Impact of Life Events on Periodontal Health : A Longitudinal Randomized Controlled Trial

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Abstract

Now days, it has been found that a cluster of social events requiring change in ongoing life adjustment are significantly associated with many periodontal diseases. Similarly, the relationship of what has been called 'life stress,' 'emotional stress,' 'object loss,' etc. and periodontal onset has been demonstrated and is one the main reasons for periodontal diseases. It has been confirmed from studies that this clustering of social or life events achieves etiologic significance as a necessary but not sufficient cause of periodontal disease and accounts in part for the time of onset of disease.

Aim: To study association between physiological stress (life stress, emotional stress etc.) and periodontitis.

Material and Method: A longitudinal descriptive study by a questionnaire trial was done on 1020 individuals between the age group 20-60 years, during the 3 years of study period. 30 - 40 questions of daily life events were taken as general factors responsible for stress. Gingival and periodontal parameters were recorded and evaluated. Impact of a particular life event was graded according to the Holmes & Rahe stress scale. Findings were recorded and later statistically evaluated to find association with periodontal health of individuals.

Result: The frequency distribution method was used in this study. Values were assessed in percentage. On this basis of index interpretation diseased group were 45 % (459) and non-diseased were 55% (561). Total negative scores were 73.3% and positive were 26.5%. Values of different age individuals in diseased group; 20-30 years (38.12%), 31-40 years (11.98%), 41-50 years (32.67%) and 51-60 years (17.21%). Negative value percentage in different age variables; 20-30 years (37.8 %), 31-40 years (18.9%), 41-50 years (24.3%) and 51-60 years (21.6%).

Effect of different variables and there negative impact was evaluated; marital reconciliation (59.5 % diseased , 85.7% Negative), change in number of arguments with spouses (69.9% diseased, 80.77% negative), loan over rupees 100000(55.55% diseased , 66.66% negative), change in work hour or conditions (59.9% diseased , 70% negative), change in recreational habits(79.5% diseased , 76.3% negative), change in sleeping habits (64.9% diseased ,78.6%) etc.

Conclusion: Although there are many other risk factors responsible for onset of periodonitis, but stress is most important among all. Many studies in past have concluded a strong association between stress and periodontitis at different age levels, relationship between stress and host defense mechanism.

Introduction

Negative life events manifested as psychological stress and depression are common in day-to-day life, emphasizing the relationship between the person and environment. Economic development and modernization have introduced a variety of new stressors with disadvantageous consequences on the welfare and happiness of individuals in developed and developing countries. Clinical observations and epidemiologic studies have found that host defense and vulnerability to oral inflammatory infectious diseases are influenced by psychological factors and tension of behavioural and emotional challenges induced by life events, known as psychosocial stress. There have been many papers published in the past regarding stress and its effect on general health including mental and physical stress.

According to Selye 1976, stress could best be conceptualized as "part of a complex and dynamic system of positive and negative transactions between individuals and their environment, occurring universally in varying degrees, and exhibiting different effects upon individuals over their life course".

The potential relationship between stress and oral inflammatory infectious diseases is not a new concept; psychological stress was known as a predisposing factor in the aetiology of necrotizing ulcerative gingivitis for more than four decades.

Pathways to periodontitis

Many pathways have been proposed to explain the stress-periodontal disease association (Genco et al. 1998, Rosania et al. 2009, Stabholz et al. 2010). In general, mechanisms have been grouped into 2 broad categories as follows:

*   Health-impairing behaviors
*   Pathophysiological factors

Health-impairing behaviours: Such as increases in tobacco and alcohol consumption, poor oral hygiene, and poor nutritional intake.

Pathophysiological factors: are factors that lead to increases in stress hormones which can indirectly influence inflammatory and immunological profiles and increase the susceptibility to periodontal disease.

Genco et al. correlated various parameters of periodontal diseases with measures of psychological stress, distress and coping behaviors using an age adjusted model in which gender, smoking, diabetes mellitus, T. forsythia and P. gingivalis were also included and established as significant risk indicators. The authors stated that the effects of stress on periodontal diseases can be moderated by adequate coping behaviors. They further concluded that psychosocial measures of stress associated with financial or economical strain and distress are significant risk indicators for severe periodontal disease in adults.

Hence, an attempt was made in this present study to evaluate the effects of psychological stress on periodontal health.

Material & Method

It was a prospective randomized longitudnal study. The tool for study was one pretested questionnaire for data collection to observe the opinion and attitude toward the day-to-day stress encountered by individuals. Subjects who came to the outpatient department (OPD) of the Department of Periodontology and oral implantology in Rajasthan dental college and hospital, Jaipur, for oral prophylaxis were included in this study. A pilot study was performed with a sample of 30 subjects. The reexaminations to evaluate reproducibility "during the study" were performed 2 hr after the end of the initial examination of the participants.

The questionnaire was modified based on the experience of the pilot study and was used for the final study.

The study spanned over a period of 3 years. The nature of the study was explained to all the participants and consent was obtained prior to the commencement of the study. Patients were given the questionnaire to be filled by them before they could be clinically evaluated. The questionnaire used was "Social Readjustment Rating Questionnaire (Holmes and Rahe 1976)", for measuring stressors including changes, significant life event, and stress reactions including physiological and affective responses. Impact of life event on individual's life was measured on a positive and negative scale as highly positive (+2), positive (+1), no impact (0), negative (-1) and highly negative (-2). After the evaluation, scoring was completed by adding all the impact scores to produce total impact score of individual.

This scale measured the meaning and desirability of each event. Thus, an event with a positive score indicated that the event was good and fortunate, and an event with a negative score indicated that the event was unpleasant and not welcome. An event that had neither positive nor negative impact was classified as neutral. The impact of life-events was assessed calculating the difference between the number of positive and negative life events weighted by the respondents' perception of life-events' impact.

Gingival bleeding index by Loe and silness was used to measure gingival condition. Russell's Periodontal index was used to assess the periodontal health. The plaque was assessed by using the Silness-Löe plaque index (1964).

Behavioural data was also collected. Tooth-brushing frequency was measured on a daily basis; frequency of dental attendance was recorded as "every 6 months" or "more than 6

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monthly". Smoking was recorded as either "smoker" or "non-smoker".

Demographic data included age in years, marital status (married or single), Ethnic origin, employment status (employed or unemployed), level of education ranging from primary school incomplete to postgraduate and social class etc.

Inclusion criteria

Patients who fulfilled the following criteria were included in the study:
1. Patients within the age range of 20-60 years
2. Patients having at least 20 teeth in the mouth

Results

1100 patients joined the study, out of which 1030 patients filled the questionnaire completely. However, only 1020 patients completed both the subsets of the study (i.e., questionnaire and clinical evaluation). While analyzing the data, subjects were divided in the age groups of 20-30 years, 31-40 years, 41-50 years and 51-60 years (created for valuation of psychological stress). The number of subjects per group was uneven.

These 1020 patients were divided into 2 groups-Diseased and Non-Diseased groups-based on the indices used in the questionnaire. Diseased group comprised of 459 patients, who were further subdivided into 2 subgroups: positive score (59 patients) and negative score (400 patients). Non- diseased group comprised of 561 patients, who were subdivided into 2 subgroups: Positive score (212 patients) & Negative score (349 patients).

Later, results were evaluated and analyzed on the 30 - 40 variables of questionnaire related to daily routine life.

The age of all the subjects varied between 20 - 60 years. The mean age of the subjects (N = 1020) was found to be 38.84 ± 13.38 years. The frequency distribution method was used in this study. Values were assessed in percentage. On this basis of index interpretation, diseased group was 45 % (459) and non-diseased was 55% (561). Individuals with negative score were 73.3% and with positive were 26.5%.Values of different age individuals in diseased group; 20-30 years (38.12%), 31-40 years (11.98%), 41-50 years (32.67%) and 51-60 years (17.21%). Negative values percentage in different age variables; 20-30 years (37.8 %), 31-40 years (18.9%), 41-50 years (24.3%) and 51-60 years (21.6%).

Effect of different variables and their negative impact was evaluated, which showed significant figures in following variables: marital reconciliation (59.5 % diseased , 85.7% Negative), change in number of arguments with spouses (69.9% diseased, 80.77% negative), loan over rupees 1 lakh (55.55% diseased , 66.66% negative), change in work hour or conditions (59.9% diseased , 70% negative), change in recreational habits (79.5% diseased , 76.3% negative), change in sleeping habits (64.9% diseased ,78.6%).

Discussion

The result provided strong evidence to substantiate the hypothesis that psychosocial factors are of aetiological importance in periodontitis. In common with previous studies, this investigation demonstrated a link between psychosocial factors and periodontal diseases.

This study has met the criteria for improving the quality of studies proposed by Da Silva et al. (1995). A longitudinal design was utilized, including participants of different age and sex. In addition the respondents also showed no significant difference in their ethnic origins. Data on health behaviors was collected and analyzed. A standardized measure, the social readjustment rating scale (Holmes & Rahe 1967) was used as the basis of the measure of life events. It should be noted that this is the measure of choice in many medical studies, demonstrating significant relationships between prior life changing events and physical illness of a minor or major kind.

Another strength was the high response rate, which was similar for both diseased (45%) and non – diseased (55%) groups. An important new finding reported here was the role of positive life-events. While negative impact of life-events was associated with periodontitis, the positive impact of life-events was associated with better periodontal health. These findings raise 2 issues. Firstly, that the meaning and desirability of each event determines whether the life event may have a harmful or a protective effect in periodontal health status, and secondly, that positive events may serve to act as a protective factor, whilst only those people with more negative than positive events were more likely to develop periodontitis. Because of this, it is important to analyse life-events data taking into account people's perceptions of each event. Positive life-events may counteract the effect of negative life-events and vice-versa and, consequently, the total number of life-events tends not to be related to any health outcome variable as observed in this study.

This may explain why some studies failed to demonstrate an association between life-events and health. Respondents were asked to consider and report only those events that had occurred in the past 12 months. This raises an issue for further investigation: if most people are experiencing both negative and positive life events of recent occurrence, the possibility is raised of identifying the one negative life event of perceived major impact which might serve to 'tip the balance' and act as a trigger for an episode of periodontal disease.

One manner that periodontal disease may progress is by bursts of activity which are followed by periods of remission (Socransky et al, 1984). These episodic or cyclic patterns of periodontal destruction have been investigated primarily through risk markers such as immunological assessment, enzyme levels, bacterial counts and gingival crevicular fluid (Johnson 1989, Johnson 1991). In this investigation, life events were defined as objective occurrences of sufficient magnitude to bring about change in the usual activities of most individuals who experience them.

The model generated by the statistical analysis supported the Locker (1989) stress-disease model, based upon the work of Selye (1956). This model postulates that factors in the social environment lead to stress which have impact upon physiological processes and/or at-risk behaviour leading to disease susceptibility/disease. Firstly, because the

negative impact of life-events was associated with oral health risk-related behaviour such as smoking, we argue that life-events may be an important determinant of one of the main causes of periodontitis & tobacco smoking. Secondly, because the association between life-events and periodontitis remained significant after adjusting for this variable, we postulate that their may also be a direct effect through the physiological process. This may occur by impacting upon the immune system (kiecoh-Glaser et al, 1988) and/or on salivary flow (Scannapieco & Levine 1990). It is possible to argue that the association found between life-events and periodontitis was due to socio-economic status. However, there is no support for this claim since the association remained significant after adjusting for social class and level of education. Because level of education was a more sensitive measure than social class, the results after adjusting for level of education have been presented.

A significant association was found between periodontitis and being unemployed. Moreover, being unemployed was associated with oral health risk-related behaviours such as tobacco smoking and poor oral hygiene.

The association between employment status and periodontitis remained significant after adjusting for those risk-related behaviors. Thus, employment status, a well known psychosocial determinant of general health, is also related to periodontitis and may affect periodontal health through the same pathways postulated to explain the relationship between life events and periodontitis. Marital status was related to periodontitis, corroborating previous epidemioiogical studies that reported differences in oral health status between married and unmarried individuals (Osterberg et al, 1984, Hunt et al, 1985), however, the literature showed that it is not marriage but the quality of marriage which is related to health' (Renne 1971. 1977: Gove et al, 1983) including oral health (Marcenes & Sheiham 1996).

Other associations were broadly in agreement with those reported elsewhere, which gives greater validity to the data. Periodontitis was significantly associated with dental piaque (Loe et al. 1965, Theilade et al, 1966, WHO 1978) and tobacco smoking (Rivera-Hidalgo 1986, Pahner 1987, Bergstrom & Preber 1994). The fact that the association between periodontitis and tobacco smoking did not remain statistically significant after adjusting for other variables may not be interpreted as a lack of association. Tobacco smoking was associated with several other variables in the model and over adjustment may have occurred.

Conclusion

It was concluded that psychosocial factors, here represented by impact of life events like employment and marital status, as well as dental plaque levels, tobacco smoking and age together are important correlates of periodontitis. The results suggested that these factors may be important determinants of periodontitis. Further longitudinal studies would be valuable to rigorously establish a causal association between psychosocial factors and periodontal health.