

Original Article

Factors causing stress in postgraduate dental students during COVID-19 pandemic: A cross-sectional survey

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ABSTRACT

Background: COVID-19 pandemic has impacted the academic and clinical training of postgraduate dental students. This study aimed to assess various factors causing psychological stress in them, and the extent of stress perception during pandemic.

Materials and Methods: In this cross-sectional study, 250 postgraduate students from nine dental colleges of Haryana and National Capital Region, India, responded to an online questionnaire sent electronically to them in September 2020, which included modified dental environment stress (DES) score, Perceived Stress Scale (PSS), and questions regarding COVID-associated stress (CAS). Students already diagnosed with any psychiatric disorder or having a history of any major adverse event during the last 6 months likely to affect their psychological health were excluded from this study. The data obtained were analyzed using Chi-square test, Independent *t*-test, univariate ANOVA with *post hoc* tests, Pearson moment correlation, and multiple hierarchical regression tests. $P < 0.05$ was considered statistically significant.

Results: DES score was moderate for 48.8% and high for 34.4% of the participants. PSS was moderate for 69.2% and high for 18.8% of the participants. The most stressful factor in dental environment was the pattern of university examination, while the most stressful factor specific to COVID-19 was the fear of family members contracting the infection. PSS score was significantly higher in female participants. DES and CAS scores were significantly higher in students staying in hostels. Multiple hierarchical regression model depicted gender, mean health, and DES score as significant predictors of PSS.

Conclusion: Postgraduate dental students reported the adverse impact of COVID-19 pandemic upon their training and prospects as a reason for the increase in stress.

Key Words: COVID-19 pandemic, cross-sectional study, dental students, psychological stress

Received: 01-Oct-2020
Revised: 15-May-2021
Accepted: 16-Jun-2021
Published: 22-Nov-2021

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INTRODUCTION

Dental education is stressful^[1] so much so that among the students of all the health professions, students of dentistry are under more stress.^[2] Technique sensitive nature of dental procedures with the minimal scope of errors, pressure to achieve academic and clinical

excellence, dealing with difficult patients, concerns for the future, overwork, and a little time for relaxation predispose the students of the dental profession to overwhelming levels of stress.^[3] Already beleaguered

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How to cite this article: Juneja R, Sikka N, Kumar V, Chahal S, Arora M, Middha M, *et al.* Factors causing stress in postgraduate dental students during COVID-19 pandemic: A cross-sectional survey. *Dent Res J* 2021;18:92.

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with so many stressors, dental students are bound to be affected in myriad ways with the spread of coronavirus disease (COVID-19) – a disease having very high transmissibility and predominant spread by respiratory droplets.^[4-6]

During COVID-19 outbreak, dentistry has been categorized as a very high-risk-profession owing to aerosol-generating procedures;^[7] it had even been advocated to restrict the dental procedures to emergency and urgent ones only.^[7,8] Furthermore, public health measures taken to curb its spread had led to the closure of dental teaching institutions, suspending the clinical teaching and shifting the academics from in-class to online platform.^[9,10] As a result of these developments, dental students, in this era of uncertainty, are expected to be anxious over their health risks and career prospects.

Various studies have tried to assess the mental health effects of this pandemic on the students of dental profession.^[10-12] In a survey of 145 dental students, the majority of which were predoctoral students, Hung *et al.*^[10] reported students' concerns over their clinical education being adversely affected. Loch *et al.*^[11] reported that dental students had their stress levels increased fearing risk to their health in COVID-19. Concerns about the potential impact of the closure of teaching clinics on clinical competence and the inability to meet clinical requirements for registration as clinicians were also reported by final year students in this study. Agius *et al.*^[12] also reported fear of losing manual dexterity skills and anxiety over examinations by the students of various dental specialties.

Till date, however, literature is sparse over the effects this pandemic has on postgraduate dental education where the 3-year residency program has the enhancement of clinical skills and research work as the major part of the curriculum. Hence, this study was planned to assess various factors implicated in causing psychological stress in postgraduate dental students during COVID-19 pandemic and the extent of their stress perception during this period.

MATERIALS AND METHODS

This cross-sectional survey was conducted following the ethical principles enshrined in the World Medical Association's Declaration of Helsinki. This survey sought responses from postgraduate students of various dental colleges of Haryana and National Capital Region (NCR), India in September 2020. With

an 85% prevalence level of stress, 95% confidence level, and a 5% margin of error, a sample size of 195 was considered sufficient.

An online invitation was sent to 310 postgraduate students enrolled in the course "Master of Dental Surgery" in various dental specialties. The invitation was sent via an e-mail or WhatsApp messenger (WhatsApp Inc., California, United States). The message contained the details of the study, confidentiality assurance, informed consent, and the link to electronic Google Form which had the research questionnaire.

Stress analysis questionnaire used in this survey had sections of demographic and academic details, health behavior, dental environment stress (DES) factors, COVID-19-associated stress (CAS) factors, and Perceived Stress Scale (PSS) questionnaire. Health behavior included questions on sleeping habits, breakfast routine, habits of physical exercise, snacking in-between meals, taking health supplements, and alcohol and tobacco consumption habits. DES component was a 35-item questionnaire adapted and modified from the DES questionnaire,^[13,14] which is a widely used scale in the dental setting. It included five domains: self-efficacy beliefs, personal and accommodation factors, curriculum-associated factors, educational environment factors, and clinical factors. As no validated instrument to measure COVID-associated stress in dental students could be found in the existing literature, CAS element of the questionnaire was constructed to include nine questions on stress and fears specific to COVID-19 in postgraduate dental students like risks of infection to self and the family, inability to visit home, future scope, and financial implications among others. The content validity of this element of the questionnaire was checked by a panel of seven specialists and was determined to be 0.89. PSS, a scale with proven reliability and validity,^[15] was used to measure the degree of stress perception using respondents' subjective experiences of feelings and thoughts quality during the previous month.^[16]

The data were analyzed using Microsoft Excel 2007 and IBM SPSS statistics 19 (IBM Corp., New York, USA). Coding of the data was done for analytical purposes. For the calculation of mean health score, the responses "no," "sometimes" and "yes" were coded 1, 2, and 3. The negatively stated items were reverse coded and then the mean was calculated. For

DES score, the Likert responses of “not stressful” to “severely stressful” were coded 1–4. The total score of each student for all 35 questions was calculated for overall stress score and then grouped as follows ≤ 35 – not much stress; 36–70 – mild stress; 71–105 – moderate stress; and 106–140 – high stress. Similarly, the CAS score was calculated and grouped as ≤ 10 – not much stress; 11–20 – mild stress; 21–30 – moderate stress; and 31–40 – high stressed.

For PSS, the Likert responses of “never” to “very often” were coded 0–4 for negatively stated items. Positively stated items were reverse scored and finally summated to the remaining items to achieve assessment score. Scores ranging from 0 to 13 were considered low stress, 14–26 were considered moderate stress, and 27–40 were considered high perceived stress.

The primary outcome measures were DES score, CAS score, and PSS score. Bivariate associations were analyzed using an independent *t*-test. Variability based on independent variable groups – the year of study, the specialty of postgraduation, and type of accommodation – was assessed using univariate ANOVA. The correlation among DES, CAS, and PSS was calculated using Pearson moment correlation. Multiple hierarchical model (method: Enter) was used to study various study factors as potential predictors of PSS score. In general, a two-sided $P < 0.05$ was considered significant.

RESULTS

A total of 250 responses, with an overall response rate of 81%, were evaluated. Cronbach’s alpha coefficient was 0.940 for 35-item DES questionnaire, 0.888 for 9-item CAS questionnaire, and 0.755 for 10-item PSS questionnaire.

Demographic and academic details of the participants are presented in Table 1. The study sample included participants from all dental specialties and all academic years of dental postgraduation course. During their postgraduation, 31.2% of the participants stayed in their own homes; 46.4% of participants stayed in hostels, and 22.4% rented the accommodation. However, during the lockdown period, 57.2% of the participants stayed with their families.

The assessment of DES score revealed that 16.8% of the students perceived their dental environment as mildly stressful, 48.8% as moderately stressful, and

Table 1: Demographic description of the study population (n=250)

Variables	Number of participants (n=250), n (%)
Gender	
Male	88 (35.2)
Female	162 (64.8)
Year	
Year 1	81 (32.4)
Year 2	75 (30.0)
Year 3	94 (37.6)
Specialty	
Orthodontics	28 (11.2)
Prosthodontics	48 (19.2)
Conservative dentistry and endodontics	31 (12.4)
Pedodontics	40 (16.0)
Periodontics	25 (10.0)
Oral Pathology	17 (6.8)
Preventive and community dentistry	17 (6.8)
Oral and maxillofacial surgery	24 (9.6)
Oral medicine and radiology	20 (8.0)

34.4% as highly stressful. The most stressful factors were the pattern of university examinations, and synopsis, thesis and library dissertation [Figure 1]. Fear of unemployment after the course, no support from support staff for clinical work during COVID pandemic, lack of adequate infrastructure, and completing postgraduate requirements were other factors perceived as highly stressful. In general, the mean DES score was highest of self-efficacy beliefs followed by clinical factors, education environment factors, curriculum associated factors, and personal and accommodation factors. There was a significant gender difference in DES scores reported for the following domains: lack of confidence to be a successful dentist ($P = 0.001$), stress due to minimum requirements for completing postgraduation ($P = 0.006$), fear of unemployment after the course ($P = 0.005$), inadequate time for assigned work ($P = 0.048$), submission of the thesis, synopsis and library dissertation ($P = 0.040$), criticism for staff for academic/clinical work ($P = 0.008$), and politics by the faculty ($P = 0.043$). Females were more stressed than males for all the above-mentioned factors. Overall DES score, however, was not significantly influenced by gender ($P = 0.092$).

The assessment of CAS score revealed that 10.8% of the participants were mildly stressed due to COVID, 36.8% were moderately stressed, and 51.6% were severely stressed. Students were most stressed about the fear of their family members getting infected

from their environment. The second most cited reason was the fear of them getting infected from the patients [Figure 2]. Significantly more females were more concerned about inadequate clinical learning due to COVID-19 ($P = 0.012$). Overall CAS score was not significantly influenced by gender ($P = 0.074$). About 32% of the participants thought, though infrequently, of changing their career after postgraduation and

9.6% definitely wanted to change their career field after postgraduation.

PSS score was low for 12% of the participants, moderate for 69.2%, and high for 18.8%. DES, CAS, and PSS score had a significant positive correlation with each other ($P = 0.000$). Independent *t*-test determined PSS to be significantly higher in female participants ($P = 0.002$) with significantly more

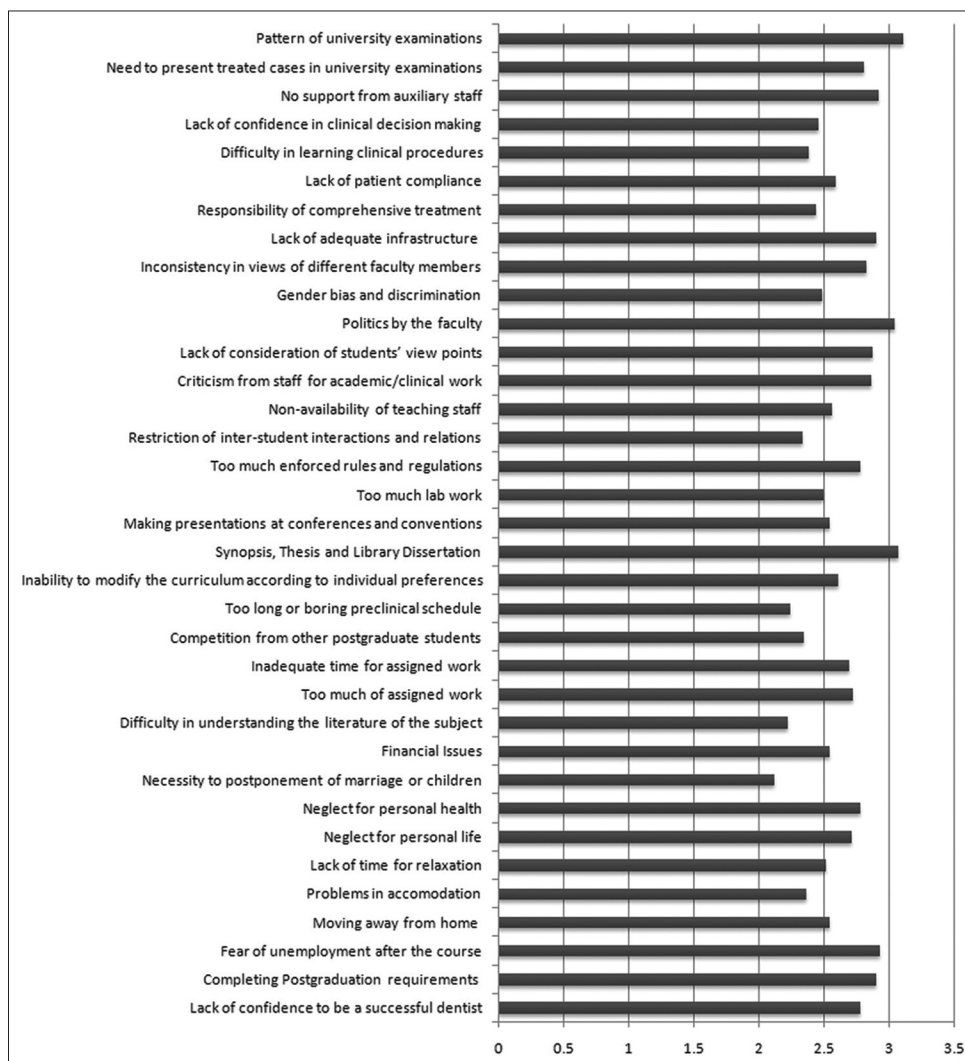


Figure 1: Mean dental environment stress score in dental postgraduate students during COVID-19 pandemic.

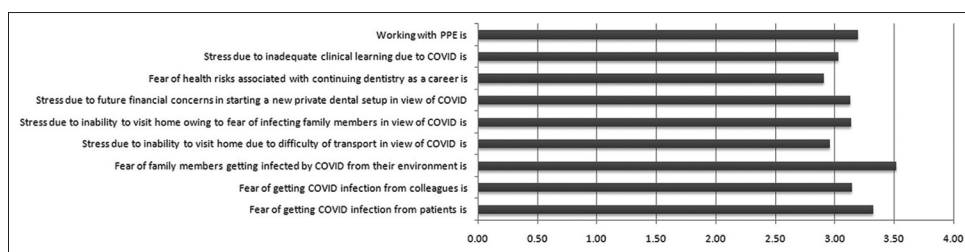


Figure 2: Mean psychological stress in dental postgraduate students attributed to various factors associated with COVID-19 pandemic.

females being upset due to unexpected things, unable to control important things in life, being nervous, and unable to cope with the things.

One-way ANOVA tests revealed that there was no statistically significant difference between DES score, CAS score, or PSS score based on year of study or dental specialty. Type of accommodation, however, had a significant influence on DES and CAS scores, with students who stayed in hostels during postgraduation reporting significantly higher DES and CAS scores than those residing in their own homes ($P = 0.002$ and 0.008 respectively). Routines of daily exercise and daily breakfast had significant negative correlations with the DES ($P < 0.005$), CAS ($P < 0.010$) as well as the PSS ($P < 0.010$). Those who spent lockdown doing personal activities such as cooking, playing games, and hobbies had significantly less DES and CAS scores. Multiple hierarchical regression model depicted that gender, mean health, and DES score were significant predictors of PSS [Table 2]. Female gender was a significant positive predictor of PSS. A high mean health score was a significant negative predictor of PSS and a high DES score was a significant positive predictor of PSS. CAS score was not a significant predictor of PSS [Table 2].

DISCUSSION

The practice of dentistry involves the generation of aerosols and exposure to salivary secretions for a

prolonged duration of time.^[17] Spread of COVID-19, therefore, is expected to produce fear of contracting the infection in the practitioners and students of this profession, predisposing them to psychological stress. This is of particular concern as stress associated with the health-care profession may be prejudicial to delivering compassionate and quality health care to the patients.^[18,19]

This study reports a high DES score in dental postgraduate students in all the domains of the DES questionnaire. This accords with evidence of increased stress in health-care workers whenever new infectious disease having the potential to pose serious health hazards and affecting their clinical practice emerges, as it was seen in case of HIV AIDS in the 1980s,^[20] and SARS outbreak in 2004.^[21] Recently published literature on the mental health effects of COVID-19 on dental health-care workers or students in various parts of the world has also reported similar findings.^[10-12,22,23]

The highest scores noticed, in this study, are for “clinical factors” and “self-efficacy beliefs” domains of DES. Owing to the fear of contracting the infection from dental operatories,^[24] and the guidelines to restrict the dental procedures to emergency and urgent ones only,^[7,8] a negligible number of patients visited the dental teaching institutions these months, depriving dental students of opportunities to hone their clinical skills, adding to their worries. Previous

Table 2: Multiple (hierarchical) regression model for Perceived Stress Scale predicted by various study factors (method: Enter)

Model	Variables	B (95% CI)	z	B	P	R ² change	F model test
1	Gender	2.846 (1.189-4.502)	0.841	0.209	0.001	0.067***	5.892***
	Specialty	0.455 (0.132-0.778)	0.164	0.172	0.006		
	Year of study	0.016 (-0.963-0.994)	0.497	0.002	0.975		
2	Gender	3.254 (1.626-4.882)	0.827	0.239	0.000	0.051***	8.168***
	Specialty	0.393 (0.076-0.709)	0.161	0.148	0.015		
	Year of study	-0.008 (-0.961-0.946)	0.484	-0.001	0.988		
	Mean health score	-5.188 (-7.913--2.462)	1.384	-0.229	0.000		
3	Gender	2.392 (0.925-3.858)	0.745	0.176	0.001	0.184***	21.116***
	Specialty	0.250 (-0.035-0.534)	0.144	0.094	0.085		
	Year of study	-0.096 (-0.947-0.754)	0.432	0.012	0.824		
	Mean health score	-3.399 (-5.867--0.930)	1.253	-0.150	0.007		
	DES score	0.123 (0.092-0.153)	0.015	0.443	0.000		
4	Gender	2.376 (0.906-3.847)	0.747	0.175	0.002	0.000	17.566***
	Specialty	0.244 (-0.042-0.530)	0.145	0.092	0.094		
	Year of study	-0.100 (-0.952-0.752)	0.433	-0.012	0.817		
	Mean health score	-3.435 (-5.914--0.957)	1.258	-0.151	0.007		
	DES score	0.116 (0.071-0.160)	0.023	0.418	0.000		
	COVID-related stress score	0.303 (-1.135-1.741)	0.730	0.034	0.678		

*** $P < 0.001$. B: Regression coefficient; DES: Dental environment stress; CI: Confidence interval; P: Significance; COVID: Coronavirus disease

studies have also reported students' concern over interruption in clinical teaching during COVID-19 pandemic.^[10-12]

Public transport services remained affected due to the pandemic. Furthermore, dental teaching institutions worked in close association with COVID care hospitals. In such a scenario, conducting practical clinical examinations was challenging. Consequently, uncertainty about the pattern of university examinations was the most stressful factor for postgraduate students during this period. This finding accords with a recent study reporting students' anxiety over changes in examination formats and platforms.^[12] Research work and thesis follow-ups were also badly affected owing to disrupted clinical work, contributing significantly to stress.

Nearing completion of their residency program and starting their independent practice, postgraduate students may be expected to be more anxious over nonproductive months of their fixed academic tenure. This may be responsible for a higher DES score in "self-efficacy beliefs" domain which included "lack of confidence to be a successful dentist," "completing postgraduation requirements," and "fear of unemployment after the course." Such lack of confidence to start with their medical practice has also been observed in medical students in United Kingdom which they attributed to contact-less patient exercises, online mode or outright cancellation of examination.^[25] Similar to medical students in China,^[26] a notable percentage of students (41.6%) in the present study also considered discontinuing dental profession after postgraduation.

The fear of unemployment after the course may have exacerbated due to the stay on new recruitments, of any kind, by the Government of India. Financial burden, owing to additional expenses on the infrastructure and equipment to be compliant with strict infection control measures during and post-COVID-19 pandemic, along with a possibility of financial regression affecting patient turnover at private clinics, might explain their worry over career prospects. More than half of the final-year dental students in New Zealand^[12] and 22.2% of students in a study in Utah, USA,^[10] were also concerned about getting employment after completion of the courses. Loch *et al.*,^[11] however, reported that only 7% of the students expressed concern over choosing dentistry as a career.

Staying away from home and fear of contracting infection in shared accommodation exacerbated the stress in dental students. Hung *et al.*^[10] also have also reported that students expressed concerns over not being able to secure housing after the pandemic shutdown. These findings point to the fact that helping in addressing the accommodation concerns can help diminish stress arising out of accommodation factors of DES.

Similar to a previous study,^[12] this study reports a significantly higher PSS score in females. This may be explained by the fact that females are generally more expressive of their negative feelings.^[27] Ahmed *et al.*,^[23] however, reported no gender differences in fear and anxiety among dental professionals amid COVID-19 pandemic. The year of the study was found to have no significant influence on stress scores, as reported by a previous study.^[12]

Further, a high mean health score was a negative predictor of DES and there was a negative correlation of exercise routine with DES, CAS, and PSS. It has earlier been reported that the front-line COVID-19 medical staff who exercised routinely had less psychological stress and better sleep status.^[28]

This was a web-based study, which usually entails the problem of coverage error.^[29] Although we tried to include all students of all specialties of dental colleges Haryana and NCR in the research invitations to overcome coverage error,^[30] chances of bias of self-selection in sampling cannot be eliminated. It is highly probable that the research topic was more relevant for those who opted to accept the invitation, as they were more affected by COVID-related stress.

The data in this study were collected at a time when the lockdown restrictions had begun to ease. The number of infected cases, however, rose steadily. This allowed the recording of the fears the students were facing while treating the patients. However, the stressors related to total lockdown might have been missed out. Moreover, this study includes dental institutions from one part of northern India. The responses may vary in other parts of the nation, affecting the generalizability of the results.

The practice of dentistry during COVID-19 pandemic requires stringent infection control measures. However, a survey conducted among dental students of India has shown that level and practice of infection control measures are unsatisfactory.^[31] Knowledge and training for infection control measures reduce

the stress in health workers.^[32,33] Utilization of strategies such as stress reappraisal interventions,^[34] or mindfulness-based cognitive behavior therapies,^[35] may also help this highly vulnerable cohort subdue stress and enable them to provide much-needed health services to the highest level of their efficiency in this time of crisis.

CONCLUSION

The present work concludes that during COVID-19 pandemic, postgraduate dental students perceived their dental college environment as a highly stressful place. Factors such as thesis submission and university examinations during uncertain times of COVID-19 pandemic and lockdown, and fear of contracting infection, were the most stressful factors cited by the postgraduate dental students.

Financial support and sponsorship

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or nonfinancial in this article.

Conflicts of interest

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