

Periodontal Diseases: Revealing the Background Status of World Population at Epidemiological Triad

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ABSTRACT

Background: Periodontium is the supporting structure of teeth which includes; Gingiva, Periodontal Ligament, Alveolar Bone and Cementum, Progression of gingival infection to the deeper tissues causes inflammation of surrounding structures of teeth and known as periodontitis, which is again classified as aggressive and chronic periodontitis depending on several clinical as well as genetic factors. This review article presents the prevalence of periodontal diseases in both the Indian and world population.

Keywords: Chronic Periodontitis, Aggressive Periodontitis, Attachment loss, Periodontal Pocket.

INTRODUCTION

Periodontitis is a chronic inflammatory infection that affects the gingiva and bone supporting the teeth. Until about 20 years ago, it was generally accepted with the dental profession that, all individuals eventually become susceptible to severe periodontitis and there is continuous, linear loss of periodontal support and finally tooth loss as well as the susceptibility to periodontitis increases with age. A more recent approach is to dichotomize the adult population, differentiating between those who are healthy or have gingivitis and those who are susceptible to periodontitis. The prevalence of gingivitis and mild or moderate forms of periodontitis is strongly correlated to the standard of plaque control and dental care habits. However, periodontitis is the result of a complex interplay of bacterial challenge, host response, and other modifying factors, and, despite extreme variations in oral hygiene standards. Periodontitis exists in three forms; chronic periodontitis; aggressive periodontitis and periodontitis as a manifestation of systemic diseases. Now the question arise that "*how much chronic periodontitis is present?*" The most recent data for the prevalence

of periodontal disease in the United States comes from the third National Health and Nutrition Examination Survey NHANES III (1988-1994). The components that are taken into consideration to describe the prevalence of periodontitis are the prevalence of attachment loss and pocket formation.

Prevalence of periodontal attachment loss:

The prevalence of periodontal attachment loss depends greatly on the threshold chosen. At a threshold of greater than 3mm, the prevalence of attachment loss in at least one site in the mouth was 53.1%. The prevalence of attachment loss increased steadily with age, from a low of 35.7% for the 30 to 39 year old group to a high of 89.2% for the 80 – 90 year old group. Maxillary molars and mandibular incisors were more likely than other teeth to have attachment loss greater than 3mm, whereas maxillary central incisors were the least likely.

Prevalence of Pocket:

The prevalence of periodontal pocket also depends greatly on the threshold chosen. Generally,

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pocket depth greater than 3 mm are considered to reflect disease. The prevalence of periodontal pockets greater than 4mm was 23.1%. The increase in the prevalence of attachment loss with increasing age is not seen with pocket depth. Baelum and coworkers¹ recalculated their own data from a Kenyan and a Chinese adult population to corroborate with the methods of examination and data utilized in each of 6 other surveys (from Japan, Norway, New Mexico, Sri Lanka, and 2 South Pacific islands). Despite marked differences in oral hygiene conditions, the distribution of advanced disease was strikingly similar in 6 out of 8 samples. Hence, the data failed to corroborate the traditional generalization that the prevalence and severity of periodontal disease is markedly increased in African and Asian populations.

INDIAN STUDIES

Sharma (1953)² examined 1158 patients in the age group 15 to 50 years who visited Sir C.E.M Dental College and Hospital in Bombay and established that the incidence of high oral hygiene index was more in early age group and decreased with advancing age. Mehta et al (1953)² examined 2219 male subjects who had a non-vegetarian diet from a low socio-economic group in 18-55 years age group range in Bombay and Ratnagiri district. They concluded that the incidence of periodontal disease among Indians is very high as well as the severity of disease increased with age. They also concluded that the Papillae and margins do not show much difference in the severity of the disease and the extent of involvement of upper and lower marginal gingiva and papillae is much the same. Sanjana et al (1953)³ in their survey examined 2000 adults of age group 18-55 years belonging to lower middle class in Bombay and Ratnagiri district. They found that 80-90% of them used tobacco ash for cleaning teeth with the help of finger. Deposition of calculus ranged from 0-3 %; with increasing age, deposition of calculus increases in severity. Sanjana et al (1956)⁴ examined 1445 men and women between 16-50 years age to determine the incidence of periodontal disease and its relation to oral hygiene habits. They found that 83% had generalized periodontal disease and incidence increased with age regardless of oral hygiene method used. Mehta et al (1956)⁵ examined 1023 men ranging from age group 16-30 years, all were non-vegetarians and

belonged to low middle class. They found a high incidence of periodontal disease in betel leaf chewer than in non-chewer. Hence they concluded that betel leaf chewing is definitely related to health of gingival tissue and is contributory to the high incidence of periodontal disease. Gupta O.P. (1962)⁶ in Trivandrum examined 800 medically healthy people, aged 11-50 years using Russell's index and concluded that periodontal disease was 100% after the age of 30 years and 90% between 11-30 years. They also noted a higher severity of disease in low-income group and in people using finger for cleaning teeth. Mehta et al (1958)⁷ at Nair Hospital, Bombay conducted a study to determine the common cause of tooth loss in India. They established that periodontal disease accounts for the largest number of extractions in Indian individuals and tooth loss due to periodontal disease was high in males. They also concluded that the average extractions increased with increasing age.

Ramachandra et al (1973)⁸ surveyed 6,647 rural and 1,536 urban population of Tamil Nadu State and found that periodontal disease in both the populations were high (95.3% & 95.5% respectively) and periodontal index score was found to have an increase with age.

To probe into the opinion that periodontal disease is more prevalent in vegetarians than non-vegetarians, Cheru R.T. and T.A. Thelly (1976)⁹ studied 401 subjects, aged 15 years and above. Results showed that 100% of population suffered from periodontal disease and was more pronounced in vegetarians than in non-vegetarians. Singh et al (1985)¹⁰ examined 141 subjects aged 15-40 years in Lucknow and reported that prevalence of absolute pocket increased with age. Central incisor and first molars had maximum pocket depth whereas Canine and premolar teeth had minimal pocket depth. Laveri et al (1986)² examined 2082 patients aged 15-64 years in Nair Hospital, Bombay using CPITN index. They found that pervasiveness and severity of periodontal disease increased with age, among lower income group and among finger users and the males were affected more than females. Chattopadhyay A. (1990)¹¹ studied self-assessed oral health awareness among medical and dental professionals in Calcutta. The study group included 300 physicians and 200 dentists. He found that

most of the physicians 64% and 37.5% of dentists brushed their teeth only once a day; other oral hygiene aids were used by only a negligible number. Dentists had significantly better self-assessed oral health and better utilization of oral health care facilities.

In 1990, Anil S, Hari S and Vijayakumar T¹² assessed the periodontal conditions of 2756 subjects aged 15-44 years from urban and rural areas of Trivandrum using CPITN Index. They reported that calculus and bleeding was more frequent (86%) in 15-19 years; Shallow pocketing in 80% of subjects in 25-29 years; Deep pockets more than 6 mm were in 33% in age group of 35- 44 years. Maity AK, Banarjee KL and Pal TK (1994)¹³ examined 5960 subjects aged 15-65 years in rural populations in West Bengal using CPITN Index. The subjects selected were mostly poor farmers. Remarkable finding was that there is relatively low percentage of people with deep periodontal Pockets. They found CPITN score 4 in only 2-3 subjects. On the other hand calculus was wide spread. They concluded that calculus appears to be associated with severe periodontal disease.

The same group in 1994 (as a second part of study) assessed the periodontal treatment needs of 142 adults of rural West Bengal using CPITN index. They found that calculus predominated in about 64% of population. Also it was observed that severe Periodontal disease with score 4 and periodontally healthy (score 0) was very less.

PREVALENCE OF CHRONIC PERIODONTITIS

It is frequently stated that the prevalence of periodontal disease has decreased in the United States over the past 30 years. Again, however, because of methodologic differences in the national surveys conducted, it is difficult to draw any conclusions about changes in the prevalence of periodontal disease. In a study conducted by Douglas CW and Fox CH (1993)¹⁴ on the trends in periodontal diseases, they concluded that the decline in the prevalence and severity of periodontal diseases will be atoned by the substantial increase in the number of persons and number of teeth per person at risk of disease.

Chronic Periodontitis generally becomes clinically significant after age 30. The disease is

characterized by a slow progression of attachment loss over time. Among adults, the prevalence of attachment loss and periodontal pockets are higher in males than females. The prevalence of attachment loss and periodontal pockets is more in males than in females. There is also increased prevalence with age and it reflects the cumulative effect of attachment loss over time rather than an increased susceptibility to periodontitis. The increase in attachment loss with age without a corresponding increase in pocket depth may result from the increasing prevalence of gingival recession with age.

Why do patients have chronic periodontitis, and what puts them at risk?

Periodontitis is an infectious disease associated with a group of mainly gram-negative bacteria. (Genko R et al 1996)¹⁵. The session members of the 1996 World Workshop in Periodontics concluded that sufficient evidence exists to consider three microorganisms as the main causative agents; *Aggregatibacter actinomycetemcomitans*, *Porphyromonas gingivalis*, and *Tannerella forsythia*. The clinical expression of the disease (extent and severity) depends on how the host responds to the extent and virulence of the microbial burden. The body's inflammatory response is an attempt to protect itself from the pathogens, which also results in periodontal connective tissue destruction and bone degeneration as the body attempts to rid itself of the infectious tooth. Much epidemiologic research has focused on the identification of environmental and host factors involved in the initiation and progression of periodontal disease.

AGGRESSIVE PERIODONTITIS

Aggressive periodontitis (Early onset periodontitis) is periodontal destruction that becomes clinically significant during adolescence or early adulthood.

The disease has been classified into: Localised – characterized by bone loss around the first molars and incisors. Generalised – characterized by a more widespread pattern of periodontal destruction. Even though aggressive periodontitis is defined by age of onset and pattern of periodontal destruction, case definitions for

early-onset disease or its subtypes have been diversified across epidemiologic studies. Three case definitions used are; localized aggressive periodontitis: At least one first molar and at least one incisor or second molar and two or fewer canines or premolars had greater than 3 mm of attachment loss. Generalized aggressive periodontitis: Criteria for localized disease were not met; four or more teeth had greater than 3 mm of attachment loss; and at least two affected teeth were second molars, canines or premolars.

Incidental loss of periodontal attachment: Criteria for localized or generalized were not met, and one or more teeth had greater than 3 mm of attachment loss.

How much aggressive periodontitis is present?

Most studies from the United States and other countries that have examined localized aggressive periodontitis in adolescents have reported prevalence estimates below 1%. In the United States the prevalence of localized and generalized aggressive periodontitis was estimated at 0.53% and 0.13%, respectively. **NIDR**¹⁶ survey of children (14 to 17 years) found that 0.53% had LJP, 0.13% had GJP and 1.61% had incidental loss of attachment.

Prevalence of Juvenile Periodontitis:

It has been suggested that there is more juvenile periodontitis in India than elsewhere in the world but even here the estimates vary from 0.1% in Madras (Miglani and Sharma 1965)¹⁷ to 6.8% in Bombay (Rao and Tewani 1968)¹⁸ and 17.6% (Day & Shourie 1949)¹⁹. Several authors have pointed out that juvenile periodontitis is more frequent in females than in males (Miller et al. 1941, Zappler 1948²⁰, Baer & Benjamin 1974²¹, Manson & Lehner 1974²², Horman & Frandsen 1976²³).

Prevalence of Juvenile periodontitis in Finland:

A study conducted by **Leena Saxen 1980**²⁴ in Finland in an ethnic group representing a uniform Caucasoid population of about 8,096 (16-year-old), the prevalence of juvenile periodontitis was about 0.1% and the female to male ratio was about 5:3.

An Epidemiological Study in the West Midlands of the United Kingdom:

M.S. Saxby 1987²⁵ studied the prevalence of juvenile periodontitis among 7266 school children in the cities of Coventry and Birmingham. The overall prevalence of juvenile periodontitis of 0.1% with 95% was seen in Coventry and Birmingham. There was a highly significant difference in prevalence between ethnic groups, with overall prevalence figures of 0.02% for the Caucasian group, 0.8% for the Afro-Caribbean group and 0.2% for the Asian group. There was no difference in prevalence between male and female.

Prevalence of incipient juvenile periodontitis at age 16 years in Switzerland:

E. Kronauer, G. Borsa and N.P. Lang 1986²⁶ performed a study on the prevalence of incipient juvenile Periodontitis (JP) in a population of 16 year old adolescents in Switzerland. After screening of 7604 pairs of bitewing radiographs, 8 patients (4 female and 4 male) were definitely diagnosed as "incipient juvenile periodontitis" in a prevalence of 0.1% with ratio of female to male of 1:1. No differences in the incidence of JP in different ethnic groups could be found.

A. Stabholz, J. Mann, S. Agmon 1998²⁷ described prevalence of Localized juvenile periodontitis in adolescents of 12 to 20 years of age group. Of the 86 individuals examined, 33 individuals from 15 families were diagnosed as having LJP (38.4%). The mean age of LJP patients was about 15 ± 2.3 years with a 1:1.75 male to female ratio. These findings strongly suggest that there was an environmental influence in the etiology of the disease.

INDIAN STUDIES

Marshall-day and Sourie K.L¹⁹, in 1949 studied 568 people in India from 9 to 60 years of age and reported periodontitis was present in 35% of cases. In 1953 Belting, Massler and Seham²⁸ examined up to 30 years of age and reported 2% of cases with periodontitis. Miglani DC and Sharma OP¹⁷ in 1965 studied the prevalence of Juvenile Periodontitis among patients at government Hospital at Madras and reported a prevalence of 0.1%. Tewani and S.S. Rao 1968¹⁸ studied 1200

Indian patients having various types of periodontal complaints and existence of Juvenile periodontitis as a specified disease entity. This investigation showed a prevalence of 6.83%.

How much new aggressive periodontitis is present?

Very few longitudinal studies on aggressive periodontitis have been conducted. In a 5 years, longitudinal study (Clerehugh et al 1990)²⁹ attachment loss on one or more of the examined teeth increased dramatically; from 3% to 77% for attachment loss of greater than 1 mm and from 0% to 14% for attachment loss of greater than 2 mm. A review of the available longitudinal studies of periodontitis in childhood and adolescence concluded that subjects with signs of periodontal disease at a young age are likely to have further periodontal deterioration. Progression is more extensive at initially infected sites and among subjects of low socioeconomic status.

Does my patient with aggressive periodontitis fit the typical profile?

The prevalence of aggressive periodontitis is higher in African Americans than in whites. In a study of aggressive periodontitis among U.S adolescents, it was estimated that; 2.05% of African Americans had localized periodontitis compared with 0.14% of whites. For generalized periodontitis the prevalence was 0.59% for African Americans and 0.03% for whites. The prevalence of incidental attachment loss was much higher among African Americans than whites; 4.63% versus 0.91%. Early case reports and small studies often found the condition to be more prevalent among women; however, findings from larger studies have suggested the distribution of the disease is fairly equal between the genders. Among African Americans, males were 2.9 times more likely to have localized disease than females. Among whites, the association was reversed. White females were 2.5 times more likely than white males to have localized disease.

Why do patients have aggressive periodontitis and what puts them at risk?

The bacterium *Aggregatibacter actinomycetemcomitans* is found in high numbers

in localized aggressive periodontal lesions and is the primary pathogen associated with the disease. Elimination of the pathogen is associated with clinical improvement. Highly toxic strains of these organisms produce a strong leukotoxin that kills neutrophils, which provide an important defence against periodontal infections. Although infection with *Aggregatibacter actinomycetemcomitans* is strongly associated with cases of localized disease, not all individuals infected with this organism develop localized aggressive periodontitis, and not all individuals with localized disease have detectable level of *Aggregatibacter actinomycetemcomitans*. Another factor believed to be involved in the pathogenesis of aggressive periodontitis is defective neutrophils function. Localized aggressive periodontitis tends to occur in families, and this neutrophils chemotactic abnormality is genetic in origin and may predispose individuals to localized disease. Other, currently unidentified host factors are likely involved in the pathogenesis of aggressive periodontitis.

CONCLUSION

With advancement of time though the names of the diseases and pathogens were changed viz. Juvenile Periodontitis (Periodontosis) to Aggressive Periodontitis, *Actinobacillus Actinomycetemcomitans* to *Aggregatibacter Actinomycetemcomitans*, the severity of the disease and pathogens has increased, not only in India but world over. This article was aimed at giving an over view on the prevalence of both chronic and aggressive periodontitis in world population. With this review we have tried to compile various studies that were conducted over years in order to evaluate the prevalence of periodontal diseases.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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