

## Psychological Stress and Its Relation with Oral Health Status among Tobacco Users and Non-users

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### Abstract:

**Background:** The objective of the study was to assess the relationship between psychological stress and its relation with oral health among tobacco user and non-user.

**Materials and Methods:** A hospital based study was conducted for 3 months among 1184 subjects visiting the outpatient department of Vyas Hospital in India. After obtaining institutional ethical clearance, a pretested proforma was used for data collection. Informed consent was taken from study subjects. Stress was measured by using modified Dental Anxiety Stress Scale (DASS). Frequency, percentage, and multinomial logistic regression analysis were performed using SPSS (version 16.0, Chicago, IL, USA). The level of significance was set at  $P \leq 0.05$ .

**Results:** Subjects, who were having low income (28%) and low education (18.2%) status, were under high psychological stress as compared to other groups. It was also found that as the stress level was increasing dental caries (82.4%), gingival inflammation (88.4%), and periodontal disease (88.4%) were also increasing. From multiple logistic regression model, it was found that age, gender, income, and psychological stress had a significant effect on periodontal status and dental caries status among tobacco users.

**Conclusion:** Stressful life events are often presumed to be associated with dental disease progression hence it is important for clinician to recognize patients who are in stress and guide them about detrimental effects of stress on oral health along with routine dental treatment.

**Key Words:** Dental caries, periodontal, smokers, stress, tobacco user

### Introduction

Over the past 40 years of research in dentistry, it has grown significantly, with relatively new disciplines such as social epidemiology and psychophysiology devoted to the investigation of the links among the social environment, psychological and emotional states, and physiological change and disease.<sup>1</sup>

As health is considered to be a multidimensional whereas, diseases are multifactorial in nature. They cannot be adequately conceptualized within the pathogenic paradigm of diseases. The "Salutogenic model" by Antonovsky stresses the psychosocial determinants of health and disease process.<sup>2</sup>

In past 30 years, statistics shows that the dentists achieved 70% reduction in dental caries, and on the other hand also shows improvement in the treatment and prevention of gingivitis and periodontitis through the use of fluoride and patient's oral health education for good oral hygiene. Dentistry has advanced beyond the basic dental care through, cosmetic dentistry and as well as dental implants.<sup>3</sup> Stress is related to many dental problems. Teeth, gingiva, and other oral structures may be affected by stress in many ways.<sup>3</sup>

Stress has been defined in general as the need to make a behavioral adjustment to environmental changes. It can also be defined as adaptive response of an organism to a threatening stimulus, which provides the link between the psychological and physiological processes that are associated in the onset of the disease.<sup>4</sup>

It is markedly seen that general stressors affect general as well as oral health. In recent decades, stress and stressors have emerged as variables of considerable interest in the examination of health and disease.<sup>5</sup>

Diverse measures of distress, such as financial strain, anxiety, stress, and depression, were found to be significant risk indicators for periodontal disease.<sup>6,7</sup> Perceived stress and stressful experiences were found to be related to higher caries experience.<sup>8</sup> Recent studies have also addressed the relationship between psychological distress and skeletal status, demonstrating an interaction among behavioral responses, the brain, and the skeleton, and portraying depression as a significant risk factor for low bone mineral density.<sup>9</sup>

The aim of the study was to assess the relationship between psychological stress determinants with dental diseases and tobacco use.

## Materials and Methods

### Study design

The present study was a hospital based study with cross-sectional design conducted over a period of 1-month on the subjects visiting the outpatient department (OPD) of Vyas Dental College and Hospital, Jodhpur. This institution is the multispecialty dental hospital catering to a wide population in and around Jodhpur city. Ethical clearance for the study was obtained from the Institutional Ethical Committee.

### Sample selection and data collection

The sample was selected from the patients visiting the OPD of the hospital in the month of November 2014. A total of 1471 patients came to the OPD of the hospital, out of which 1184 patients were included in the study. Those patients who did not agree to be interviewed or gave incomplete information were excluded. The purpose of the study was explained to each participant, and their written informed consent was obtained. The trainer was standardized with the procedure and calibrated in the Department of Public Health Dentistry prior to the study. The examiner was trained and calibrated by carrying out the examination on the pre-selected subjects twice at the interval of 30 min. A slight change in the dental status was expected during re-examination. The intra examiner reliability was found to be kappa value 0.85.

A pretested proforma was used for data collection. The proforma included sections addressing socio-demographic characteristics of the patient, questions related to psychological stress, smoking habits, and dental diseases status including dental caries, gingivitis, and periodontitis.

Stress was measured by using modified Dental Anxiety Stress Scale questionnaire with a given score level, which divides stress into low, moderate and severe stress. The various parameters were used to analyze stress according to gender and socioeconomic status. The patients were divided into four age groups ranging from 15 to 30 years, 31 to 50 years, 51 to 70 years, and 71 years and above.

### Statistical analysis

The Statistical Package for the Social Sciences (SPSS version 20, SPSS Inc., Chicago, IL, USA) and Microsoft Office Excel 2007 were used for data processing and analysis. Variables were described using frequency and percentage distribution. Multinomial logistic regression analysis was performed to assess the association between independent variables and dental diseases status.  $P \leq 0.05$  is set to be significant.

## Results

The total study subjects consisted of 1184. In Table 1, it was observed that more number of study subjects who were under

high stress falls in the age group of 15-30 years (18.1%) as compared to other age groups. Among gender, males (59.5%) were having more stress as compared to females. Among religion, Hindus were more affected with high psychological stress (33.6%) as compared to Muslims and Sikhs.

Table 2 showed the distribution of study subjects according to income and education status. It was found that those subjects who were having low income (28%) and low education (18.2%) status were under high psychological stress as compared to other groups.

Table 3 showed that most of the study subjects who were under high psychological stress were having the habit of tobacco use (59.5%).

Table 4 was showing the relation between psychological stress and dental diseases status. It was found that as the stress level was increasing dental caries (82.4%), gingival inflammation (88.4%), and periodontal disease (88.4%) were also increasing.

A multiple logistic regression model was applied for independent variables effect on the periodontal status of

**Table 1: Distribution of study subjects having different levels of stress according to age, gender and religion.**

Variables	n (%)		
	Low stress	Moderate stress	High stress
Age (years)			
15-30	144 (12.2)	71 (6)	214 (18.1)
31-50	120 (10.1)	175 (14.8)	135 (11.4)
51-70	59 (5)	141 (11.9)	75 (6.3)
70 and above	15 (1.3)	15 (1.3)	20 (1.7)
Gender			
Male	208 (17.6)	203 (17.1)	294 (24.8)
Female	130 (11)	199 (16.8)	150 (12.7)
Religion			
Hindu	300 (25.3)	371 (31.3)	398 (33.6)
Muslim	38 (3.2)	31 (2.6)	45 (3.8)
Sikh	0 (0)	0 (0)	1 (0.1)

n: Number of patients in a particular category

**Table 2: Distribution of study subjects having different levels of stress according to socioeconomic status.**

Variables	n (%)		
	Low stress	Moderate stress	High stress
Income			
Below Rs 5000	25 (2.1)	27 (2.3)	27 (2.3)
Rs 5001-15000	246 (20.8)	292 (24.7)	332 (28)
Rs 15001-30000	63 (5.3)	79 (6.7)	80 (6.8)
Rs 30001-45000	4 (0.3)	4 (0.3)	2 (0.2)
Rs 45001 and above	0 (0)	0 (0)	3 (0.3)
Education			
Illiterate	9 (0.8)	11 (0.9)	8 (0.7)
Primary	158 (13.3)	203 (17.1)	216 (18.2)
High school	130 (11)	152 (12.8)	183 (15.5)
Graduate	33 (2.8)	31 (2.6)	30 (2.6)
Post graduate	8 (0.7)	5 (0.4)	7 (0.6)

n: Number of patients in a particular category

smokers in Table 5. The four variables that reached statistical significance as predictors of periodontal disease status were age, gender, income, and psychological stress ( $P = 0.000, S$ ).

A multiple logistic regression model was applied for independent variables effect on dental caries status of smokers in Table 6. The four variables that reached statistical significance as predictors of dental caries status were age, gender, income, education, and psychological stress ( $P = 0.000, S$ ).

In Table 7, a multiple logistic regression model was applied for independent variables effect on periodontal status among tobacco chewers. The four variables that reached statistical

significance as predictors of periodontal disease status were income and psychological stress ( $P = 0.000, S$ ).

In Table 8, multiple logistic regression model was applied for independent variables effect on dental caries status among tobacco chewers. The four variables that reached statistical significance as predictors of dental caries status were age, income, education, and psychological stress ( $P = 0.000, S$ ).

**Discussion**

The present study analyzed the data collected among the study subjects who were from Jodhpur city and attending the OPD of Vyas Dental College and hospital and was conducted first time in this city. The results of the present study have offered us a unique opportunity to determine the associations between changing dental and periodontal health status among study subjects who were having mild, moderate, or severe psychological stress.

In the present study, it was found that level of stress was higher among younger and middle age group males as compared to older study subjects the reason might be the day-to-day work load to earn livelihood.

Our finding shows that those who were having low socioeconomic status were under high stress as compared to others and the most possible explanation for such finding

**Table 3: Distribution of study subjects having different levels of stress according to tobacco use.**

Variables	n (%)		
	Low stress	Moderate stress	High stress
User	192 (16.2)	256 (21.6)	257 (21.7)
Non user	146 (12.3)	146 (12.3)	187 (15.8)

n: Number of patients in a particular category

**Table 4: Distribution of study subjects having different levels of stress according to dental diseases.**

Variables	n (%)		
	Low stress	Moderate stress	High stress
Dental caries status			
Present	195 (16.5)	337 (28.5)	444 (37.5)
Absent	143 (12.1)	65 (5.5)	0 (0)
CPI			
Healthy	86 (7.3)	51 (4.3)	0 (0)
Bleeding	40 (3.4)	31 (2.6)	0 (0)
Calculus	212 (17.9)	174 (14.7)	17 (1.4)
Pocket 4-5 mm	0 (0)	146 (12.3)	335 (28.3)
Pocket 6 mm or more	0 (0)	0 (0)	92 (7.8)
LOA			
0-3 mm	121 (10.4)	156 (13.4)	177 (15.2)
4-5 mm CEJ within black band	170 (14.6)	192 (16.5)	214 (18.4)
6-8 mm (CEJ between upper limit of black band and 8.5 mm ring )	40 (3.4)	39 (3.4)	39 (3.4)
Gingival status			
Mild	86 (7.3)	122 (10.3)	136 (11.5)
Moderate	40 (3.4)	49 (4.1)	47 (4)
Severe	212 (17.9)	231 (19.5)	261 (22)

n: Number of patients in a particular category, CEJ: Cement enamel junction

**Table 5: Multiple logistic regression model for independent variables effect on periodontal of smokers.**

Variable	OR	95% CI	P value	Significance
Age	1.8	1.2-2.5	0.000	S
Gender	0.47	0.32-0.96	0.000	S
Education	5.83	3.74-6.48	0.998	NS
Income	1.8	1.2-2.4	0.000	S
Psychological stress	5.3	3.6-7.7	0.000	S

$P \leq 0.05$  - Significant, CI=95%, OR: Odds ratio, CI: Confidence interval

**Table 6: Multiple logistic regression model for independent variables effect on dental caries status of smokers.**

Variable	OR	95% CI	P value	Significance
Age	10.3	2.9-11.1	0.000	S
Gender	0.46	0.32-0.67	0.000	S
Education	7.7	7.0-8.4	0.000	S
Income	1.8	1.2-2.4	0.000	S
Psychological stress	11.8	8.0-17.2	0.000	S

$P \leq 0.05$  - Significant, CI=95%, OR: Odds ratio, CI: Confidence interval

**Table 7: Multiple logistic regression model for independent variables effect on periodontal of tobacco chewers.**

Variable	OR	95% CI	P value	Significance
Age	1.7	0.15-2.7	0.679	NS
Gender	0.41	0.14-1.2	0.100	NS
Education	2.5	1.2-3.4	0.189	NS
Income	4.9	4.1-5.8	0.000	S
Psychological stress	11.4	4-32	0.000	S

$P \leq 0.05$  - Significant, CI=95%, OR: Odds ratio, CI: Confidence interval

**Table 8: Multiple logistic regression model for independent variables effect on dental caries status of tobacco chewers.**

Variable	OR	95% CI	P value	Significance
Age	3.2	1.2-5.1	0.000	S
Gender	0.67	0.32-1.3	0.288	NS
Education	1.8	1.2-2.7	0.000	S
Income	1.8	1.2-2.4	0.000	S
Psychological stress	4.7	1.8-9.3	0.000	S

$P \leq 0.05$  - Significant, CI=95%, OR: Odds ratio, CI: Confidence interval

would be the needs and demands of the society as well as family. Although the physical and social environments in which we work can have a negative effect on health, so can low socioeconomic status. There are two main reasons why low socioeconomic status affects the health. First, the reason is standard of living and the conditions of life, and second is a stressful event when become chronic then it deprives an individual from the social role and contact with others.

Another interesting finding of the study was that those study subjects who were smoking were under a high level of stress as compared to non-tobacco users. According to Kouvonen *et al.*<sup>10</sup> and Cox *et al.*,<sup>11</sup> the exposure to psychological stress has been linked to an wide array of unhealthy behaviors such as physical inactivity, excessive drinking and smoking, poor diet and sleep, and similar findings were also present in our present study.

Our finding that psychological stress is one of the most psychosocial factors related to dental caries and periodontal status and then the habit of tobacco smoking and chewing is correlated. Dissimilarly, other studies, conducted by Finlayson *et al.*<sup>12</sup> and Ide *et al.*<sup>13</sup> have demonstrated that stress was not associated with dental caries at all. An interesting finding in the present study was that among tobacco users the dental diseases were progressing reasons being not only the habit but also the psychological stress which has an additive effect. As tobacco use leads to xerostomia and which further leads to dental caries and periodontal destruction susceptibility.

Several plausible explanations have been given for the associations between psychological stress and oral health specifically periodontal health. A direct pathophysiological impact has been seen on host resistance which will further be affecting the immune system. Salivary cortisol levels were found to be higher among people exhibiting severe periodontitis with high levels of stress, according to Genco *et al.*<sup>6</sup> Between the extent and severity of periodontitis close relationships were noticed and salivary levels of stress related hormones cortisol and dehydroepiandrosterone have been demonstrated Ishisaka *et al.*<sup>14</sup>

The second most common explanation that has been offered is the behavioral mechanism. Stress arises when there will be insufficient or inadequate coping resources undermine the capacity for maintaining healthy behavior and thereby may exacerbate lifestyles known to potentiate periodontal disease, such as neglect of oral hygiene and increase in smoking Sander *et al.*<sup>15</sup> Similar findings were also found in our present study that as stress level was increasing periodontal disease was also increasing.

Conceivable explanations for the association between psychological stress and dental caries might involve the intermediary role of salivary flow and composition. Saliva

has been clearly implicated as independently related to both psychological stress and dental caries. The possible association between psychological stress and dietary practices, which has been noted in the literature, should be addressed. Gender, income, and education were also found to be the indicators of changing oral health levels in the present study population, but dissimilar results were reported by Vered *et al.*<sup>16</sup>

### Conclusion

Stressful life events are often presumed to be associated with disease progression hence it is important to recognize patients who are in stress and guide them about detrimental effects of stress on general as well as oral health of patient.

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