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Periodontal conditions and treatment in urban and rural population of West Bengal, India

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ABSTRACT

Objective: To search adequate epidemiological data on periodontal conditions for the planning of oral health programs in Indian population, and to determine the prevalence of periodontal diseases, in regards to age and gender of urban and rural population in West Bengal, India. **Methods:** 22 542 subjects aged 15 years onwards, representative of rural and urban areas of West Bengal were examined for their periodontal conditions using the community periodontal index (CPI). **Results:** Supra and/or sub gingival calculus dominated as the most frequent score (score 2) among males (76.51%) and females (76.58%), which was least affected in young age group and higher in rural population. Severity of highest score were significant ($P<0.001$) according to their gender, age group and habitation and had independent effects ($P<0.001$) on it. Mean number of sextants affected by scores 1, 2, 3, & 4 were more in the rural areas. Assessed treatment needed was predominantly type II (Scaling and improved oral hygiene). **Conclusions:** The severe periodontal condition (Score 2, 3 and 4) is observed among rural males in older age group more than its urban counterparts of West Bengal, India.

1. Introduction

Periodontal disease is one of the commonest and major dental diseases among the human populations worldwide[1]. The most severe score or sign of periodontal disease (CPITN score 4) varies worldwide from 10% to 15% in adult population[2]. The World Health Organization (WHO) recently published a global overview of oral health, a statement that described the approaches to oral disease prevention and promotion of oral health during the 21st century[1]. The report emphasized that, despite great improvements in the oral health status of populations across the world, problems still persist, particularly among the underprivileged groups in the developing countries. Many developing countries have a shortage of oral health personnel, services are mostly offered from regional or central hospitals of urban centers, and little importance is given to preventive dental care. For various reasons, less attention has been given to the periodontal diseases in most developing countries by the population at large, providers of oral health care, and public health administrators[2]. The epidemiological data from the Global Oral Health Data Bank indicates that in the developing countries like India, Nepal, China, Indonesia etc, only a small percentage of adults aged 35–44 years or elderly aged>60 years have a healthy periodontal status, i.e. less than 3%, while advanced periodontal diseases indicated by deep probing depths are seen in 20% to 30% of the subjects. In India, studies have revealed that the percentage of the adult population suffering from advanced periodontal disease ranged from 3% to 32%[3].

Globally, considerable differences in the occurrence of periodontal disease are found by urbanization, and the socio-environmental factors are highly responsible for distinct profiles of periodontal disease observed in populations living in certain geographic regions or locations[2].

In India, very few studies have been conducted on periodontal disease in urban and rural areas. In Ludhiana, Punjab, 96.8% of the urban subjects and 97.2% of the rural subjects showed the presence of calculus[4]. However,

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no significant difference was found in the periodontal conditions of school children in the urban and rural areas of Sewagram[5]. A study done in a rural population of a district of West Bengal comprising of 5 960 subjects showed that 3% of the subjects aged 45 years and above showed destructive periodontal disease, while 92.7% of the subjects aged 20 to 29 years showed presence of calculus. These results were indicative of low levels of destructive periodontal disease in the rural population of West Bengal[6]. However, the epidemiological data are inadequate for assessing the magnitude of periodontal diseases and therefore the planning for oral health programs appropriate to meet the requirements for the population of India. Also there is a lack of an extensive epidemiological study to compare the periodontal conditions of the urban and rural population particularly in West Bengal. This type of study may reflect the magnitude of the problem and assessments of the results can be evaluated periodically through the implementation of the various preventive programs of oral health problems.

The Community Periodontal Index of Treatment Needs (CPITN) was developed by the joint efforts of WHO and foreign direct investment (FDI) in 1978[7] for assessing the periodontal treatment needs of the population. This data can be interpreted in terms of disease prevalence[8,9] and complexity of treatment needs[10,11]. The CPITN was revised as Community Periodontal Index (CPI) in 1997[12].

Therefore, there are dearth of data regarding the prevalence and treatments of periodontal disease in India and especially in West Bengal. In the present study, an attempt was made to determine the prevalence of periodontal diseases, in regards to age and gender of urban and rural population in West Bengal State from its different districts.

2. Materials and methods

2.1.Data

The study was carried out in 19 districts of West Bengal, India including urban and rural areas. Total 22 542 subjects were examined for the purpose of the study, aged 15 years onwards. The WHO CPI[12] was used to assess the level of periodontal condition. The examination was done by conducting dental checkup camps covering different districts of West Bengal, of which several schools were also covered under the School Health Programs. Several block hospitals in various districts were also visited. The study was approved by the ethical committee of the Dr. R. Ahmed Dental College and Hospital, Kolkata.

2.2.Armamentarium required

The instruments used for performing the study included a portable chair, portable light, No.4 dental mirrors, explorers and CPI probes. Protocol for asepsis was developed and strict procedures for infection control were performed. The services of one or two non-dental assistants were obtained for the purpose of recording the findings with prior training.

2.3.Methodology

For the application of this index, the dentition was divided into six sextants[13]. The treatment need in a sextant was recorded only when two or more teeth were present in a sextant, and not indicated for extraction. The indication for extraction due to periodontal involvement was that the tooth had vertical mobility and caused discomfort to the patient. Missing sextants were indicated by putting a diagonal line through the appropriate box.

2.4.Index teeth

The modification was made in order to avoid scoring the deepened sulci associated with eruption as periodontal pockets.

All indexed teeth were examined at 6 sites per tooth (mesiobuccal, buccal, distobuccal, distolingual, lingual and mesiolingual). The worst finding for the index teeth was recorded for the sextant. When there was no indexed tooth present for examination in the sextant, all the remaining teeth in the sextant were examined. A missing sextant was crossed diagonally.

No treatment was employed for no sigh of disease as score 0, improvement in personal oral hygiene (TN1) was employed for gingival bleeding after gentle probing as score 1, TN1+Scaling (TN2) was employed for supra and/or sub gingival calculus as score 2, TN2 was employed for pathologic pockets 4 of 5 mm deep as score 3, TN2+complex treatment (TN3) was employed for pathologic pockets 6 mm or deeper as score 4, no treatment (TN3) was employed for excluded sextant (less than two teeth present) as score X, and not recorded as score 9.

2.5.Statistical analysis

The statistical analysis of the data included the classification of data and calculation of frequencies. The differences between age, sex, habitation groups and highest score were tested statistically using the Pearson chi-square test. In order to understand the relationship between dependent and independent variables, multivariate linear regression was carried out to measure the effect of age groups, sex, and habitation on the highest score. The data were transferred to coding forms and analysed by computer using Statistical Package of Social Sciences (SPSS, version 11.0). Cumulative tabulations of the mean number of sextants affected per person for each examination period were calculated[14].

3. Results

Table 1 showed sex-wise distribution of the prevalence of highest scores. It was observed that 76.54% of the population were affected by supra and/or sub gingival calculus (score 2), where the prevalence was slightly higher among females (76.58%) than males (76.51%). But reverse

results were observed in the prevalence of pathologic pockets 4 of 5 mm deep and pathologic pockets 6 mm or deeper, which was higher among males (10.76%, 4.97%) in comparison to females (7.31%, 3.52%), respectively. The total number of healthy sextants without sign of diseases was also higher in females (6.27%) than males (3.76%). However, the frequency of highest scores by sex was statistically significant (P<0.001).

Table 2 revealed that the highest prevalence of supra and/or sub gingival calculus (score 2) was observed among 20–29 years age group (86.99%), where males showed higher prevalence (88.75%) compared to females (85.07%). A similar trend was also observed in 15–19 years age group. The most severe forms of periodontal condition as pathologic pockets 4 of 5 mm deep and pathologic pockets 6 mm or deeper increased with increasing age group. The highest prevalences of pathologic pockets 4 of 5 mm deep (17.41%) and pathologic pockets 6 mm or deeper (10.29%) were noticed in above 65 years age group, respectively, where males were higher in prevalence compared to females. On the other hand, the highest prevalence (18.44%) of healthy teeth (no sign of disease) was noticed in 15–19 years age group in both males and females. Overall the distributions of prevalence of different highest scores according to age groups were significant (P<0.001) both in case of specific gender (male or female) and irrespective of sex.

Table 3 demonstrated the distribution of highest score in urban and rural habitations, where periodontal condition was healthier in urban (5.27%) compared to rural areas (4.04%). Though the prevalence of pathologic pockets 6 mm or deeper (score 4) was slightly higher in urban (4.62%) than rural area (3.64%), but rural population suffered more from supra and/or subgingival calculus (77.55%) and pathologic pockets 4 of 5 mm deep (11.12%) compared to urban population. The overall distribution of periodontal status was significant (P<0.001) according to urban and rural habitations.

On the other hand, habitation-wise differences of highest score in different age groups (Table 4) also revealed that supra and/or sub gingival calculus was comparatively higher among rural population than urban counterparts in 15–19 yrs, 20–29 years and more than 65 years age groups. A similar trend was also observed in case of pathologic pockets 6 mm or deeper (score 4) among 15 – 19 and above 65 years age groups. The distributions of highest score according to age group were significant (P <0.001) in both the habitations.

Irrespective of age group, the comparison of periodontal status among males and females in terms of their habitation (Table 5) demonstrated that the prevalence of supra and/or sub gingival calculus (76.01% in males and 76.17% in females) and pathologic pockets 4 of 5 mm deep (9.59% in males and 6.94% in females) in the urban areas were comparatively lower than their rural counterparts (77.47% in males and 77.67% in female of supra and/or sub gingival calculus and 13.05% in males and 8.24% in female of pathologic pockets 4 of 5 mm deep), respectively. Although higher prevalence of pathologic pockets 6 mm or deeper (score 4) was observed in urban people than its rural counterparts. Here also in both sexes, the distributions were significant (urban P<0.001; rural P<0.01).

To understand the independent effects of age, gender and habitation on severity of highest score, multiple linear regression analysis showed that the significant independent effect on the severity of the periodontal destruction of age, sex and habitation were noticed (P<0.001).

Table 6 represented the mean number and percentages of sextants affected by different scores in various urban and rural habitations. The results indicated that the numbers of periodontal disease free individuals were more in urban areas (15 385 dentate persons, 92 310 sextants) than in the rural areas (6 981 dentate persons, 41 886 sextants). Mean number of sextants affected by scores 1, 2, 3 and 4 were observed more in the rural areas. Frequency of score 2 was seen in maximum in both the areas. For the sextants having no teeth, no significant difference was observed for the rural and urban population.

4. Discussion

The present study is probably the first study in West Bengal, India examing a large number of populations with the CPI index to estimate the prevalence of periodontal disease, which mainly reveals the periodontal conditions of urban and rural population according to age and gender. Females showed a significantly higher healthy periodontal status than males in both urban and rural areas. The reason for such a finding can be attributed to the habit and consciousness of the females in doing better oral hygiene practices[15]. It is observed that young people are less affected (15–19 years of age) compared to higher age group. Similar findings have also been reported in many other studies of the world[16–18]. Within the highest score, subjects with supra and/or sub gingival calculus is the most frequently observed condition for the population as a whole and mainly it is observed in subjects of the 20 to 29 years age groups and in the age group of 45 years and above, mainly pathologic pockets 4 of 5 mm deep and pathologic pockets 6 mm or deeper were observed. Pilot *et al* [19] also reported the same trend in the world population.

Overall, it is seen that periodontal status in the urban area is significantly better compared to the rural area. The reason for this difference could be due to faulty oral hygiene habits, culture, and nutrition and health beliefs[20].

With respect to the severity of the periodontal disease, the relative explanatory value of various independent factors was evaluated by multiple regression analysis. The present study indicated a significant correlation between the severity of the periodontal disease with respect to age, gender and habitation, a finding which has been supported by studies conducted among Swedish people[15].

Apart from these, the results of this study indicate an unsatisfactory state of oral health of the adult population of West Bengal. This may be due to the individual's attitudes and behavior towards the positive and negative motives for dental treatment on one hand, and social living conditions and organization of the dental care on the other. Fear for

Table 1
Prevalence of highest score by sex [*n* (%)].

Highest score	Male	Female	Total
No sign of disease	466(3.76)	636(6.27)	1 102(4.89)
Gingival bleeding after gentle probing	402(3.24)	560(5.52)	962(4.27)
Supra and/or sub gingival calculus	9 486(76.51)	7 768(76.58)	17 254(76.54)
Pathologic pockets 4 of 5 mm deep	1 334(10.76)	741(7.31)	2 075(9.21)
Pathologic pockets 6mm or deeper	616(4.97)	357(3.52)	973(4.32)
Excluded sextant (less than two teeth present)	95(0.77)	81(0.80)	176(0.78)
Total	12 399(100.00)	10 143(100.00)	22 542(100.00)

Pearson chi-squares value = 239.381, *df*= 5, *P*<0.001.

Table 2
Prevalence of highest score by age group in male and female [*n* (%)].

	Age group (years)	No sign of disease	Gingival bleeding after gentle probing	Supra and/or sub gingival calculus	Pathologic pockets 4 of 5 mm deep	Pathologic pockets 6 mm or deeper	Excluded sextant (less than two teeth present)	Total
Male	15–19	338(17.46)	276(14.26)	1 310(67.67)	7(0.36)	5(0.26)	0(0.00)	1 936(100.00)
	20–29	84(2.93)	75(2.61)	2 548(88.75)	123(4.28)	41(1.43)	0(0.00)	2 871(100.00)
	30–44	27(0.67)	39(0.97)	3 212(79.82)	534(13.27)	206(5.12)	6(0.15)	4 024(100.00)
	45–65	12(0.39)	11(0.36)	2 098(68.56)	573(18.73)	311(10.16)	55(1.80)	3 060(100.00)
	>65	5(0.98)	1(0.20)	318(62.60)	97(19.09)	53(10.43)	34(6.69)	508(100.00)
Female	15–19	390(19.38)	352(17.50)	1 250(62.13)	11(0.55)	9(0.45)	0(0.00)	2 012(100.00)
	20–29	154(5.85)	129(4.90)	2 239(85.07)	81(3.08)	28(1.06)	1(0.04)	2 632(100.00)
	0–44	72(2.20)	60(1.83)	2 679(81.88)	323(9.87)	124(3.79)	14(0.43)	3 272(100.00)
	45–65	17(0.87)	18(0.92)	1 413(72.54)	286(14.68)	168(8.62)	46(2.36)	1 948(100.00)
	>65	3(1.08)	1(0.36)	187(67.03)	40(14.34)	28(10.04)	20(7.17)	279(100.00)
Total	15–19	728(18.44)	628(15.91)	2 560(64.84)	18(0.46)	14(0.35)	0(0.00)	3 948(100.00)
	20–29	238(4.32)	204(3.71)	4 787(86.99)	204(3.71)	69(1.25)	1(0.02)	5 503(100.00)
	30–44	99(1.36)	99(1.36)	5 891(80.74)	857(11.75)	330(4.52)	20(0.27)	7 296(100.00)
	45–65	29(0.58)	29(0.58)	3 511(70.11)	859(17.15)	479(9.56)	101(2.02)	5 008(100.00)
	>65	8(1.02)	2(0.25)	505(64.17)	137(17.41)	81(10.29)	54(6.86)	787(100.00)

Male Pearson chi-squares value = 3 413.06, *df*= 20, *P* <0.001;
Female Pearson chi-squares value = 2 436.89, *df*= 20, *P* <0.001;
Total Pearson chi-squares value = 5 863.74, *df*= 20, *P* <0.001.

Table 3
Prevalence of highest score by habitation [*n* (%)].

Highest score	Urban	Rural	Total
No sign of disease	818(5.27)	284(4.04)	102(4.89)
Gingival bleeding after gentle probing	750(4.83)	212(3.02)	962(4.27)
Supra and/or sub gingival calculus	11 806(76.08)	5 448(77.55)	17 254(76.54)
Pathologic pockets 4 of 5 mm deep	1 294(8.34)	781(11.12)	2 075(9.21)
Pathologic pockets 6mm or deeper	717(4.62)	256(3.64)	973(4.32)
Excluded sextant (less than two teeth present)	132(0.85)	44(0.63)	176(0.78)
Total	15 517(100.00)	7 025(100.00)	22 542(100.00)

Pearson chi-squares value = 108.00, *df*= 5, *P*<0.001.

Table 4
Prevalence of highest score by age group in urban and rural habitations [*n* (%)].

	Age group (years)	No sign of disease	Gingival bleeding after gentle probing	Supra and/or sub gingival calculus	Pathologic pockets 4 of 5 mm deep	Pathologic pockets 6mm or deeper	Excluded sextant (less than two teeth present)
Urban	15–19	549(18.47)	534(17.96)	1 871(62.93)	13(0.44)	6(0.20)	0(0.00)
	20–29	163(4.36)	130(3.48)	3 246(86.88)	143(3.83)	53(1.42)	1(0.03)
	30–44	73(1.58)	66(1.43)	3 735(81.05)	468(10.16)	250(5.43)	16(0.35)
	45–65	25(0.70)	18(0.50)	2 553(71.55)	554(15.53)	350(9.81)	68(1.91)
	>65	8(1.27)	2(0.32)	401(63.45)	116(18.35)	58(9.18)	47(7.44)
Rural	15–19	179(18.36)	94(9.64)	689(70.67)	5(0.51)	8(0.82)	0(0.00)
	20–29	75(4.24)	74(4.19)	1 541(87.21)	61(3.45)	16(0.91)	0(0.00)
	30–44	26(0.97)	33(1.23)	2 156(80.21)	389(14.47)	80(2.98)	4(0.15)
	45–65	4(0.28)	11(0.76)	958(66.53)	305(21.18)	129(8.96)	33(2.29)
	>65	0(0.00)	0(0.00)	104(67.10)	21(13.55)	23(14.84)	7(4.52)

Urban Pearson chi-squares value = 4 297.65, *df*= 20, *P*<0.001;
Rural Pearson chi-squares value = 1 581.00, *df*= 5, *P*<0.001.

Table 5
Prevalence of highest score by sex in urban and rural habitations[*n* (%)].

	Habitation	No sign of disease	Gingival bleeding after gentle probing	Supra and/or sub gingival calculus	Pathologic pockets 4 of 5 mm deep	Pathologic pockets 6mm or deeper	Excluded sextant (less than two teeth present)	Total
Male	Urban	345(4.21)	323(3.94)	6 233(76.01)	786(9.59)	446(5.44)	67(0.82)	8 200(100.00)
	Rural	121(2.88)	79(1.88)	3 253(77.47)	548(13.05)	170(4.05)	28(0.67)	4 199(100.00)
	Total	466(3.76)	402(3.24)	9 486(76.51)	1 334(10.76)	616(4.97)	95(0.77)	12 399(100.00)
Female	Urban	473(6.46)	427(5.84)	5 573(76.17)	508(6.94)	271(3.70)	65(0.89)	7 317(100.00)
	Rural	163(5.77)	133(4.71)	2 195(77.67)	233(8.24)	86(3.04)	16(0.57)	2 826(100.00)
	Total	636(6.27)	560(5.52)	7 768(76.58)	741(7.31)	357(3.52)	81(0.80)	10 143(100.00)

Male Pearson chi-squares value = 92.64, *df*= 5, *P* <0.001;
Female Pearson chi-squares value = 16.80, *df*= 5, *P*<0.01.

Table 6
Number, mean number and percentage of sextants affected by different scores in various habitation groups.

Habitation		Number of sextants which contain different scores with mean number and percentages					
		0	1	2	3	4	X
Urban	*n*	10 561	7 955	65 853	3 677	1 341	3 725
	Mean	0.68	5.12	4.60	0.32	0.08	0.24
	%	11.44	8.61	71.33	3.98	1.45	4.00
Rural	*n*	3 384	3 087	31 558	1 978	461	1 732
	Mean	0.49	5.31	4.86	0.34	0.06	0.25
	%	8.07	7.37	75.34	4.75	1.10	4.13

the dental treatment as well as intense negative motivation for the treatment are the negative factors seen among these people. Poor availability of the specialist dental services is also a common factor. Inappropriate dentist-patient ratio, poverty, poor transport system in the rural areas may be considered as the main factor of large number of rural population affected by this form of dental disease. Also there are behavioral factors like neglecting the disease at an early stages or using domestic methods or traditional folk remedies. Another negative factor that bears upon this situation is very low level of health education in rural population, compounded with low dental awareness. Considering the present situation, more number of dental hygienists is to be recruited in the rural areas that can provide oral prophylaxis and primary dental care for the subjects. The most efficient way to prevent periodontal disease is to control it in childhood and young adult life. It is especially important to take the advantage of school settings where it is possible to reach large number of school children with well planned preventive measures. Further steps should be taken to raise the dental awareness among the rural subjects, which can be included in the school health program.

From the present study, it may be concluded that the severe periodontal condition (Score 2, 3 and 4) is observed among rural males in older age group than its urban counterparts of West Bengal, India. However, further study is necessary to evaluate the factors responsible for that. Whereas the availability of estimates of the periodontal disease prevalence would greatly improve the calculation of needs estimates. These estimates are important for the future planning of dental services in the urban and rural areas of West Bengal.

Conflict of interest statement

We declare that we have no conflict of interest.

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