

## Original Article

## A Mirror Reflection of Psychological Stress on Periodontal Status: A Clinicobiochemical Study

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### Abstract

**Background:** Periodontitis is defined as infection and inflammation of the tissues that support the teeth. Greater number of evidence proposes that the psychosocial aspects such as stress, despair, depression, and extent of social support aggravate changes in host defense mechanisms that alter the disease process. **Aims:** This study is aimed to identify the correlation present between social stress, social support and periodontal health status of persons. **Materials and Methods:** A prospective cross-sectional study was done on 660 subjects (age range 20-70 years) with complain of chronic periodontitis. Questionnaire was used as a primary tool for collection of data. Plaque index and clinical attachment level were used to assess the oral hygiene status and periodontal status. **Results:** Analysis of the collected data was done by using statistical software Statistical Package for the Social Sciences (SPSS) version 17.0. A significant correlation was seen between psychological stress, unsecured job, economic problems and periodontitis. **Conclusion:** Stress is a significant risk factor for causing periodontal problems and has an aggravated effect in presence of plaque on the periodontal status. Through this study we recommend that patients who are suffering from stress should be given proper periodontal care to evade deterioration of periodontal disease.

**Keywords:** Periodontitis, plaque, psychological stress

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### INTRODUCTION

Stress is human body's natural mechanism to retort to a stressor. Undesirable life events expressed as psychological stress and depression are commonly seen in day-to-day life, highlighting the association between the individual and environment. <sup>[1]</sup>Stress is believed to affect the host defenses, applying an immunosuppressive effect, growing one's vulnerability to disease. <sup>[2-4]</sup> Cytokines and additional humoral mediators of inflammation are strong activators of central stress response. <sup>[5-6]</sup>When the inflammatory act is amply long and

profound, the systemic indicators of the disease may become marked, as could happen with periodontitis. <sup>[7]</sup>Studies have established the significance of subjective elements in oral infections such as stress <sup>[8-10]</sup> and also the prominence of psychological instabilities on the progression of periodontitis <sup>[11-12]</sup> and its treatment response. <sup>[13]</sup>Hence, factors linked to the social and environment may aggravate changes in the host defenses and transform health behavior. <sup>[7]</sup> The basic logic behind the association of these factors with the increase in the periodontal disease

predisposition is poorly understood and traced at this stage<sup>[14]</sup>

Hence, an attempt was made in this present study to evaluate the effects of psychological stress on the periodontal status of individuals from various stages of life.

## MATERIAL AND METHOD

A cross-sectional study was carried out by including a sample magnitude of 660 patients, to evaluate the impact of stress on the periodontal health of personalities with varying age groups.

The study traversed over a period of 3 years. All the participating individuals were explained about the nature of study and their valuable consensus were taken before commencing the study. The detailed ethical approval was obtained from Institutional Ethical Committee prior to the initiation of the study.

All individuals filled a general questionnaire for assessment of demographic variables, socioeconomic status, cigarette smoking, health history, and health issues.

A pilot study was conducted comprising a sample size of 30 subjects. The two pretested questionnaires were utilized as tools for data collection to perceive the attitude and view toward the day-to-day stress faced by subjects. The reevaluation to assess reproducibility "during the study" was done 2 hour after the preliminary examination of the patient was done. The questionnaire was revised and improved on the understanding of the pilot study and was utilized for the final study.

Patients were provided with the questionnaire to be completed by them prior to their clinical assessment. Two type of questionnaires were finally used, Multidimensional Scale of Perceived Social Support (MSPSS) scale and Center for Epidemiologic Studies Depression (CESD) scale, for calculating stressors along with changes, noteworthy life event, and stress responses including affective and psychological reactions. The individuals were divided into two subgroups

(happy/satisfied and unhappy/unsatisfied) after the scoring and evaluation is done on the basis of the questionnaire.

Two independent examiners were selected for performing the clinical examinations. These two clinicians were completely blinded to the results of questionnaire in order to evade bias in the clinical findings.

The values of probing pocket depth in addition to clinical attachment level were obtained and documented to the nearest millimeter, using William's periodontal probe at six sites per tooth.. The individuals having at least 4 teeth with probing depth  $\geq 4$  mm along with CAL  $\geq 3$  mm at six sites per tooth, were diagnosed to be suffering from chronic localized periodontitis.<sup>[13]</sup> The Sillness and Loe plaque index(1964) was used to assess the plaque.<sup>[15]</sup>

### Inclusion criteria

Patients who satisfied the following criteria were involved in the study:

1. Patients with age group of 20-70 years and
2. Patients with at least 20 teeth present in the mouth.

### Exclusion criteria

1. Patients with diabetes.
2. Chronic smoker patients.
3. Patients who were undergoing immunosuppressive drug therapy.
4. Patients with depressed immunity.
5. Persons who had taken periodontal treatment within 6 months prior to the examination.
6. Patients who were on chroniccorticosteroid drugs

Initially seven hundred and eighty patients joined the study, out of which 696 patients only completed the questionnaire. Though, only 684 patients succeeded to complete both the sets of the study (i.e. clinical evaluation and questionnaire). During the analysis of data, patients were further divided into 3 groups of 20-40 years, 41-59 years and 60-70 years(formed for evaluation of psychological stress), the groups were having an

uneven number. In order to keep ease in the process of statistical analysis, equal number of patients are kept in every group, hence only 660 patients were finally involved in the statistical analysis.

These 660 patients were again subdivided into 2 groups –

1. Group 1 (happy/satisfied/employed) and,
2. Group 2 (unhappy/unsatisfied/unemployed)-on the basis of questionnaire results.

Group 1 consisted of 330 patients, who were divided in 3 subgroups: 1-A (110 patients, 20-40 years, happy/satisfied/employed), 1-B (110 patients, 41-59 years, happy/satisfied/employed), 1-C (110 patients, 60-70 years, happy/satisfied and living with children).

Group 2 consisted of 330 patients, who were divided in 3 subgroups-2-A (110 patients, 20-40 years, unhappy/unsatisfied/unemployed), 2-B (110 patients, 41-59 years, unhappy/unsatisfied/unemployed), 2-C (110 patients, 60-70 years, unhappy/unsatisfied and not living with children.)

### Statistical analysis

Descriptive and inferential methods were included in the statistical analysis. The complete analysis of the data was done using statistical programming software Statistical Package for the Social Sciences (SPSS) version 17.0 (SPSS-Inc., Chicago, US). The major characteristics and main features of the collected sample data was analyzed by the Descriptive statistical analysis. Categorical measurements of results were presented in numbers (%).

The significance of mean differences in plaque index was identified by using One-way analysis of variance (ANOVA), also, CESD scale and MSPSS

scale scores were used to measure the psychological stress among subgroups (1A, 2A, 1B, 2B, 1C, and 2C). The probability value  $P < 0.001$  was considered to be highly significant while  $P < 0.05$  was considered to be highly significant.

### RESULTS

All the subjects were of varying age ranging between 20 to 70 years.  $49.48 \pm 14.38$  years is the mean age obtained for subjects (N=660). The analysis of plaque index revealed a mean plaque index of  $1.20 \pm 0.65$  for all subjects. The spread of mean stress among all the subjects was  $60.78 \pm 16.50$  as shown by CESD scale while it is  $46.82 \pm 25.35$  as shown by MSPSS scale.

### DISCUSSION

The prime motive of conducting this study was to determine the association between periodontal status and psychological stress. Therefore, the study groups were categorized in such a way that the age factor was considered as a prime criteria as different age groups have different types of stressors. For youngsters, friends and environment create major part of happiness, whereas middle aged people receive satisfaction from a sound source of money and job security, at the same time elderly individuals get happiness from their strong bond with their children and grandchildren. Thus, the groups were made on the basis of human psychology of a person at a certain age, and the further subgrouping was done keeping in mind different types of stressors commonly faced by various age groups. The periodontal health status was assessed by clinicians blinded to this grouping so as to eradicate the bias.

**Table 1:** Distribution of Plaque Index

Plaque index	Category	20-40 years (N=110)		41-59 years (N=110)		60-70 years (N=110)	
		1A	2A	1B	2B	1C	2C
0.1-0.9	Good	104 (95.2)	17(16.3)	98(88.7)	0 (0.0)	0 (0.0)	0 (0.0)
1.0-1.9	Fair	6 (4.8)	93(83.7)	12(11.3)	9 (8.6)	89 (80.9)	7 (6.7)
2.0-2.9	Poor	0 (0.0)	0 (0.0)	0 (0.0)	101 (91.4)	21 (19.1)	103 (93.3)

**Table 2:** Distribution of Periodontitis

Periodontitis	20-40 years (N=110)		41-59 years (N=110)		60-70 years (N=110)	
	1A	2A	1B	2B	1C	2C
Good	106 (96.3)	15(13.6)	100(90.9)	0 (0.0)	0 (0.0)	0 (0.0)
Fair	4 (3.7)	95(86.4)	10(9.1)	5(4.6)	91(82.7)	8 ( 7.3)
Poor	0 (0.0)	0 (0.0)	0 (0.0)	105 (95.4)	19 (17.3)	102(92.7)

**Table 3:** Comparison of Mean Plaque Index, CESD, and MSPSS Scale Scores among Subgroups

Variable and age group		Specified subgroup	Group (N=8)	Spread Mean + SD	95% CI for mean	
					LB	UB
Plaque index	20-40 years	Happy/satisfied/employed	1A	0.31±0.23	0.25	0.34
		Unhappy/unsatisfied/unemployed	2A	1.16±0.38	1.07	1.25
	41-59 years	Happy/satisfied/employed	1B	0.41±0.26	0.33	0.48
		Unhappy/unsatisfied/unemployed	2B	2.22±0.35	2.14	2.27
	60-70 years	Happy/satisfied/living with children	1C	1.50±0.49	1.40	1.57
		Unhappy/unsatisfied/not living with children	2C	2.25±0.34	2.16	2.30
One way ANOVA (F=554.48 , P,0.001 highly significant)						
CESD scale score	20-40 years	Happy/satisfied/employed	1A	46.43±3.48	44.75	47.09
		Unhappy/unsatisfied/unemployed	2A	78.57±8.35	76.94	80.14
	41-59 years	Happy/satisfied/employed	1B	46.22±3.34	45.52	46.84
		Unhappy/unsatisfied/unemployed	2B	80.15±6.11	78.91	81.38
	60-70 years	Happy/satisfied/living with children	1C	46.55±4.81	45.63	47.48
		Unhappy/unsatisfied/not living with children	2C	79.29±7.72	77.77	80.79
One way ANOVA (F=964.78 , P,0.001 highly significant)						
MSPSS scale score	20-40 years	Happy/satisfied/employed	1A	71.68±9.88	69.74	73.54
		Unhappy/unsatisfied/unemployed	2A	28.57±11.21	26.47	30.78
	41-59 years	Happy/satisfied/employed	1B	68.09±12.26	65.74	70.46
		Unhappy/unsatisfied/unemployed	2B	25.47±9.32	23.62	27.24
	60-70 years	Happy/satisfied/living with children	1C	72.70±8.58	71.03	74.35
		Unhappy/unsatisfied/not living with children	2C	26.40±10.04	24.43	28.35
One way ANOVA (F= 576.87 , P,0.001 highly significant)						

The plaque index assessments shows good outcomes in group 1A [20-40 years, employed/happy (95.2%)] followed by group 1B [41-59 years, employed/satisfied/ happy (88.7%)], and the index was reasonable in groups 2A [20-40 years, unemployed/ unhappy (83.7%)] and 1C [60-70 years, living with children/grandchildren (80.9%)], whereas the index was below average in groups 2B [41-59 years, unemployed/unsatisfied/ unhappy (91.4%)] and 2C [60-70 years, not living with children/grandchildren (93.3%)] [Table 1].

The above outcomes depict that the elderly individuals who did not stay with their children or grand children or are unsatisfied/unhappy were found more prone to develop plaque. This result is in harmony with that of Deinzer *et al*<sup>[16]</sup> who concluded that when plaque and psychological stress are present together, periodontal health status is worsen by the effect of stress as there is an increase in the concentration of interleukin (IL)-1 $\beta$ , which in turn activates the osteoclasts and inhibits the bone formation. These effect are even exaggerated when oral hygiene was neglected.

Studies have also found that if an individual is first exposed to stress factor and then the oral hygiene is not maintained then the stress continuously alter the immunological efficacy of immune system against microbial challenges to the periodontium.<sup>[17]</sup> Researches have shown that the

adrenaline and nonadrenaline released during stress period alter the composition of subgingival biofilm due to the stress influenced changes in the level of catecholamine and ultimately it plays an important role in the pathogenesis and etiology of periodontal diseases. It has also been found that the stress induced alterations occur in the localized immune response against *Porphyromonas gingivalis* pathogen which is usually associated with the link between stress and periodontal disease. On assessing the periodontal health status [Table 2], it was found that individuals in 1A group who were happy/satisfied/employed had mild periodontitis. Whereas moderate periodontitis was seen in individuals in groups 2A (20-40 years, unemployed/unhappy) and 1C (60-70 years, living with grandchildren/children), at the same time

severe periodontitis was seen in groups 2C (60-70 years, not living with grandchildren/children) and 2B (41-59 years, unemployed/unhappy). This seemed to be in accordance with DeMarco *et al.* who suggested that in patients suffering from periodontal emotional stress syndrome (PESS); psychological stress and emotional stability should be evaluated carefully as this syndrome widely manifest with severe vertical and horizontal bone loss.<sup>[18]</sup> Genco *et al.* also suggested that monetary strain is related with greater amount of attachment and alveolar bone loss. It was also seen in research that immune reaction is greatly suppressed by which results in severe periodontics. Chronic stressors also accelerate the hazard of age-related diseases by advanced aging of the immune response.<sup>[19]</sup>

On assessment of association between stress and plaque index, the resultant scores showed that plaque status of individuals is dependent on their psychological status.

One way ANOVA also depicted that the means difference in all categories; 1A, 1B, 1C, 2A, 2B, 2C was highly significant ( $P < 0.001$ ) as shown statistically. The stress scores and mean plaque index values for the individuals who were happy/satisfied/employed were significantly different from those who were unhappy/unsatisfied/unemployed and not living with their children.

These findings highlight the role of social support required for an individual to lead a less stressed lifestyle. Therefore it is scientifically proved that as man is a social animal, those with a healthy social support will be less stressed over life as compared to those with less or no social support, will be more stressed even for minor issues.

## CONCLUSION

To conclude, it can be rightly said that stress plays a significantly role in maintenance of oral hygiene status and negligence of oral health is done under increased level of psychological stress thus promoting increased plaque accumulation and amplified number of *P. gingivalis* growth, which act as the primary pathogen for development of periodontitis. Thus, through this study, we propose that psychoanalysis must be an essential part of case history, and as it is seen that in stressed periodontal patients the treatment therapy is usually not much effective, as stress makes the

individual resistant to therapy, therefore, in such patients motivation and guidelines for maintenance of oral hygiene must be given with utmost importance.

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