

DENTAL CARIES EXPERIENCE AND PERCEIVED STRESS AMONG UNDERGRADUATE STUDENTS IN PESHAWAR, PAKISTAN: A CROSS-SECTIONAL STUDY

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Abstract

Background: Dental caries is a frequent oral health issue in young adults and the psychological stress of undergraduate students may be associated with the academic workload, examinations, financial issues, and other stressors. Perceived stress can affect the oral health-related behaviors and possibly be related to dental caries experience.

Objective: To assess dental caries experience and perceived stress among undergraduate students in Peshawar, Pakistan.

Methods: The study design was descriptive cross-sectional study, conducted on 384 undergraduate students in Peshawar from September to December, 2024. Convenience sampling was used for the selection of participants. Perceived stress was assessed using the 10 item Perceived Stress Scale (PSS) and dental caries experience was assessed using the Decayed, Missing, and Filled Teeth (DMFT) index. Some sociodemographic and academic data were also gathered. The SPSS version 25 software was used to analyze the data by descriptive statistics such as frequency, percentage, mean, and standard deviation.

Results: Of the 384 participants, 240 (62.5%) were male and 144 (37.5%) were female. The majority of the participants were 21 years old, and enrolled in the second-year (20.8% and 40.6% respectively). The largest academic grouping was the BS Medical Laboratory Technology students (26.8%). The mean number of decayed, missing, and filled teeth was 1.83 ± 0.77 , 1.53 ± 0.62 , and 1.56 ± 0.64 , respectively. Compared to the items that participants responded to with "sometimes," there was a range of perceived stress responses in the PSS.

Conclusion: The results of the present study indicated that dental caries experience and perceived stress were noted in the study population. The results

emphasize the need for integrating oral health promotion and stress-related health education in undergraduate student health programs.

INTRODUCTION

Dental caries is a multifactorial disease of the hard tissues of the teeth. It is mainly generated from the fermentation of dietary carbohydrates by mouth bacteria which results in demineralization of the tooth enamel and the progressive destruction of the dental structure. Dental caries can lead to pain, infection and loss of teeth if it is not treated. These preventive measures include good oral hygiene, a balanced diet, and regular dental care. Dental caries is a chronic disease and has been found to be one of the most prevalent in the world in all age groups, such as young adults and university students (1)(2).

Dental caries is a problem that could affect a particular group of people: the under-graduate students, due to lifestyle changes, irregular schedules, eating habits, and academic pressures. All of these factors can lead to poor oral hygiene, an increase in consumption of sugary foods and beverages, and fewer visits to the dentist (3). Untreated dental disease can impact a student's eating, sleeping, concentration and overall health and wellness, which can ultimately impact their academic and social life (4)(5).

Perceived stress is one of the important psychological reactions to situations that people feel is difficult or out of their control. The academic stress, exams, deadlines, settling into a university, financial worries and other demands are very common among university students. Chronic and high levels of stress can impact health-related behaviors, such as eating habits, oral hygiene routines and dental service utilization. Higher levels of perceived stress have been correlated with suboptimal oral hygiene practices such as irregular brushing of teeth, increased consumption of sweet foods, and decreased attendance for routine care checkups, which can lead to increased risk for dental caries (6).

There may be behavioral and physiological pathways between stress and dental caries. Stress

can also affect dietary habits and may cause people to eat more sugary foods and drinks, resulting in greater exposure of teeth to fermentable carbohydrates and contributing to enamel demineralization (6). Poor sleep, poor self-care, smoking and other behaviors that can negatively impact oral health may also be associated with stress (7). Additionally, the flow and composition of saliva can be altered by psychological stress. A decrease in saliva production may affect the natural mouth cleansing and buffering function and changes in saliva can provide conditions that are conducive to cariogenic bacteria and dental caries (8).

Changes in oral health may also be due to physiological reactions to stress. One of the most important stress hormones, cortisol regulates immune, metabolic and inflammatory functions. Long-term stress and physiological changes can affect immune and salivary function, which in turn could impact the oral environment (9). It has therefore been investigated in previous studies whether perceived stress may be associated with dental caries and other oral health outcomes in children and young people (10) (11).

Much of the stress related to the undergraduate period comes from academic, social, financial, emotional, physical, career, and time related stressors. Academic stress could be related to examinations, deadlines, workloads and expectations for academic performance (12). Psychological stress can also be exacerbated by social and financial problems, and can impact students' overall wellness (4)(7). These triggers can have an indirect effect on oral health because of changes in daily activities and self-care.

The past research studies show that there is link between student's stress and their oral health. There has been some study of the association between dental caries and perceived or academic stress in different populations and some research on the role of dietary behavior, salivary changes,

and oral hygiene practices on this association (11)(13). In Pakistan, perceived stress in university and medical students has also been reported and therefore, it is essential to investigate perceived stress and its potential health implications in this population (14). But, the evidence is not consistent throughout populations and contexts and therefore the following research work is required among the students in the undergraduate level.

Considering perceived stress along with dental caries may be relevant information for student oral-health programs, given the high prevalence of dental caries and extensive psychological and academic demands during undergraduate years. The purpose of the present study was to evaluate the level of perceived stress and dental caries experience among the undergraduate students in Peshawar and to describe between these two factors.

Materials and Methods

Study Design and Setting

The study was descriptive, cross sectional study conducted among undergraduate students in Peshawar from September, 2024 to December, 2024. The purpose of the study was to describe dental caries experience and perceived stress among undergraduate students.

Sampling Technique

The participants were selected using a convenience sampling technique, which is a non-probability sampling method, throughout the four months of the study (September-December 2024).

Sample Size

The sample size was 384 participants. Cochran formula is used for sample size calculation. Sample size was calculated through formula at 95% confidence interval, level of significance 0.05%, anticipated population 50% and Z-score is 1.96.

Sample size formula $n = P(1-p) (z/e)^2$

n= Sample size

p= Anticipated population = 50% = 0.50

Z= confidence interval = 95% = (1.96) = (1.96)² = 3.84

$E = \text{Margin of error} = 0.05 = (E)^2 = 0.0025$

$n = \frac{0.50 (1 - 0.50) (1.96/0.05)^2}{0.0025} = n = 384$

n=384

Data Collection Instruments

The Decayed, Missing and Filled Teeth (DMFT) index (11) and the Perceived Stress Scale (PSS) (14) were used to collect data. Dental caries experience was evaluated using the DMFT index, and the perceived stress was assessed using the PSS. Sociodemographic data (age, gender) was also gathered.

Data Collection Procedure

Eligible students of the institute of health sciences, Peshawar were selected and data collection was done after getting permission from authorities. The study questionnaire was completed by the respondents by answering the questions, and the dental examination was performed to evaluate dental caries by the DMFT index.

Statistical Analysis

The data were analyzed using the program called statistical package for the social sciences (SPSS) version 25. The study variables were summarized with descriptive statistics. Means, standard deviations and percentages were computed as appropriate. The results were displayed using frequency tables and graphs.

Inclusion Criteria

The study was conducted with undergraduate students of age 18-25 years studying in Peshawar. Students were eligible if they gave informed consent and agreed to get an oral examination to assess dental caries.

Exclusion Criteria

Students with mental disorders were not included, nor those refusing to participate. There was also exclusion of students under 18 years of age and above 25 years. Medical conditions that might impact oral health or stress that might be

experienced by participants (diabetes, psychiatric illness) were excluded from the study.

Ethical Considerations

The study was conducted after obtaining ethical and administrative approval from the relevant institutional authorities. Permission for data collection was obtained from the concerned departments. All participants were informed about the study objectives and procedures, and informed consent was obtained before participation. Confidentiality and privacy of the participants were maintained throughout the study.

Results

The age of participants ranged from 18 to 25 years. The number of the participants in age group 21

years are highest 80 (20.8%) and 22 years 60 (15.6%) and 23 years 60 (15.6%). The oldest age group was 25 years, (10; 2.6%). Of the 384 participants, 240 (62.5%) were male and 144 (37.5%) were female.

When asked about year of study, the second year (156; 40.6%) had the highest number of participants followed by first-year students (75; 19.5%) and third-year students (75; 19.5%). 48 participants (12.5%) were fourth year student and 30 (7.8%) were fifth year student. The highest percentage (103; 26.8%) were from BS Medical Laboratory Technology (BS MLT), whereas the second highest was BS Anesthesia (91; 23.7%) and the third was BS Dental (83; 21.6%) when it comes to the different academic programs. BS Radiology represented 61 (15.9%), DPT 27 (7.0%), and Pharm-B 19 (4.9%) participants.

Table 1. Sociodemographic and academic characteristics of participants (n=384)

Variable	Category	n	%
Age (years)	18	36	9.4
	19	53	13.8
	20	47	12.2
	21	80	20.8
	22	60	15.6
	23	60	15.6
	24	38	9.9
	25	10	2.6
Gender	Male	240	62.5
	Female	144	37.5
Year of study	1st year	75	19.5
	2nd year	156	40.6
	3rd year	75	19.5
	4th year	48	12.5
	5th year	30	7.8
Field of study	BS Dental	83	21.6
	BS MLT	103	26.8
	BS Anesthesia	91	23.7
	BS Radiology	61	15.9
	DPT	27	7.0
	Pharm-B	19	4.9

Dental caries experiences

Means and standard deviations of the descriptive statistics of the DMFT components indicated that the mean score for the decayed teeth is 1.8281 ± 0.77267 ranging from 1 to 4. The mean number of teeth missing due to dental caries was 1.5286 ± 0.62097 ranging from 1 to 3. The mean number of filled teeth was 1.5599 ± 0.64355 , also ranging from 1 to 3.

The total sample for decayed teeth was 143 (37.2%) and 174 (45.3%) in the first and second categories respectively, making up 82.6% of the

sample. Additional 57 (14.8%) participants were in the third category and 10 (2.6%) in the fourth category. Of the 207 (53.9%) participants who were missing due to caries, 151 (39.3%) were in the second category and 26 (6.8%) were in the third category. Of the 207 (53.9%) who were missing due to caries, 151 (39.3%) were in the second category and 26 (6.8%) were in the third. When it comes to filled teeth, 201 (52.3%) participants were in the first category, 151 (39.3%) in the second, and 32 (8.3%) in the third.

Table 2. Descriptive statistics and distribution of DMFT components among participants (n=384)

DMFT component	Category	n	%	Mean $\pm$ SD	Range
Decayed teeth (D)	1	143	37.2	1.8281 ± 0.77267	1-4
	2	174	45.3		
	3	57	14.8		
	4	10	2.6		
Missing teeth due to caries (M)	1	207	53.9	1.5286 ± 0.62097	1-3
	2	151	39.3		
	3	26	6.8		
Filled teeth (F)	1	201	52.3	1.5599 ± 0.64355	1-3
	2	151	39.3		
	3	32	8.3		

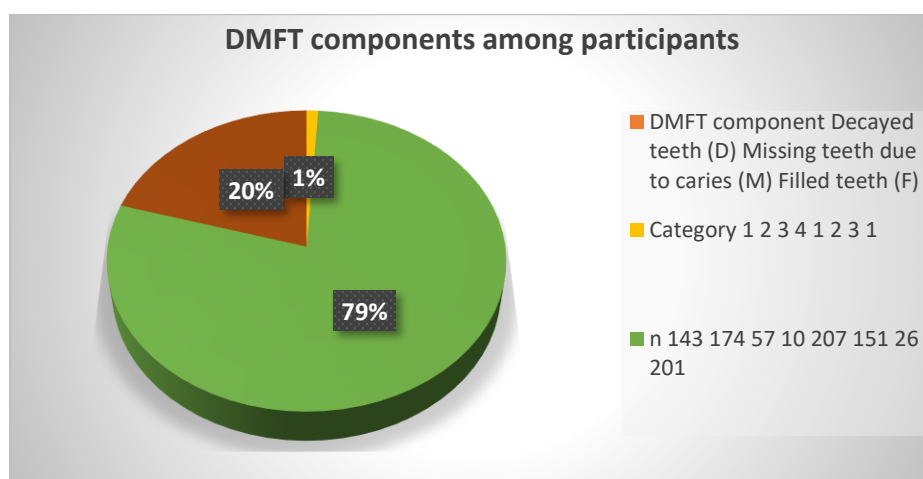


Figure 1: DMFT components among participants

Perceived Stress

Participants' answers to the ten PSS revealed differences in the frequency of which they encountered the stressful situation in the last month. Unexpected events; 49 (12.8%) participants reported that they were never upset, 113 (29.4%) reported being upset almost never. The most common response was "sometimes" (129; 33.6%), followed by "fairly often" (76; 19.8%) and "very often" (17; 4.4%). Regarding inability to control important things in life, 47 (12.2%) reported "never," 101 (26.3%) "almost never," 115 (29.9%) "sometimes," 98 (25.5%) "fairly often," and 23 (6.0%) "very often." For feeling nervous or stressed, 58 (15.1%) reported "never," 118 (30.7%) "almost never," 95 (24.7%) "sometimes," 78 (20.3%) "fairly often," and 35 (9.1%) "very often." For confidence in handling personal problems, 36 (9.4%) reported "never," 125 (32.6%) "almost never," 114 (29.7%) "sometimes," 86 (22.4%) "fairly often," and 23 (6.0%) "very often." Regarding whether things were going their way, 50 (13.0%) reported "never,"

104 (27.1%) "almost never," 110 (28.6%) "sometimes," 87 (22.7%) "fairly often," and 33 (8.6%) "very often." For inability to cope with things they had to do, 50 (13.0%) reported "never," 104 (27.1%) "almost never," 112 (29.2%) "sometimes," 91 (23.7%) "fairly often," and 27 (7.0%) "very often." Regarding control of irritations, 34 (8.9%) reported "never," 124 (32.3%) "almost never," 128 (33.3%) "sometimes," 72 (18.8%) "fairly often," and 26 (6.8%) "very often." For feeling on top of things, 39 (10.2%) reported "never," 101 (26.3%) "almost never," 106 (27.6%) "sometimes," 113 (29.4%) "fairly often," and 25 (6.5%) "very often." Regarding being angered by things outside their control, 48 (12.5%) reported "never," 107 (27.9%) "almost never," 115 (29.9%) "sometimes," 94 (24.5%) "fairly often," and 20 (5.2%) "very often." Finally, for difficulties piling up to the extent that they could not overcome them, 29 (7.6%) reported "never," 120 (31.3%) "almost never," 103 (26.8%) "sometimes," 96 (25.0%) "fairly often," and 36 (9.4%) "very often."

Table 3: Distribution of responses to the Perceived Stress Scale items (n=384)

PSS item	Never n (%)	Almost never n (%)	Sometimes n (%)	Fairly often n (%)	Very often n (%)
Upset because of something unexpected	49 (12.8)	113 (29.4)	129 (33.6)	76 (19.8)	17 (4.4)
Unable to control important things in life	47 (12.2)	101 (26.3)	115 (29.9)	98 (25.5)	23 (6.0)
Felt nervous and stressed	58 (15.1)	118 (30.7)	95 (24.7)	78 (20.3)	35 (9.1)
Confident about handling personal problems	36 (9.4)	125 (32.6)	114 (29.7)	86 (22.4)	23 (6.0)
Felt things were going your way	50 (13.0)	104 (27.1)	110 (28.6)	87 (22.7)	33 (8.6)
Unable to cope with things to do	50 (13.0)	104 (27.1)	112 (29.2)	91 (23.7)	27 (7.0)
Able to control irritations	34 (8.9)	124 (32.3)	128 (33.3)	72 (18.8)	26 (6.8)
Felt on top of things	39 (10.2)	101 (26.3)	106 (27.6)	113 (29.4)	25 (6.5)
Angered by things outside control	48 (12.5)	107 (27.9)	115 (29.9)	94 (24.5)	20 (5.2)
Difficulties piling up and becoming overwhelming	29 (7.6)	120 (31.3)	103 (26.8)	96 (25.0)	36 (9.4)

The descriptive results indicated that the respondents were mainly male and second year

students. The academic programs that were represented were largest among the BS MLT. The

distribution of the DMFT component showed that the second category (decayed teeth) was most common, while the first category (missing teeth) and the third category (filled teeth) were most common. The responses of the PSS differed between the 10 items, with “sometimes” being the most common answer for several of the items about stress.

Discussion

The present study attempted to evaluate the dental caries experience and perception of stress in 384 students of the undergraduate programs in Peshawar. The mean numbers of decayed, missing and filled teeth were 1.83, 1.53 and 1.56 respectively. The results showed that there was an experience of dental caries among the students with variation in distribution of decayed, missing and filled teeth. DMFT is a widely used indicator for dental caries experience in populations (15). The fact that both untreated and treated dentition was found in this study, demonstrates that dental caries is still a problem in young adults with higher education.

Some previous studies have reported an association between perceived stress and dental caries, but the association has been found to be inconsistent within different populations. Jain et al. found a statistically significant positive correlation between perceived stress and DMFT among pre-university students from Bangalore community (13). Likewise, academic stress has been determined a possible risk factor in dental caries among school-going children (16). Dental caries is a multifactorial disease, however, and is not solely a result of psychological stress. Other health behaviors, such as diet, oral hygiene and socioeconomic factors, also can play a role in the development of caries (17)(18). Thus, variations in the results between studies could be attributed to differences in age, educational institutions, dietary habits, oral hygiene habits, socio-economic factors and stress and dental caries measurement methods.

The results of PSS reveal that a considerable proportion of participants reported stress-related

experiences. For instance, 29.9% indicated that they sometimes felt that they were unable to control important things in their lives, and 25.5% said that this happened fairly often. Likewise, 24.7% said they sometimes were nervous or stressed, 20.3% fairly often, and 9.1% very often. The results showed that stress was a salient experience for the study population and corroborate previous studies that found that undergraduate health-professional students experience high levels of stress (14)(19). Some causes of stress among university students are academic workload, examinations, performance expectations, social situation and uncertainty about future careers. But, students coping skills and social support could affect the way students see and react to these pressures (12).

There are several behavioral and biological pathways that might account for a possible association between stress and dental caries. Stress can affect diet and oral care habits such as eating more sugary foods and paying less attention to oral care (15). A high intake of fermentable carbohydrates has been a known risk factor for dental caries (3)(17). Similarly, some studies have suggested that the association between perceived stress and self-efficacy with oral-health behaviors among dental undergraduate students (5). Therefore, stress can indirectly impact dental caries, as it can change behavior, but not cause it. Another potential pathway may be salivary function. Saliva is important in protecting oral health and studies have investigated links between perceived stress, xerostomia and salivary flow rate (2). There has also been research on salivary markers for stress and oral symptoms (20). The biological stress reaction (BSR) and its associated increase or decrease in cortisol have also been suggested as possible mechanisms that could explain the relationship between chronic stress and oral health (17). However, no measurements of salivary flow or cortisol or other biological markers were measured in the present study. Based on the current results, none of these mechanisms can be confirmed and are only considered as

potential explanation according to previous literature.

Dietary behavior is especially important in relation to the possible interaction of stress and dental caries. Previous studies have confirmed the role of diet and sugar in dental caries (3)(9)(17). Students under academic and psychological stress can be less likely to have a healthy diet as they may eat more sugary food and drink. Concurrently, personal oral hygiene habits could influence the impact of dietary exposure on caries development (5). This may account for some of the inconsistent findings of studies interested in stress and dental caries. The current study did not measure dietary intake or oral hygiene practices in detail, so it is not possible to determine how much dietary intake and detailed oral hygiene practices contributed to the observed caries experience.

Consideration of the study population must also be made when interpreting the results. The participants were undergraduate students (18–25 years) from one university and various health-related academic programs. Medical and other health-professional students have been shown to be highly stressed in previous studies (19). But the stress can differ from one academic discipline to another, one year to another, from one student to another and from one country to another. There could also be some variation between students from various health-related programs in their oral-health knowledge and practices. All of these factors could lead to variation in the assessment of stress and dental caries experience among the study population.

Limitations:

While the study shed light on the potential link between stress and oral health, it has several limitations. The cross-sectional design limits the ability to determine temporal or causal relationships between perceived stress and dental caries experience. Convenience sampling may also limit the generalizability of the findings. In addition, detailed information on dietary habits, oral hygiene practices, socioeconomic factors, and dental service utilization was not collected.

Furthermore the cross sectional nature of the study limits the ability to infer causality. Future research should consider longitudinal design to better understand the causal pathways linking stress and oral health. Intervention aimed at reducing psychological stress particularly among young adults may have a beneficial impact on oral health outcome.

Significance of the Study

This study offers locally relevant information on the dental caries experience and perceived stress of the undergraduate students of Peshawar. The results can be useful in identifying the importance of incorporating oral health promotion and stress related health education into school health initiatives. The study also serves as a foundation to future studies on the association between stress and dental caries, taking into account the other factors, like diet, oral hygiene and dental care.

Conclusion

The study identified dental caries experience and varying responses to perceived stress among undergraduate students. The findings highlight the potential relevance of integrating oral health promotion and stress-related health education within student health programs.

Recommendations:

Investigate the biological mechanisms underlying stress-induced oral health changes, including hormonal influences (e.g., cortisol levels) and salivary composition alterations. Conduct longitudinal studies to better understand the causal relationships between stress and dental caries. This would help identify the long-term effects of stress on oral health and provide insights into changes over time. The 2nd recommendation would be like to expand research to include more diverse populations beyond undergraduate students to understand the broader applicability of findings. This can involve various age groups, socioeconomic backgrounds, and geographical locations. Conduct deeper analyses of gender-specific differences in stress responses and their

impact on oral health, as hormonal and behavioral responses to stress can vary significantly between males and females.

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