Study on Periodontitis in Relation with Subgingival Calculus in Rajshahi Region, Bangladesh

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Abstract: Background: Bangladesh is a country possessing harmful lifestyle for oral health. The country culture put the people to be exposed to harmful factors responsible for development of periodontitis. However, effective health education can bring encouraging result to aware them for healthy practice. Objectives: The aims of the study were to describe and analyze the periodontal condition and oral hygiene practices among Bangladeshi population. Methods: A hospital-based cross sectional descriptive study was done over 200 subjects. Subjects were recruited from a wide age range (6–80 year) by random and cluster samplings. A total of 200 cases were interviewed and examined. Data were collected from all patients attended the dental outpatient department of Dental Unit of Rajshahi Medical College Hospital, Udoyon Dental College Hospital and Upozila Health Complex, Raninagar, Naogaon. All patients were interviewed (face-to-face) using a semi-structured questionnaire. Clinical examination was performed to measure the periodontal health status using standard calculus index and periodontal index. Plaque, calculus, gingival bleeding, periodontal pocket probing depth, gingival recession, and tooth loss were recorded using a mouth mirror, and Williams- and WHO periodontal probes. Statistical analysis was carried out using SPSS program version 16.0. Results: Among all participants 48% were female and 52% were male. Most of the participants were student (27%).The study showed high rate of peridontitis (63%). The peak prevalent age group was over 45 years. Most of the participants had supra- and sub-gingival calculus. Gingival bleeding (GB) on probing was found in 91% of the participants. At the age >45 years, a periodontal pocket probing depth (PPD) of 4–6 mm was found in 43.85% and a PPD >6 mm in 17.54%. Conclusion: The occurrence of severe periodontal disease was low. The factors cause periodontal diseases were age, male sex, low education, rural residence, plaque and calculus.

Keywords: Peridontitis, Oral Hygiene Practices, Subgingival Calculus, Bangladesh

1. Introduction

Periodontal diseases are the diseases that involve the periodontal structures beyond the gingiva and lead to loss of connective tissue attachment[1]. Periodontal diseases are among the most widespread diseases in mankind[2]. The oral cavity is not a sterile cavity. There are more than 500 bacterial species that are capable of colonizing in the oral cavity, and while about 150 species can be found in one individual, a number of these species are more associated with periodontal diseases than others[3]. Periodontal diseases are caused not by a single oral micro- organism but by several and the list is still being refined due to the complexity of the matter. Some of the micro-organisms are considered to be more pathogenic than others.

Several methods have been developed to study the distribution of periodontal diseases in a population. These methods are usually used to determine both the occurrence of periodontal diseases and associated conditions in the community. For each or more than one of the periodontal conditions there is an index that is specifically designed to score the presence and extent of each condition of interest. The indices for periodontal conditions particularly the microbial plaque, calculus, gingival bleeding, gingival recession, periodontal pockets, connective tissue attachment levels have a long history of development, and modifications to improve their applications have been adopted from time to time[4-7].

The use of different methods to study periodontal diseases and even different approaches in selecting the study

participants, all limit the process of interpretation of the available data from different epidemiological population-based studies around the world[8]. However, in these studies, a close relationship between dental plaque and gingivitis has been demonstrated as was initially reported in non-population-based studies[9]. As for global epidemiological data, it is clear that there is a less pronounced relationship between dental plaque and severe periodontitis. Severe forms of human periodontitis frequently affect the minority globally, in particular, in the United States[10], in Central and South America[11], in Europe[12], in Asia and Oceania[13], and in Africa[14].

Prevention of periodontal diseases is important. Strategies for prevention and periodontal control could be high risk and whole population strategies. For populations with a low level of oral hygiene and dental care, a "whole population strategy" is recommended to reduce the periodontal treatment need in the general population[15,16].

For personal reasons, Bangladeshi will be presented in detail as a prototype of a population with a low level of oral hygiene and dental care. In principle, it is agreed that the basic etiological factors of periodontal diseases do not differ in industrialized and developing countries[15]. However, in countries with an "emerging economy" compared to those with an "established economy", there is a higher prevalence of gingivitis in children and slight to moderate periodontitis due to poor oral hygiene standards[15].

Geographically, Bangladeshis a country in South Asia; and is bordered by India to its west, north and east; Burma to its southeast and separated from Nepal and Bhutan by the Chicken's Neck corridor. To its south, it faces the Bay of Bengal. Bangladesh is the world's eighth-most populous country, with over 160 million people, and among the most densely populated countries. It forms part of the ethno-linguistic region of Bengal, along with the neighbouring Indian states of West Bengal and Tripura.

Fig. 1. *Bangladesh map showing seven divisions.*

Fig. 2. *Map showing study areas in Rajshahi.*

Bangladesh is divided into seven administrative divisions each named after their respective divisional head quarters: Barisal, Chittagong, Dhaka, Khulna, Rajshahi, Sylhet and Rangpur. Dhaka is the capital and largest city of Bangladesh. The population of Bangladesh as of 15 March 2011 is 142.3 million (census 2011 result), much less than recent (2007–2010) estimates of Bangladesh's population ranging from 150 to 170 million and it is the 8th most populous nation in the world. In 1951, the population was 44 million. It is also the most densely populated large country in the world, and it ranks 11th in population density, when very small countries and city-states are included.

Fig. 3. *Population of Bangladesh according to religion.*

Bangladesh has a low literacy rate, estimated at 61.3% for males and 52.2% for females in 2010.Health and education levels remain relatively low, although they have improved recently as poverty levels have decreased. In the rural areas, village doctors with little or no formal training constitute 62% of the healthcare providers practicing modern medicine and the formally trained providers are occupying a mere 4% of the total health workforce. The aim of this study was to establish a preliminary picture of the periodontal condition of the peoples in Rajshahi by determining the occurrence of periodontal diseases in relation to oral hygiene practices and subgingival calculus.

2. Methods

The study was cross-sectional and descriptive in design. The data collected from the study participants were related to the occurrence of periodontal diseases, oral hygiene practices, periodontal treatment needs, and tooth loss. The target population included all outpatients at Rajshahi Medical College (RMC) Hospital Outdoor, RMC Dental Unit Outdoor, Udoyon Dental College Hospital Outdoor and Upozila Health Complex, Raninagar, Naogaon. All registered patients at Rajshahi Medical College Hospital Outdoor, RMC Dental Unit Outdoor, UDC Outdoor and UHC, Raninagar, Naogaon are taken into consideration and started from latest to backward until it reaches 200. The data were mainly on the presence of plaque, calculus, gingival bleeding, periodontal probing pocket depths (4–6 mm and >6 mm), gingival recession (4–6 mm and >6 mm), and tooth-cleaning devices, all of which were recorded separately to reflect the state of each condition. In addition, while the study was population-based cross-sectional study that involved both males and females. All patients were interviewed (face-to-face) using a semi-structured questionnaire. Clinical examination was performed to measure the periodontal health status using standard calculus index and periodontal index. Plaque, calculus, gingival bleeding, periodontal pocket probing depth, gingival recession, and tooth loss were recorded using a mouth mirror, Williams- and WHO periodontal probes. The method for the assessment of periodontal disease involves clinical examination of the periodontal tissues or radiological assessment of the alveolar bone loss. Statistical analysis was carried out using SPSS program version 16.0.

3. Results

The factors assessed in all the study were utilized to describe the occurrence of periodontal diseases and related conditions among the studied populations. Sample according to registration region is given below:
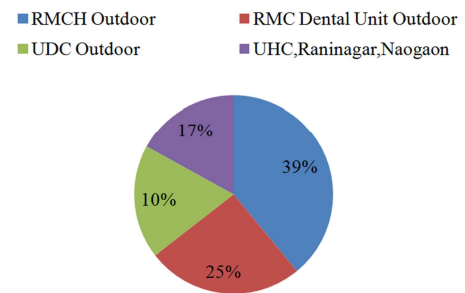
Registration place wise Sample

Fig. 4. Sample selected from four different registration centers.

Table 1. Distribution of the study participants by age.

Age of the respondents in years	Frequency	Percent
<18 years	39	19.5
18 - 45 years	104	52.0
>45 years	57	28.5
Total	200	100.0

According to age of the participants about 52% participants were between 18-45 years of age, 28.5% above 45 years of age and 19.5% less than 18 years of age.

Table 2. Distribution of the study participants by gender.

Sex of the patients	Frequency	Percent
Male	104	52.0
Female	96	48.0
Total	200	100.0

Among the study participants 52% of the patients were male and 48% of the patients were female shown in table 2.

3.1. Oral Hygiene Status

In <18 years of age about 19.5% of the patient have periodontitis, in between 18-45 years of age about 52% of the patient have periodontitis and over>45 years of age about 28.5% of the patient have periodontitis. Periodontitis is severe about 5% of the patient over >45 years of age. According to the data $p<0.05$ so the relationship between periodontitis and age of the participants is significant.

Table 3. Distribution of the study participants by their age & periodontal index.

Age of the Patient's in years	Patient's periodontal index					
	Score 0	Score 1	Score 2	Score 3	Score 4	Total
<18 years	9 (23.07%)	26 (66.66%)	4 (10.25%)	0 (0%)	0 (0%)	39 (19.5%)
18 - 45 years	9 (8.65%)	27 (25.96%)	60 (57.69%)	8 (7.69%)	0 (0%)	104 (52%)
>45 years	0 (0%)	3 (5.26%)	19 (33.33%)	25 (43.85%)	10 (17.54%)	57 (28.5%)
Total	18 (9%)	56 (28%)	83 (41.5%)	33 (16.5%)	10 (5%)	200 (100%)

$\chi 2=1.242$, df=8, $p<0.000$

3.2. Calculus

The assessment of the presence of dental calculus as either present or absent without further categorization into supra-, sub- or both supra- and sub-gingival was also reported to be substantially high. The occurrence of calculus among the study participants aged ≥45 years in was 100%. In the study that involved children and adults, the occurrence of calculus in different age groups, for example, was 25.64% among the

subjects of <18 years of age, among those 18–45 years of age it was 81.73% and among those of >45 years of age it was

100%. According to the data p<0.05 so the relationship between calculus and age of the participants is significant.

Table 4. *Distribution of the study participants by their age &calculus index.*

Age of the respondents in years	Patient's calculus index				Total
	Grade 0	Grade 1	Grade 2	Grade 3	
<18 years	29 (74.35%)	10 (25.64%)	0 (0%)	0 (0%)	39 (19.5%)
18 - 45 years	19 (18.26%)	78 (75%)	7 (6.73%)	0 (0%)	104 (52%)
>45 years	0 (0%)	21 (36.84%)	24 (42.10%)	12 (21.05%)	57 (28.5%)
Total	48 (24%)	109 (54.5%)	31 (15.5%)	12 (6%)	200 (100%)

$\chi 2 = 1.409$ df=6 p<0.000

3.3. Periodontal Status

3.3.1. Healthy Periodontal Tissue

In the study more participants aged >18 years or over (9%) had healthy periodontal sextants and did not have gingival bleeding, calculus or periodontal pockets (p<0.05).

3.3.2. Gingival Bleeding on Probing

The occurrence of gingival bleeding on gentle probing (BOP) with an estimated 20 gm force using the CPITN probe was extremely high (91%) in both the population-based studies and in the health-facility-based study. However, in the study that employed the CPITN index the findings on gingival bleeding on probing as the highest score showed a different picture when all the subjects are taken together (5%). Moreover, a unique picture is portrayed when BOP is considered by age where you find that in the hierarchical scoring system, the BOP as the highest score in CPITN decreases with increasing age. the occurrence of gingival bleeding was extremely high, up to 91%. In the study gum bleeding on toothbrushing was self-reported in 30% of the study participants. The occurrence of gingival bleeding was found to be more common in males (90.38%) than in females (91.66%). In the study the occurrence of gingival bleeding was significantly higher among the subjects that had plaque or calculus than in those without these conditions, and higher among those who had no formal education compared to those who had formal education.

3.3.3. Periodontal Pockets

The periodontal status among the study participants is shown in Figure 5. In the study, where the age of the study participants was 45 years or more, the prevalence of periodontal disease as assessed mainly by probing periodontal pocket depth (PPD) was very high for both PPD 4–6 mm (43.85%) and PPD >6 mm (17.54%).

In the study there were no deep gingival crevices among the child study population at 6–18 years of age. The periodontal pockets (3–4 mm) were first detected (2%) among the participants aged <18 years, and then to a greater extent among those participants aged 18-45 years (30%). Among the participants age >45 year PPD 4–6 mm was seen in about 43.85%.
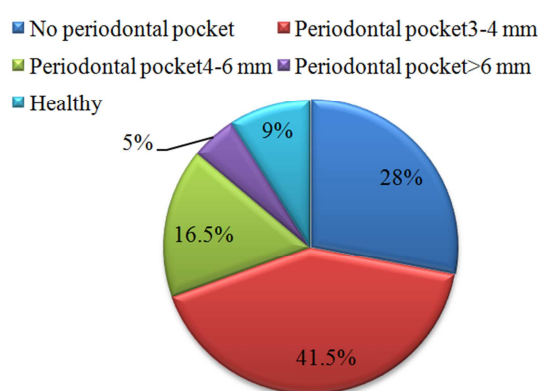
Periodontal pocket depth(PPD)

Fig. 5. *Occurrence of periodontal pockets among the study participants (%).*

4. Discussion

This study on the occurrence of periodontal diseases was performed on the people in Rajshahi region who resided in rural and urban areas and therefore comprised rural and urban, as well as mixed populations. The study was based on data collected from four different places among populations of different age groups and sex at different time in2014, using different established methods including the basic methods for Oral Health Surveys[4,5]. The findings from this study collectively provide an insight into aspects of the periodontal status of the people in Rajshahi region but because of some limitations, they cannot be compared to each other and cannot be considered to represent a comprehensive epidemiological survey of periodontal diseases in Bangladesh. The study was conducted in four regions of Rajshahi division in Bangladesh out of seven divisions in Bangladesh.

In the study, gingival recession was strongly associated with calculus. Most of the study population had calculus. Now the question is: should the participants be scheduled for scaling and root planning? Perhaps not, as this has not been a public health problem and most people retain their teeth to almost the end of their life without many problems, as reported earlier in a previous study of the Bangladesh

population. However, systematic tooth brushing should be emphasized to control the other predisposing factors for gingival recession, including plaque and gingival inflammation. It may be proposed, that professional periodontal care be sought, if gingival bleeding on tooth brushing does not improve after two weeks[17].

Gingival bleeding on clinical gentle probing was very common in some studied populations, almost 100%. In the study, gum bleeding on tooth brushing was self-reported is about one third of the study patients. A high level of gingival bleeding has been reported in both adult and child populations in Bangladesh for many years. It might be possible that much of this observed gingival bleeding could be controlled by instituting proper home oral care that includes systematic tooth brushing. However, if regular tooth brushing has already been established, persistent gingival bleeding during tooth brushing after, for example, two weeks, might be considered a self-assessment criterion for seeking oral health care for the population that could be provided by the established oral health services in the country. However, due to lack of equipment and materials in these UHCs, the OHS may at the beginning have rely on oral health education. The use of "gum health", together with loose or mobile teeth has been considered an important condition in the self-assessment exercise in the Florida study in the United States[18].

The method used to diagnose periodontal disease in these studies was probing of the periodontal pockets following the protocol recommended by the WHO[4,5]. The study involved assessment of probing pocket depth not only in adults but also among children aged 14 years or more. Usually, assessment of PPD is not recommended under 15 years of age[4,5]. In addition, for young people up to the age of 19 years, all second molars (17, 27, 37 and 47) are excluded in the PPD assessment to avoid inclusion of eruption gingival crevices (pseudo pockets) as real pockets[4,5]. However, the first encounter of PPD 3–4 mm was in patients aged <18 years, where the prevalence was 2%, and PPD >6 mm >45 years of age 12.5%. The relatively high prevalence of PPD 4–6 mm found >45 years of age. The results show that the occurrence of periodontal pockets, for example, among adults aged >45 years was high in some populations, almost as high as four in five, while in the other populations it was as low as one in five . The differences in methodology in terms of partial versus full mouth examination and recording, together with some possible intra- and inter-examiner variability might have contributed to the variations in the present study. However, the amount of variation due to real differences in the different populations studied is not known and may be assumed to be minimal. Even where it was formerly thought that there was a big difference between industrialized and non- industrializes countries in the occurrence of periodontal disease, the understanding has changed, because the Global Oral Data Bank that used CPITN worldwide has revealed that the differences are not clear[19-21]. In addition, despite massive gingival inflammation and very poor oral hygiene, as also seen among the Kenyans,

the level of loss of attachment was still quite similar to those reported among young adults in the USA, in Mexico, in Norway, in New Mexico, and in Japan, as well as in India[22].

5. Conclusion

The majority had plaque, calculus, gingival bleeding and a moderate periodontal probing pocket depth of 4–6 mm. A minority had severe periodontal disease with a periodontal probing pocket depth of >6 mm, but with some geographical/population differences. Gingival recession, when seen in the study population, was associated with age, calculus and gingival inflammation rather than with tooth-cleaning practices.

References

[1] Ranney RR. Classification of periodontal diseases.Periodontol 1993; 2:13–25.

[2] WHO. Epidemiology, etiology and prevention of periodontal diseases. Report of WHO Scientific Group, Technical Report 1978; Series 621, Geneva.

[3] Socransky SS, Haffajee AD. Microbiology of periodontal disease. In: Clinical periodontology and implant dentistry. Lindhe J, Lang NP & Karring T (eds). Oxford: Blackwell Munksgaard 2003.

[4] WHO. Oral health surveys 1987; Basicmethods,3rd ed. Geneva.

[5] WHO. Oral health surveys 1997; Basicmethods, 4th ed. Geneva.

[6] Papapanou PN, Lindhe J. Epidemiology of periodontal diseases. In: Clinical periodontology and implant dentistry. Lindhe J, Lang NP & Karring T (eds). Oxford: Blackwell Munksgaard 2003.

[7] Beck J D, Arbes Jr SS. Epidemiology of gingival and periodontal diseases. In: Carranza's clinical periodontology, 10th ed. Newman MC, Takei HH, Klokkevold PR, Carranza FA (eds). St.Louis: Saunders, Elsevier, 1997.

[8] Albandar JM, Rams TE. Global epidemiology of periodontal diseases: an overview. Periodontol 2002; 29:7–10.

[9] Löe H, Theilade E, Jensen S B. Experimental gingivitis in man. J Periodontol 1965; 16:177–187.

[10] Albandar JM, Tinoco EMB. Global epidemiology of periodontal diseases in children and young persons. Periodontology 2002; 29:153–176.

[11] Gjermo P, Rösing CK, Susin C, Oppermann R. Periodontal diseases in South and Central America. Periodontol 2002; 29:70–78.

[12] Sheiham A, Netuveli GS. Periodontal diseases in Europe. Periodontol 2002; 29:104–121.

[13] Corbet EF, Zee KY, Lo ECM. Periodontal diseases in Asia and Oceania. Periodontol 2002; 29:122–152.

[14] Baelum V, Scheutz F. Periodontal diseases in Africa. Periodontol 2002; 29:79–103.

[15] Axelsson P, Albandar JM, Rams TE. Prevention and control of periodontal diseases in developing and industrialized nations. Periodontol 2002; 29:235–246.

[16] Baelum V, van Palenstein Helderman W, Hugoson A, Yee R, Fejerskov O. A global perspective on changes in the burden of caries and periodontitis: implications for dentistry. J Oral Rehabil 2007; 34:872–906.

[17] Pattison AM, Pattison GL. Periodontal Instrumentation, 2nd ed. 2002.

[18] Gilbert GH, Litaker MS. Validity of self-reported periodontal status in the Florida dental care study. J Periodontol 2007; 78(7 Suppl):1429–1438.

[19] Miyazaki H, Pilot T, Leclercq MH, Barmes DE. Profiles of periodontal conditions in adolescents measured by CPITN. Int Dent J 1991; 41:67–73.

[20] Miyazaki H, Pilot T, Leclercq MH, Barmes DE. Profiles of periodontal conditions in adults measured by CPITN. Int Dent J 1991; 41:74–80.

[21] Pilot T, Miyazaki H, Leclercq MH, Barmes DE. Profiles of periodontal conditions in older age cohorts, measured by CPITN. Int Dent J 1992; 42:23 30.

[22] Baelum V, Chen X, Manji F, Luan WM, Fejerskov O. Profiles of destructive periodontal disease in different populations. J Periodontal Res 1996: 31:17–26.