PREVALENCE OF PERIODONTAL DISEASE IN MARATHWADA REGION OF MAHARASHTRA, INDIA

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Abstract

Introduction: Overall health status of an individual is greatly influenced by the oral cavity. Periodontal disease (PDD) and dental caries are the biggest threats to oral health among the various oral diseases. Despite increasing awareness and improvement in oral health, the global epidemiological data suggests that a worldwide prevalence of periodontal disease is 11.2%. It is a complex chronic disease which can lead to chronic inflammation, destruction of tooth supporting structures, and tooth loss in adults. With this background the study was planned to determine the prevalence of periodontal disease and perceptions towards oral health among the community in Aurangabad district of Maharashtra.
Methods: A community based cross-sectional study was conducted among 2151 subjects in Aurangabad district, being the capital of Marathwada region by Rural Health Training Center, Paithan under Govt. Medical College, Aurangabad. The standard pro-forma was designed and house to house survey was conducted over a period of 3 months i.e. from June to August 2021. Mouth mirrors, caries explorers and periodontal probes were used for oral examination with proper aseptic precautions. All the findings were recorded in the data sheet and descriptive statistics and chi-square test were applied using SPSS-17 version.
Results: Prevalence of periodontal disease in the present study was found to be 31.06%. It was observed that various factors act as predicators for periodontal disease.
Conclusion: For reducing the disease Burdon and its impact on the community, school and community based oral health awareness programs should be implemented.

Key words: Oral health, periodontal disease, prevalence, community periodontal index

Introduction

Overall health status of an individual is greatly influenced by the oral cavity, which is regarded as a mirror and a gateway to general health. Periodontal disease and tooth decay are the biggest threats to oral health among the various diseases affecting the oral cavity. The prevalence of periodontal disease dates back to early human civilization as it was indicated by paleopathological studies and despite increasing awareness and improvement in oral health, the global epidemiological data suggests periodontal disease to be one of a major burden on oral diseases with a worldwide prevalence of 11.2% [1, 2]. General unawareness, infrequent dental visits, lower socioeconomic status and illiteracy attributes to its high prevalence [3].
Periodontal disease is a chronic inflammatory disease presenting mainly as gingivitis and periodontitis resulting in subsequent destruction of supporting tissues. Plaque induced gingivitis is confined to the gingival tissues, whereas the various forms of periodontitis affect all components of periodontium i.e. gingivae, periodontal ligament, cementum and alveolar bone [4]. Multiple factors that contribute to this complex disease include genetic and epigenetic influences, patient behaviors, use of medications, and/or environmental factors [5]. Risk factors like Hispanic ethnicity, increased age, poor oral hygiene, psychological stress, obesity and systemic health co-morbidities together promote periodontal disease initiation and progression [6, 7].
Since many years measures have been introduced for periodontal disease among the elderly, but not enough attention is paid to adolescents. In fact, periodontal disease is among the most common diseases affecting adolescents. Gingivitis in adolescents may remain for a longer period presenting as gingival bleeding, and it may

gradually lead to the progression into periodontitis. However, according to WHO Global Oral Health Data Bank, the occurrence of periodontal disease is found higher in older children and adolescents. Almost 50-100% of 12-year-old children having the signs of gingival inflammation, this suggests a risk of periodontal disease among the adolescent population [8]. Periodontal disease may have negative effects on oral health, chewing function, and aesthetics, and the physical and mental health of adolescents. Also, it has been reported that periodontal disease may influence the severity of malocclusion in adolescents [9].

With this background a study was planned by Rural Health Training Center, Paithan under Govt. Medical College, Aurangabad of Marathwada region of Maharashtra, India with the objectives to determine the prevalence of periodontal disease and perceptions towards oral health among the community.

Materials and Methods

Study design: It was a community based, cross-sectional study.

Study area: Field practice area of Rural Health Training Center, Paithan of Govt. Medical College, Aurangabad, Maharashtra, India.

Study period: June 2021 to August 2021.

Study population: Being a capital place of Marathwada region, Aurangabad District was chosen for the study. Pathfinder methodology was used for sample selection. For urban population, 4 sites from Aurangabad city, For Urban III/Semi-urban population, 2 sites from Paithan and 2 sites from Kannad were selected whereas for rural population 4 villages from Aurangabad city i.e. Phulambri, Kachner, Adult and Hathnoor were selected.

Five index age groups were included: 5-6 yrs, 12 yrs, 15-18 yrs, 35-44 yrs and above 65yrs. According to standards of pathfinder methodology the minimum number of subjects acceptable as one cluster is 20, but considering the errors from recorder, operator or examiner, a size of 25 per cluster is recommended. Male: Female ratio was tried to be kept as 1:1. Applying this sampling distribution to the entire population the total sample size of 2151 was selected.

Study tool: The standard proforma was designed for Community Periodontal Index and Treatment Needs (CPITN) according to WHO Oral Health Assessment Form (3rd Ed) and pretested on 25 subjects as a pilot trial and continued on entire subjects for data collection.

Three indicators of periodontal status were used for the assessment:
1) Presence or absence of gingival bleeding.
2) Supra-or subgingival calculus.
3) Periodontal pockets-subdivided into shallow (4-5 mm) and deep (6 mm or more).

Index teeth: for adults aged 20 years and above, the teeth to be examined are:

17	16	11	26	27
47	46	31	36	37

For young people upto age of 19 years, only six teeth-16, 11, 26, 36, 31 and 46 were examined. Codes were given as follows:

0 – Healthy.
1 – Bleeding observed, directly or by using mouth mirror, after sensing.
2 – Calculus felt during probing.
3 – Pocket 4 or 5 mm.
4 – Pocket > 6 mm.

Following instruments were used for the examination:
1. Mouth Mirror.
2. Caries Explorers.
3. Periodontal Probe.
4. Concentrated sterilized solution.

All the findings were recorded in the data sheet after thorough examination.

Statistical analysis: The data of respondents was collected, compiled and entered in MS Excel 2007 worksheet. It was analyzed using open Epi version 3.01. Percentages were calculated and graphical presentation was used wherever necessary by using Microsoft Office Excel 2007 software. The proportions were compared using Chi-square test with and without Yate's correction and the level of significance was set at $P<0.05$.

Results

Table 1: Socio-demographic profile of study population

Sr. No.	Socio-demographic profile	Urban	Urban III	Rural	Total
1	**Sex**				
	Male	380 (32.20)	386 (32.71)	414 (35.08)	1180(100)
	Female	316 (32.54)	300 (30.9)	355 (36.56)	971 (100)
	Total	696 (32.36)	686 (31.89)	769 (35.75)	2151 (100)
2	**Age (in years)**				
	5-6 yrs	114 (27.74)	154 (37.47)	143 (34.79)	411(100)
	12 yrs	91 (24.33)	118 (31.55)	165 (44.12)	374 (100)
	15-18 yrs	165 (37.84)	125 (28.67)	146 (33.49)	436 (100)
	35-44 yrs	222 (39.86)	171 (30.7)	164 (29.44)	557 (100)
	65 + yrs	104 (27.88)	118 (31.64)	151 (40.48)	373 (100)
	Total	696 (32.36)	686 (31.89)	769 (35.75)	2151(100)
3	**Religion**				
	Hindu	588 (30.85)	624 (32.74)	694 (36.41)	1906 (100)
	Muslim	56 (34.57)	56 (34.57)	50 (30.86)	162 (100)
	Budhist	52 (62.65)	6 (7.23)	25 (30.12)	83 (100)
	Total	696 (32.36)	686 (31.89)	769 (35.75)	2151 (100)
4	**literacy status**				
	Middle_school	102(22.82)	149(33.33)	196(43.85)	447(100)
	High school	93(30.9)	83(27.57)	125(41.53)	301(100)
	Illiiterate	160(41.67)	103(26.82)	121(31.51)	384(100)
	Primary_school	204(30.72)	210(31.63)	250(37.65)	664(100)
	Graduate	36(40.45)	34(38.2)	19(21.35)	89(100)

	Intermediate or post high school certificate	48(29.45)	72(44.17)	43(26.38)	163(100)
	Literate	43(57.33)	21(28)	11(14.67)	75(100)
	Post Graduate	8(33.33)	13(54.17)	3(12.5)	24(100)
	Professionals	2(50)	1(25)	1(25)	4(100)
	Total	696 (32.36)	686 (31.89)	769 (35.75)	2151(100)
5	**Occupation**				
	Student	297(28.02)	333(31.42)	430(40.57)	1060(100)
	Dependent	61(35.67)	73(42.69)	37(21.64)	171(100)
	Housewife	144(44.58)	118(36.53)	61(18.89)	323(100)
	Agricultural labour	81(21.89)	103(27.84)	186(50.27)	370(100)
	Own Business	41(43.62)	25(26.6)	28(29.79)	94(100)
	Others	5(41.67)	2(16.67)	5(41.67)	12(100)
	Unemployed	12(75)	2(12.5)	2(12.5)	16(100)
	Employed	54(56.84)	27(28.42)	14(14.74)	95(100)
	Not applicable	01(10)	03(30)	06(60)	10(100)
	Total	696 (32.36)	686 (31.89)	769 (35.75)	2151(100)
6	**Socio-economic status**				
	Class I and II (Upper and Upper Middle class)	272 (42.11)	339 (52.48)	35(5.42)	646 (100)
	Class III (Middle class)	381 (35.51)	328 (30.57)	364(33.92)	1073 (100)
	Class IV and V (Lower middle and Lower class)	43 (5.85)	19 (2.59)	370(50.34)	735 (100)
	Total	696 (32.36)	686 (31.89)	769 (35.75)	2151(100)

As Table 1 shows the socio-demographic profile of the study population. Out of 2151 participants, 696 were from urban area, 686 from Urban III and 769 were from rural area. Out of 696 from urban area, 380 (32.20) were male and 316 (32.54) were female. Similarly out of 686 from Urban III 386 (32.71) male and 300 (30.9) were female and out of 769 from rural area, 414 (35.08) were male and 355 (36.56) were female. Considering the index age groups 411 were of 5-6 yrs, 374 were of 12 yrs, 436 were of 15-18 yrs, 557 of 35-44 yrs and 373 were of above 65 yrs. Maximum number of study subjects were of Hindu religion 1906, followed by Muslim 162, and 83 were Buddhist religion. In view of literacy status, maximum no. of population was seen to have education upto primary school 664whereas only 24 were studied upto postgraduates and only 4 were among professionals. In study population maximum number of participants were seen in 3 groups ie, 1060 students, 370 agricultural labours and 323 were housewives. Distribution of socio-economic status shows in urban area maximum number of family belong to upper and upper middle class 42.11%, followed by middle class 35.51% and 5.85 lower middle and lower class. Similarly in Urban III area also maximum number of subjects were in upper and upper middle class 52.48%, Middle class 30.57% and only 2.59% were on lower and lower middle class. Whereas in Rural areas maximum study population was in lower and lower middle class 50.34%, middle class 33.92% and only 5.42% were in upper and upper middle class.

Table 2: Association between ggeographic location and periodontal status in study population

Sr. No.	Geographic Location	Periodontal Status						P-value
		0	1	2	1, 2	1, 2, 3	Total	
1	Urban I	534(76.72)	103(14.80)	40(5.75)	10(1.44)	9(1.2)	696(100)	X^2= 147.47 P<0.05
2	Urban III	449(65.45)	67(9.77)	87(12.68)	35(5.10)	48(6.99)	686(100)	
3	Rural	500(65.01)	33(4.29)	119(15.47)	38(4.94)	79(10.27)	769(100)	
4	Total	1483(68.94)	203(9.43)	246(11.44)	83(3.86)	136(6.32)	2151(100)	

Note: 0-healthy; 1-bleeding observed, directly or by using mouth mirror, after sensing; 2-calculus felt during probing; 3-pocket 4 or 5 mm; 4-pocket > 6 mm.

It was seen from Table 2 that the prevalence of periodontal disease according to study area exhibited highest prevalence in rural area 34.97%, Urban III area revealed 34.54% whereas Urban I area revealed 23.19% prevalence of PDD. Prevalence of severe periodontitis was also observed higher in Rural Population.

Table 3: Association between socio-demographic profile and periodontal status of study population

Sr. No.	Socio-demographic profile	Periodontal Status					Total	P-value
		0	1	2	1, 2	1, 2, 3		
1	**Sex**							
	Male	805(68.22)	105(8.90)	171(14.49)	45(3.81)	54(4.57)	1180(100)	X^2=34.9585 P<0.05
	Female	678(69.82)	98(10.09)	75(7.72)	38(3.91)	82(8.44)	971(100)	
	Total	1483(68.94)	203(9.43)	246(11.44)	83(3.86)	136(6.32)	2151(100)	
2	Age							
	5-6	404(98.30)	4(0.97)	3(0.73)	0	0	411(100)	X^2= 32.6595 P<0.05
	12	330(88.23)	23(6.15)	21(5.61)	0	0	374(100)	
	15-18	285(65.37)	60(13.76)	61(13.99)	25(5.73)	5(1.15)	436(100)	
	35-44	265(47.58)	87(15.62)	97(17.41)	43(7.72)	65(11.67)	557(100)	X^2 =90.612 p<0.05
	65+	199(53.35)	29(7.77)	64(17.16)	15(4.02)	66(17.69)	373(100)	
	Total	1483(68.94)	203(9.43)	246(11.44)	83(3.86)	136(6.32)	2151 100)	
3	Religion							
	Hindu	1301(68.26)	191(10.02)	215(11.28)	78(4.09)	121(11.12)	1906(100)	
	Muslim	115(70.99)	10(6.17)	22(13.58)	3(1.85)	12(7.40)	162(100)	X^2 =13.155 p>0.05
	Buddhist	67(80.72)	2(2.41)	9(10.84)	2(2.41)	3(3.61)	83(100)	
	Total	1483(68.94)	203(9.43)	246(11.44)	83(3.86)	136(6.32)	2151(100)	
4	**Literacy status**							
	Illiterate	221(57.55)	38(9.90)	49(12.76)	18(4.69)	58(15.10)	384(100)	
	literate	51(68)	10(13.33)	7(9.33)	2(2.67)	5(6.66)	75(100)	X^2 =108.87 P<0.05
	School Certification *	1144(72.63)	126(8)	179(11.37)	56(3.56)	70(4.44)	1575(100)	
	Graduate and Above **	67(57.26)	29(24.79)	11(9.40)	7(5.98)	3(2.56)	117(100)	
	Total	1483(68.94)	203(9.43)	246(11.44)	83(3.86)	136(6.32)	2151(100)	
5	**Occupation**							
	student	876(82.64)	77(7.26)	77(7.26)	24(2.26)	6(0.57)	1060(100)	
	Housewife	186(57.58)	45(13.93)	30(9.28)	20(6.19)	42(13.00)	323(100)	X^2 =313.25 P<0.05
	Employed ***	261(46.69)	72(12.88)	121(21.64)	38(6.79)	67(11.99)	559(100)	
	Unemployed ****	160(76.55)	9(4.30)	18(8.61)	1(.47)	21(10.04)	209(100)	

	Total	1483(68.94)	203(9.43)	246(11.44)	83(3.86)	136(6.32)	2151(100)	
6	**Socio-economic status**							
	Class I and II	391(60.53)	115(17.80)	64(9.90)	35(5.42)	41(6.35)	646(100)	
	Class III	761(70.92)	68(6.34)	154(14.35)	28(2.61)	62(5.78)	1073(100)	X^2 =109.6732
	Class IV and V	331(76.62)	20(4.63)	28(6.48)	20(4.63)	33(7.64)	432(100)	P<0.05
	Total	1483(68.94)	203(9.43)	246(11.44)	83(3.86)	136(6.32)	2151(100)	

Note: 0-healthy; 1-bleeding observed, directly or by using mouth mirror, after sensing; 2-calculus felt during probing; 3-pocket 4 or 5 mm; 4-pocket > 6 mm.

*School Certification includes primary/middle/high school and intermediate or post high school certificate.

**Graduate and above includes graduate, post graduate and professionals.

***Employed includes agricultural labour, own business and employed.

****Unemployed includes Dependent, Others, not applicable and unemployed.

As Table 3 shows that sex wise prevalence of PDD was found to be 31.77% in males and 30.16%in females. Age wise prevalence was found be highest in a 35-44 yrs age group i.e. 52.42% and lowest in 5 to 6 yrs age group i.e. 1.7%. In case of religion, Hindus exhibited highest prevalence of PDD i.e. 36.51% and Buddhist lowest prevalence i.e. 19.27%. Literacy status revealed maximum prevalence in illiterate group 42.45%. Among different occupations

employed exhibited highest 35.78% prevalence, prevalence of PDD was found to be highest in class I and II Socioeconomic status i.e. 39.47% and lowest in class IV and class V i.e. 23.38%.

It was observed that statistically significant difference in prevalence of PDD was seen in study area or geographic location, sex, different age groups, literacy status, occupation and socio-economic status whereas only religion wise prevalence of PDD was not found to be statistically significant.

Discussion

Periodontal disease is one of the common oral diseases which can lead to chronic inflammation, the destruction of tooth supporting structures, and tooth loss in adults. Epidemiological studies and clinical observations both revealed that periodontal disease increases with age and almost everybody is more or less susceptible to it. Reflection is seen as increasing edentulousness in older individuals. With this context the present study aimed to assess the prevalence of periodontal disease in the subjects of Aurangabad district.

The Community Periodontal Index (CPI) was introduced by WHO to provide profiles of periodontal health status in countries and to plan intervention programs for effective control of periodontal disease. The major advantages of the CPI are simplicity, speed, reproducibility and international uniformity [10, 11].

`In the present study, the prevalence of periodontal disease was found to be 31.06%. The prevalence of periodontitis in the present study are in accordance with the findings of the study conducted by Joseph and Cherry in Trivandrum [12], India where it was reported that 27% of the subjects had periodontitis and according to a survey conducted by Doifode VV *et al*. [13] in Nagpur, Maharashtra where periodontitis was reported to be 34.8%. However, the findings were contradictory to previous studies conducted by Kundu D. *et al*. [14] where prevalence of periodontitis was found to be 97.51%.

According to study area the prevalence of periodontal disease was found higher in rural areas compared to urban. It can be attributed to several factors, e.g. the huge population of India (approximately 1,000 million), out of which 72% live in rural areas. There is no oral health care system in rural areas with the dentist: Population ratio of about 1:2,00,000. There is no para-dental infrastructure at the village level and the primary health care center level. At the community health care center level, only 25% community health centers have dental surgeons, but have inadequate instruments, equipment, and dental materials. Good oral health care infrastructure and easy access to the services available at village/primary health center level have been shown to affect the prevalence of periodontal diseases. The results of the present study also revealed similar findings i.e. highest prevalence in rural area 34.97%, Urban III area revealed 34.54% whereas Urban I area revealed 23.19% prevalence of PDD. Prevalence of severe periodontitis was also observed higher in rural population.

Evaluating the relationship of gender and periodontal disease, it was observed that gender was a contributing factor for periodontitis. Males were shown to have a higher predilection towards periodontitis i.e. prevalence found was 31.77% in males and 30.16% in females. The findings were similar to a previous study by Doifode *et al*., [13] Kundu D *et al*., [14] and Peter S *et al*. [15] where it was reported that periodontal disease was more common in males. This male predilection could be attributed to the deleterious oral habits which are more prevalent in male population. Habits like smoking and pan with tobacco chewing was shown to be a significant risk factor for more prevalence of periodontal diseases. Smoking causes an alteration of the diameter of the blood vessels perfusing the gingival tissues. Decreased bleeding is the reflection of disruption of the immune response accounting for the increased loss of clinical attachment and alveolar bone. Tobacco acts as a contributing factor for increased colonization of periodontal pathogens in shallow and deep periodontal pockets. Smoking may alter neutrophil chemotaxis, phagocytosis and oxidative burst. It may induce increase in levels of tumor necrosis factor alpha, prostaglandin E, neutrophil collagenase and elastase in gingival crevicular fluid [19-

20].

Early periodontal disease presenting as bleeding was more prevalent in the younger age groups as compared to advanced stages that was more prevalent in older age groups. Calculus was present in subjects that is most frequently observed periodontal condition. Deep pockets were found in subjects with increasing age groups up to 35-44 and decreased thereafter. This could be attributed to the fact that CPITN index is based on the measurement of pocket depth and does not record the gingival recession [15]. A study by Waerhaug *et al.* [16] explained the strong correlation between age and periodontal breakdown. The reason behind this is the disturbed equilibrium between plaque attack and host response. Numerous studies done have given unswerving results. Actually age of a person is not responsible for high prevalence of periodontal disease, but relatively the duration of periodontal tissue, which is grappled with the accumulation of chronic plaque in an individual's periodontium[17]. Based on the study findings, it can be said that age can be one of the influencing factors of periodontal disease [18].

Considerable ethnic differences in periodontal disease between and within different ethnicities have been reported. Based on the study results by Shen J *et al.* [21] and his colleagues in the year 2013, socioeconomic factors of an individual, such as education, employment and income have an influence on the oral health of an individual, which shows that these factors affect inequalities in oral health status. The income of an individual might play a role in an individual's ability to access oral health care services, which may affect the outcome of their oral health. A big impact is seen amongst illiterates due to the lack of utilization of oral health care services, due to the lack of interaction with service providers and lack of use of oral health information received. Dietary habits also plays a major role in PDD prevalence. It has been well-related with our study that there is an association between socioeconomic factors and periodontal disease and it also correlates with the outcomes of various studies. Recent investigations showed that consuming a high amount of alcohol might alter the host defence mechanisms of an individual, and it is well-established that intake of alcohol is linked with high prevalence of infections and might have effect on an individual's periodontium [22].

Conclusion

Prevalence of periodontal disease in the present study was found to be 31.06%. The study also validated that; age, gender, residency, monthly income, and different habits are the significant prognosticators associated with periodontal disease. For reducing the disease burden and its impact on the community, school level oral health education program should be commenced and community-based oral health awareness programs should be implicated.

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