, effective, and exemplary. However, concerns about the quality and readiness for online curriculum delivery in Pakistan persisted. This study assesses the anxiety and satisfaction levels of undergraduate dental students with online classes during the pandemic.

Methods:
An analytical cross-sectional study was conducted between June and July 2020. Data were collected via email from undergraduate dental students of a private dental college using convenience sampling, after three months of online teaching. Two tools were used: a student satisfaction questionnaire adapted from Bollinger and halupa's study, and a student anxiety questionnaire. Frequencies, percentages, means, and standard deviations were calculated for satisfaction and anxiety scores. Univariate and multiple linear regression analyses were performed to assess factors associated with student satisfaction.

Results:
Out of 300 eligible participants, 237 responded (79% response rate). Most participants (53.16% female, 59.07% hostellers) had no prior experience with online learning (85.65%). The mean anxiety score was 54.87 (SD=9.6), and the mean satisfaction score was 58.63 (sd=16.66). Male students showed less satisfaction than females, though not statistically significant. Second-year students had significantly higher satisfaction scores than third- and fourth-year students.

Conclusion:
Most students had no prior experience with online learning, resulting in increased anxiety and poor satisfaction with the modality during the covid-19 pandemic.

Keywords: covid19, dental students, readiness, online classes

Introduction:

The COVID-19 pandemic has significantly transformed various aspects of life, one of which is the shift to online learning as a primary mode of curriculum delivery worldwide (1, 2). As universities transitioned to digital platforms, researchers began evaluating the effectiveness of online education, highlighting its benefits, such as accessibility, flexibility, self-paced learning, and content standardization (3). In April 2020, the Higher Education Commission (HEC) of Pakistan issued COVID-19 policy guidance, including Note 5, which outlined three levels—basic, effective, and exemplary—for assessing universities' preparedness for online classes (4). This guidance provided a framework for evaluating the quality of online education and instructed institutions to train faculty before implementing digital teaching. Despite these measures, concerns regarding the quality and readiness of online curriculum delivery in Pakistan persisted (4).

Several barriers to successful online education in Pakistan have been identified, including technical limitations, lack of digital literacy, financial constraints, privacy concerns, and insufficient institutional infrastructure (5). Effective online education requires coordinated efforts at both individual and institutional levels, including policy adjustments and financial support from the HEC and the Ministry of Education to acquire necessary resources and

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Date of Receiving: 19, August, 2024

Date of Revision:5, October, 2024

Date of Acceptance: 5, October,2024

DOI: https://doi.org/10.69491/yc58g628

technology (5). While platforms like Zoom, Google Classroom, Learning Management Systems (LMS), and Microsoft Teams facilitated lecture-based modules during the pandemic, programs requiring interactive pedagogies, such as health sciences, posed additional challenges (6).

Assessing the satisfaction and anxiety levels of students in online learning is crucial, particularly in fields like dentistry, which require extensive clinical and laboratory work. Student satisfaction is a multifaceted concept influenced by factors such as teaching quality, technical support, digital accessibility, workload distribution, interactivity, and assessment procedures (7–9). Effective interaction among learners, instructors, and content is key to a positive learning experience, with satisfaction being directly proportional to the level of interactivity in the learning environment (10, 11).

Before the pandemic, limited studies assessed satisfaction with distance learning in dental education (12, 13). The abrupt shift from traditional face-to-face instruction to online learning, without adequate preparation, disrupted the learning process. The Bachelor of Dental Surgery (BDS) program in Pakistan, which spans five years and covers theoretical, clinical, and practical competencies across various subjects, requires robust clinical experience and detailed assessments to achieve its educational objectives (14). Given Pakistan's limited budget for education and low digital literacy rates, integrating e-learning into the curriculum presents significant challenges (15). Moreover, delayed evaluations and feedback further contribute to student dissatisfaction with online learning (15).

In light of these challenges, this study aims to assess the anxiety and satisfaction levels of undergraduate dental students regarding online classes during the COVID-19 pandemic, and to explore factors (e.g., year of study, gender, prior experience) influencing student satisfaction.

Methods:

An analytical cross-sectional study was conducted between June and July 2020 to assess the anxiety and satisfaction levels of undergraduate dental students regarding online classes during the COVID-19 pandemic. Ethical approval was obtained from the Research and Development Ethics Review Committee of the college (Reference No: BDMC/R&D/ERC/2020-08). The study was conducted at a private dental and medical college located approximately 75 km from Hyderabad, Pakistan.

Study Population and Sampling:

The study population consisted of undergraduate dental students from all four academic years (n = 300). A convenience sampling technique was employed to facilitate data collection, considering the constraints posed by the pandemic. Inclusion criteria involved all dental students enrolled in any academic year during the study period, who had been attending online classes for at least three months. Exclusion criteria included students who were on academic leave or had not participated in the online classes during the data collection period.

Data Collection:

Data collection began after three months of online teaching. Students were invited via email to participate in the study. The email included a link to a Google Form, which first sought informed consent before proceeding to the questionnaire. The demographic data collected covered eight items, including gender, year of study, and previous experience with online learning.

To measure students' satisfaction and anxiety levels with online classes, two validated instruments were employed. The Student Satisfaction Questionnaire, adapted from Bolliger and Halupa's study (16), comprised 21 five-point Likert scale questions that focused on six core areas:

1. Instructor quality
2. Technology
3. Online instruction setup
4. Interaction
5. Learning outcomes
6. Overall satisfaction.

The Student Anxiety Questionnaire contained 18 five-point Likert scale items, covering three domains of anxiety:

1. Computer anxiety
2. Internet-related anxiety
3. Online classes anxiety.

Both questionnaires used a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). At the end of the survey, two open-ended questions were included to capture student feedback regarding the difficulties faced during online learning and suggestions for improvement.

Reliability of Instruments:

The internal consistency of both the questionnaires was high, with Cronbach's alpha scores of 0.91 for the satisfaction scale and 0.93 for the anxiety scale, indicating strong reliability (16).

Data Analysis:

The collected data were downloaded from Google Forms as a Microsoft Excel spreadsheet and imported into STATA 15.0 for analysis. To ensure anonymity, all identifying information was removed before analysis. No missing data were reported, as all questions required mandatory responses.

Descriptive statistics, including frequencies and percentages, were generated for all variables. Means and standard deviations were calculated for both satisfaction and anxiety scales, along with their respective subscales. Univariate regression analysis was applied to examine the

association between independent variables (such as gender, year of study, and prior online learning experience) and student satisfaction scores. Variables with a p-value < 0.1 were included in the final multiple linear regression model to identify significant predictors of student satisfaction.

For the qualitative responses to the open-ended questions, thematic analysis was performed. Two independent researchers read the responses, applied open coding, and identified recurring themes to form categories based on similarities and differences in responses.

Results:

Out of 300 eligible participants, 237 responded to the survey with a response rate of 79%. More than half of the participants (53.16%) were female and 59.07% were hostellers (Table 1). Most of the participants (85.65%) had no prior experience with online learning. Table 2 shows that the mean anxiety score was 54.87 (SD=9.6) whereas, the total satisfaction score was 58.63 (SD=16.66) in table3. In table 4, it shows that sex, year of study, previous experience with online learning, number of siblings attending online classes, and anxiety were associated with satisfaction score. In table 5, it is evident that as technological anxiety increases, there is a significant decrease in satisfaction of students. Male students show less satisfaction as compared to female students but it is not statistically significant. Second year students have significantly higher satisfaction scores as compared to third and fourth year. Previous experience with online learning and no. of other siblings attending online classes do not have significant association with students' satisfaction in multivariate model

Table 1: Demographic statistics of study participants

Variables	Mean (SD) / N (%)
Sex	
Female	126 (53.16)
Male	121 (46.84)
Residence	
Hosteller	140 (59.07)
Day Scholar	97 (40.93)
Year of Study	
Year 1	66 (27.85)
Year 2	72 (30.38)
Year 3	46 (19.41)
Year 4	53 (22.36)
Total Marks Obtained in HSC	853.49 (80.08)
Previous Experience With Online Learning	
No	203 (85.65)
Yes	34 (14.35)
Device used for online classes	
Personal Smartphone/Tablet	183 (77.22)
Personal Laptop/Desktop	24 (10.13)
Shared Laptop/Desktop	30 (12.66)
No. of siblings attending Online Classes	1.13 (1.31)

Table 2: Mean Scores and Standard Deviation for Anxiety Scale and Subscales

Scales	Mean (SD)
Total Anxiety Scale (1-18)	3.05 (0.53)
Computer subscale (1-6)	2.95 (0.54)
Internet subscale (7-12)	3.12 (0.74)
Online Classes subscale (13-18)	3.08 (0.67)

Table 3: Mean Scores and Standard Deviation for Satisfaction Subscales

Scales	Mean (SD)
Total Satisfaction Scale (1-21)	2.79 (0.79)
Instructor (1-4)	3.02 (0.90)
Technology (5)	2.97 (1.24)
Setup (6-9)	2.84 (0.82)
Interaction (10-13)	2.86 (0.90)
Outcomes (14-17)	2.66 (0.95)
Overall (18-21)	2.52 (0.92)

Table 4: Univariate association with mean satisfaction score

Variable	Co-efficient	Standard Errors	p-value
Sex	-0.173	0.103	0.095*
Type of Residence	0.062	0.105	0.533
Year of Study	-0.122	0.046	0.008*
Total Marks Obtained in HSC	0.000	0.001	0.731
Previous Experience with Online Learning	0.261	0.146	0.076*
Type of Device Used	-0.014	0.074	0.850
No. of siblings attending Online Classes	0.074	0.039	0.060*
Mean Technological Anxiety Sore	-0.822	0.081	<0.001 *

Note: Variables resulting $p \leq 0.1$ in univariate regression were used for multivariate model

Table 5: Multivariate regression model showing association of mean satisfaction score with mean technological anxiety and other variables

Variable	Co-efficient	Standard Errors	p-value
Mean Technological Anxiety Sore	-0.765	0.077	<0.001
Sex (Male)	-0.123	0.080	0.127
Year of Study			
Year 2	0.270	0.107	0.013
Year 3	-0.388	0.118	0.001
Year 4	-0.228	0.114	0.047
Previous Experience with Online Learning	-0.038	0.118	0.746
No. of siblings attending Online Classes	0.056	0.031	0.077

Thematic Analysis of open-ended responses:

Eighty students responded to the last two questions and shared their responses on the difficulties they faced. Major barriers that the students faced were categorized into: technology, student, instruction and environment related factors. Students also shared improvement in the online classes in the same categories.

Technology related factors: Students shared dissatisfaction related to weak internet connectivity, lack of dedicated gadgets for online education, lack of interaction among students and faculty members during online classes, and security issues within the online learning application. A student who attended online classes from a remote area narrated:

> "The main problem I'm facing is the internet issue, as you all better know that internet facility is very poor in Pakistan, and absolutely zero quality internet in Baluchistan, Khyber Pakhtunkhwa and in many backward areas of Sindh and Punjab, I belong from Kharan which is 600km away from Quetta. We don't have internet facility in our area we use 2g network."

Student related factors: Students shared concerns related to financial burden related to buying gadgets for online learning, lack of motivation among students to join online classes, issues pertinent to time management while attending classes from home, and difficulty in understanding topics online without support from peers and instructors.

Instruction related factors: Students felt there is lack of readiness among teachers to teach online, lack of competence to use software and different features within the software, and lack of general literacy related to online teaching. One of the students narrated:"Teachers are having difficulties in teaching during online (classes) because many are unaware of technology. Teachers just come, read slides and that's it."*Environment related factors*: Students shared that the online teaching environment is not secure and it has privacy issues. One of the students reported: "The teacher asks us to open camera for online (class) which is quite ok but some students take screenshot(s) which is too bad for privacy. "Students also shared their unhappiness with the lack of security in online learning environment causing hindrance in class environment. Due to frequent disturbance from hackers during online classes, teachers used to disable chat and mute all the students. One of the students stated:"Interruption of other fake IDs was disturbing as they came to the class and distributed us and halted our study tempo."

Discussion:

The findings from our study revealed that a significant proportion of dental students lacked prior experience with online learning modalities, with 85.65% of respondents reporting no previous exposure. This lack of experience appears to correlate with increased anxiety levels and decreased satisfaction with the online learning format. The mean anxiety score was notably high at 54.87 (SD = 9.6), indicating a heightened sense of unease among students during this transition. Satisfaction, measured by a total score of 58.63 (SD = 16.66), reflects the challenges faced by students adapting to an entirely new learning environment. Factors such as gender, year of study, prior online learning experience, anxiety, and the number of siblings attending online classes were identified as significant influences on student satisfaction. Notably, male students reported lower satisfaction levels compared to their female counterparts, although this difference was not statistically significant.

The present study underscores the critical importance of student engagement and self-efficacy in online learning contexts, aligning with previous literature that emphasizes these factors as determinants of satisfaction in educational settings (17). Our results resonate with a study conducted in Egypt, which highlighted that internet availability, student motivation, and familiarity with online platforms are crucial for enhancing online learning satisfaction (18). Interestingly, while male students exhibited lower satisfaction levels, this trend could be attributed to inherent differences in learning engagement between genders. Research suggests that females tend to demonstrate greater commitment and focus in educational pursuits, contributing to their enhanced experiences with online learning modalities (19). Additionally, the female students' superior self-regulation skills may facilitate more positive learning outcomes in digital environments (20).

Anxiety has emerged as a well-documented factor influencing satisfaction in online education, not only among students but also among educators (21). The abrupt shift to online learning due to the pandemic created an environment rife with anxiety, underscoring the necessity for gradual adaptation to new educational modalities (22). Furthermore, the presence of siblings with online learning experience positively impacted satisfaction levels, likely due to the support they could offer in navigating the challenges associated with this novel learning format (23).

The qualitative responses from participants provided deeper insights into the barriers encountered during online learning. Students articulated significant concerns regarding technology-related factors, including weak internet connectivity, insufficient access to devices, and inadequate interaction with peers and instructors. One participant eloquently captured the difficulties faced by students in remote areas, stating, "The main problem I'm facing is the internet issue... We don't have internet facility in our area; we use 2G network." This reflects a broader issue prevalent in many regions of Pakistan, where internet accessibility remains a significant barrier to effective online learning.

Moreover, the financial burden associated with acquiring necessary gadgets and the absence of motivation were identified as student-related factors contributing to dissatisfaction. Participants expressed difficulty managing their time effectively while attending online classes from home, as well as challenges in grasping complex topics without adequate support from peers and instructors. These sentiments align with existing literature that indicates a strong link between student motivation and successful engagement in online learning environments (34).

Instruction-related factors also emerged as significant contributors to dissatisfaction, with students highlighting a lack of preparedness among educators for the transition to online teaching. One participant remarked, “Teachers are having difficulties in teaching during online classes because many are unaware of technology. Teachers just come, read slides, and that’s it.” This observation points to the necessity for comprehensive training for educators to effectively navigate online teaching platforms and engage students meaningfully (40). In contrast, while some developed nations have successfully implemented hybrid learning models, the sudden demand for synchronous online education in low- and middle-income countries (LMICs) presents a unique set of challenges (41).

Environmental factors further compounded student dissatisfaction, particularly concerns related to privacy and security in online learning. Participants voiced apprehensions regarding the potential misuse of personal information during online classes, such as instances of peers taking screenshots without consent. This aligns with existing literature that highlights privacy concerns in virtual learning environments, where transparent interactions can inadvertently expose personal data (38). Furthermore, issues related to disruptions from unauthorized individuals during online sessions added to the students' sense of insecurity and hindered their overall learning experience

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Conclusion

In conclusion, the findings from this study provide valuable insights into the factors influencing student satisfaction and anxiety in online learning environments. Addressing these barriers—ranging from technological limitations and instructional preparedness to environmental concerns—will be essential for enhancing the effectiveness of online education, particularly in the context of dental education in Pakistan. Future research should focus on developing strategies to mitigate these challenges, fostering a more supportive and effective online learning environment for students.

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Conflict of interest: Author declares no conflict of interest.

Funding Disclosure: Nil

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Prof. Dr. Atif Mahmood: Manuscript writing, data entry and interpretation of results
Dr. Hussain Maqbool: Conceptualization, data analysis, interpretation
Komal Abdul Rahim: Manuscript writing, result tabulation and review
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