Risk Indicators for Tooth Loss due to Caries and Periodontal Disease in Recipients of Free Dental Treatment in an Adult Population in Bangladesh

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Purpose: The aims of this study were first to identify the risk indicators for permanent tooth extraction in patients who were receiving free dental treatment, and second to determine whether or not the reasons for tooth extraction are related to socio-demographic factors.

Materials and Methods: Bangladeshi adults who visited Dhaka Dental College Hospital participated in this study. For each extraction, the clinician recorded age, sex, educational status, type of tooth extracted, dietary habits, oral hygiene, history of smoking and betel quid chewing and reasons for tooth extraction. A series of bivariate analyses and logistic regression analyses were carried out to assess the effects of major variables.

Results: A total of 868 teeth were extracted from 582 patients. Among them, 586 (67.5%) of the teeth were extracted due to caries and its sequelae, 161 (18.5%) and 121 (13.9%) were extracted for periodontal and other reasons. Logistic regression analysis revealed that tooth extraction due to caries had significant associations with age ($P = 0.0001$), tooth type ($P = 0.013$), consumption of sweets, snacks and soft drinks ($P = 0.0001$ and $P = 0.0001$, respectively), frequency of teeth cleaning ($P = 0.007$) and dental attendance pattern ($P = 0.004$). For tooth extraction due to periodontal disease, associations with age ($P = 0.001$), educational level ($P = 0.018$), tooth type ($P = 0.024$), betel quid chewing ($P = 0.0001$), smoking habit ($P = 0.032$), method of teeth cleaning ($P = 0.001$) and the use of dentifrices ($P = 0.024$) were statistically significant.

Conclusions: In this group of patients, caries and its sequelae were the most common reasons for extraction of teeth, followed by periodontal disease. Betel quid chewing, smoking and dietary and oral hygiene habits were also significant predictors of tooth loss.

Key words: betel quid chewing, dental caries, periodontal disease, permanent tooth loss, poor adult population

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Research on tooth mortality provides information on the prevalence of dental diseases, availability of dental treatments and attitudes towards dental extraction. Such research is also crucial for planning dental health services. Nationwide surveys designed to determine the reasons for tooth extraction have been carried out in several countries (Cahen et al, 1985; Reich and Hiller, 1993; Morita et al, 1994; Haddad et al, 1999; Quteish Taani, 2003). These studies were carried out in developed countries that have sufficient dental resources, and results of these studies have shown that dental caries and

its sequelae are generally the main cause for tooth loss followed by periodontal disease. However, there have been few studies carried out in developing countries such as Bangladesh.

In Bangladesh, the ratio of clinicians to inhabitants is about 1:50,000, which is much lower than the ratio of 1:2180 in the United Kingdom (World Health Organization, 2004). In rural areas in Bangladesh, where about 80% of the population live, the ratio of clinicians to inhabitants is around 1:4.1 million (Huq and Islam, 1993). Per capita income in Bangladesh is US$470 and the literacy rate is only 35% (Arvidson-Bufano and Holm, 1990). Some studies have suggested that tooth extraction is influenced by sociological factors such as age, education, anxiety, marital status, household income and ineffectiveness of dental service (Hossain and Ullah, 1993; Todd and Lader, 1991; Caldas et al, 2000; Jovino-Silveira et al, 2005; Susin et al, 2005). For example, in the United Kingdom, the percentage of tooth loss in adults is 14% in the higher social classes, and 30.5% in the lowest class (Todd and Lader, 1991). It is also possible that differences in resources and sociological factors could be a contributing factor in permanent tooth extraction in the Bangladeshi population.

Dhaka Dental College Hospital is one of the largest dental hospitals in Bangladesh and provides free dental treatment for all. Patients attending this hospital are usually inhabitants of slum areas, most of them in the lower socio-economic class. According to the UNDP (United Nations Development Programme) Bangladesh Progress Report in 2005, 36% of this population lives below US$1 a day at 1985 international prices (equivalent to $1.08 at 1993 international prices). Therefore, the majority of patients would be considered poor by any international definition (Mercer et al, 2004).

Scientific documentation of factors associated with tooth loss has been insufficient in Bangladesh. The objectives of this study were to identify risk indicators for extraction of permanent teeth in a poor population and to determine whether or not the reasons for tooth extraction are related to age, sex, educational level, tooth type, dietary habits, habits of smoking and betel quid chewing, dental attendance pattern and oral hygiene.

MATERIALS AND METHODS

The Institutional Board of Dhaka Dental College, Dhaka University, Bangladesh approved the study protocol. During the study period of 45 days from December 2005 to February 2006, a total of 4050 patients visited the hospital for various dental treatments. Among them, 3250 patients were distributed to other departments including conservative and prosthetic departments. The remaining 800 patients were referred to the oral maxillofacial surgery department to receive free dental treatment for tooth extraction from which 582 patients were included in this study. Oral surgeons were requested to refer patients requiring extraction of one or more permanent teeth to the researchers. Verbal consent was obtained from each participant. Subjects with a history of psychiatric problems or with a history of alcohol or drug abuse and who did not give consent to take part were excluded from the study (Susin et al, 2005).

Before commencing the study, the researchers and four oral surgeons discussed detailed instructions for extraction criteria (Murray et al, 1996; McCaul et al, 2001). Calibration was performed and the kappa value was 0.94. The type of tooth extracted and the reason for extraction were double-checked and discussed by the researchers and oral surgeons each time the tooth extraction was required.

The principal reason for tooth extraction was selected from the following eight categories.

- Caries (including initial and recurrent caries) or sequelae of caries (including extraction of roots where the crown was lost through caries, endodontic lesion and root fracturing due to weakening by caries).
- Periodontal disease in which pain, loss of function or pocketing due to the disease requires that the tooth be extracted.
- Orthodontic reasons, including prevention or correction of malocclusion, incompletely erupted teeth and supernumerary teeth.
- Pre-prosthetic reasons, including facilitation of better prosthetic restoration.
- Tooth or arch injury, including tooth fracture owing to trauma.
- Surgical reasons, including pericoronitis, unerupted or partially impacted teeth and oral mucosal lesions.
- Occlusal difficulties such as traumatic bite.
- Other reasons, that is extraction performed due to the patient's behaviour, for example, fear, which prevents conservative care being carried out (McCaul et al, 2001).

For patients who had undergone extraction of two or more teeth in one visit, the reason for each tooth

Table 1 Percentage distributions of reasons for tooth extraction according to sex

Reasons	Men	%	Women	%	Total	%
Caries	297	66.9	289	68.2	586	67.5
Periodontal disease	84	18.9	77	18.2	161	18.5
Orthodontics	3	0.7	35	8.3	38	4.4
Prosthetic	11	2.5	8	1.9	19	2.2
Tooth/arch injury	9	2.0	6	1.4	15	1.7
Surgical reasons	24	5.4	4	0.9	28	3.2
Occlusal difficulties	7	1.6	2	0.5	9	1.0
Others	9	2.0	3	0.7	12	1.4
Total	444	100.0	424	100.0	868	100.0

extraction was determined from the records as noted above.

Data on dietary habits, smoking, betel quid chewing habits and oral hygiene were collected using a self-reported questionnaire. Questions on dietary habits focused on the intake of snacks, sweets and soft drinks, which were scored according to frequency of consumption per week. Questions on oral hygiene dealt with frequency of brushing, as well as the use of oral hygiene aids such as adjuvants and materials. History of smoking habit was categorised as currently smoked, previously smoked or never having smoked cigarettes, and history of betel quid chewing was categorised as chewer and non-chewer. Dental attendance pattern was defined as once yearly or more if the subject had visited a clinician once per year or more on a regular basis for maintenance care, and was defined as never if the subject visited a clinician only for emergency dental treatment or had not visited a clinician within the past year (Susin et al, 2005). Patients with incomplete records were excluded from the study.

DATA ANALYSIS

The reasons for tooth extraction were analysed for each tooth type in the maxilla and mandible. Data were not divided into right and left quadrants, as our results showed no difference in the rates of extraction for right and left sides of the oral cavity (Aida et al, 2006).

The collected tooth loss data along with information about explanatory factors were statistically analysed using the SPSS statistical package for Windows, version 11.5 (SPSS Inc., Chicago, IL, USA). Bivariate analyses were undertaken to assess the association between the causes of tooth loss and each of the following nine explanatory risk factors: age, sex, education, tooth type, dietary habits, smoking habit, betel quid chewing habit, dental attendance pattern and oral hygiene habits. Logistic regression analysis was conducted to evaluate the variables associated with reasons for tooth extraction, considering tooth extraction because of dental caries, periodontal disease and for other reasons as dependent variables. For dependent variables in the other multiple logistic analyses, we classified patients into those who underwent extraction because of periodontal disease, those who underwent extraction because of dental caries and those who underwent extraction for other reasons. Variables in the bivariate analyses that showed statistical significance of $P < 0.05$ were included in a model of logistic regression. The odds ratios with 95% confidence intervals were computed from regression results.

RESULTS

A total of 868 teeth were extracted from 582 patients (mean number of teeth extracted per patient was 1.5). The age of patients ranged from 11 to 85 years with a median age of 38 years. Table 1 shows the reasons for tooth extraction based on gender. Male patients had 51.2% of the teeth extracted and female patients had 48.8% of the teeth extracted. Dental caries was the main reason for extraction (67.5% of all extracted teeth). More females had their teeth extracted owing to dental caries compared with males, whereas the opposite was true for periodontal diseases. Only 4.4% of the extractions were performed for orthodontic reasons, and 3.2% of the extractions were performed for surgical reasons. Detailed reasons for tooth extractions due to caries and periodontal disease are presented in Table 2. Extractions

Table 2 Detailed distribution of reasons for tooth extraction due to caries and periodontal disease

Reasons		N	%
Caries	Pulpitis	405	(69.1)
	Severe crown failure	145	(24.7)
	Cellulitis/abscess	16	(2.7)
	Endodontic failure	11	(1.9)
	Restorative failure	9	(1.5)
	Subtotal	586	(100.0)
Periodontal disease	Deep pocket	51	(31.7)
	Mobility	99	(61.5)
	Furcation	11	(6.8)
	Subtotal	161	(100.0)

performed due to pulpitis accounted for 69.1% of caries extractions, and 61.5% of all periodontal extractions were performed due to tooth mobility.

Table 3 shows the reasons for tooth extraction by demographics and other investigated variables in a sample of 868 teeth extracted. The categories other than caries or periodontal disease were combined into 'others'. Patients aged 11 to 50 years showed a greater proportion of tooth loss due to caries (79.7%) than did subjects $\geq$ 51 years (31.2%), the difference being statistically significant ($P < 0.001$). Losses due to caries were greater in the posterior teeth (71.3%) than those in the anterior teeth (61.0%). A greater rate of tooth loss due to periodontal disease was found in subjects with a history of betel quid chewing compared with subjects with no history of betel quid chewing (44.4% and 6.6%, respectively). Subjects who consumed sweet foods and soft drinks, more than 3 times per week had higher rates of tooth loss due to caries (89.7% and 94.6%, respectively) compared with subjects who consumed sweet foods and soft drinks three times per week or less (34.1% and 57.1%, respectively). The rate of tooth loss due to caries was higher in subjects who cleaned their teeth once per day or less (69.2%) than in subjects who cleaned their teeth more than once per day (54.2%). Subjects who cleaned their teeth using miswak (a traditional technique of cleaning by chewing a stick) or with their fingers had more tooth loss due to periodontal disease (23.0%) compared with subjects who used a toothbrush (16.9%). Subjects who cleaned their teeth by using powder/charcoal had a higher rate of tooth loss due to periodontal disease (21.8%) compared with subjects who used toothpaste only (13.8%). Subjects who visited a dental clinic once or more within the past year showed a significantly lower rate of tooth loss due to caries and periodontal disease compared with subjects who did not visit a dental clinic ($P < 0.01$ and $P < 0.01$, respectively).

Tables 4 and 5 summarise the results of multivariate analysis revealed by logistic regression analysis. Subjects $\geq$ 51 years (OR = 0.12, $P = 0.0001$) showed a less significant relation with tooth loss owing to caries. Posterior teeth were most frequently extracted (OR = 1.67, $P = 0.013$) due to caries. Prevalence of tooth loss due to caries was higher in subjects who consumed sweet foods and drinks, more than three times per week than in subjects who did not (OR = 10.52, $P = 0.0001$ and OR = 4.38, $P = 0.0001$, respectively). Subjects who cleaned their teeth more than once per day and visited a dental clinic once per year or more had less tooth loss due to caries compared with subjects who cleaned their teeth once per day or less and never visited a clinician (OR = 0.45, $P = 0.007$ and OR = 0.44, $P = 0.004$, respectively).

For tooth loss due to periodontal disease, the logistic model revealed that older age patients ($\geq$ 51 years) had a significant correlation with increasing tooth loss (OR = 10.93, $P = 0.001$). Subjects who were educated (above secondary level) required less extraction for periodontal reasons. Posterior teeth were less frequently extracted (OR = 0.55, $P = 0.024$) for periodontal reasons. A significant increase in risk of tooth loss due to periodontal disease was observed for subjects who were current smokers (OR = 1.86, $P = 0.032$) and betel quid chewers (OR = 8.15, $P = 0.0001$) compared with subjects who never smoked or had no history of chewing betel quid. Subjects who consumed sweet food more than three times per week (OR = 0.11, $P = 0.001$) had less extraction for periodontal reasons. The prevalence of tooth loss due to periodontal disease was about 3.9 times higher in subjects who cleaned their teeth by using miswak or fingers compared with subjects who cleaned their teeth with a toothbrush ($P = 0.001$). The prevalence of tooth loss due to periodontal disease was about 1.8 times higher in subjects who used powder/charcoal compared with subjects who cleaned their teeth with toothpaste ($P = 0.024$).

DISCUSSION

Information on tooth loss is a reliable indicator of a population's oral health status. To the best of our knowledge, this pilot survey is the first survey to provide detailed information on risk indicators for tooth extraction in a poor Bangladeshi population. In Bangladesh, conservative treatment such as restorative

Table 3 Reasons for tooth extraction by demographic and other investigated variables in a sample of 868 teeth extracted

Variables	Reasons for extraction			
	n (868)	Caries (586)	Periodontitis (161)	Others (121)
Age				
11 to 50 years	650	518 (79.7)***	47 (7.2)	85 (13.1)
≥ 51 years	218	68 (31.2)	114 (52.3)***	36 (16.5)
Sex				
Male	444	297 (66.9)	84 (18.9)	63 (14.2)
Female	424	289 (68.2)	77 (18.2)	58 (13.7)
Level of education				
Secondary or less	690	467 (66.7)	141 (20.4)**	82 (11.9)
Higher than secondary	178	119 (66.9)	20 (11.2)	39 (21.9)***
Extracted tooth				
Anterior	318	194 (61.0)	71 (22.3)*	53 (16.7)
Posterior	550	392 (71.3)**	90 (16.4)	68 (12.4)
History of smoking				
Non-smoker	635	443 (69.8)	89 (14.0)	103 (16.2)**
Current smoker	206	127 (61.7)	62 (30.1)***	17 (8.3)
Previous smoker	27	16 (59.3)	10 (37.0)	1 (3.7)
History of betel quid chewing				
Absence	593	448 (75.5)***	39 (6.6)	106 (17.9)***
Presence	275	138 (50.2)	122 (44.4)***	15 (5.5)
Dietary habits				
Frequency of eating snacks and sweets (consumption of sweet foods)				
1 to 3 times/week	346	118 (34.1)	129 (37.3)***	99 (28.6)***
> 3 times/week	522	468 (89.7)***	32 (6.1)	22 (4.2)
Frequency of intake of soft drinks and juice (consumption of sugary drinks)				
1 to 3 times/week	627	358 (57.1)	156 (24.9)***	113 (18.0)***
> 3 times/week	241	228 (94.6)***	5 (2.1)	8 (3.3)
Oral hygiene behaviour				
Frequency of cleaning tooth				
≤ Once/day	772	534 (69.2)**	142 (18.4)	96 (12.4)
> Once/day	96	52 (54.2)	19 (19.8)	25 (26.0)***
Method of teeth cleaning (adjuvant)				
Toothbrush	633	427 (67.5)	107 (16.9)	99 (15.6)*
Miswak/fingers	235	159 (67.7)	54 (23.0)*	22 (9.4)
Dentifrices used (materials)				
Toothpaste	349	225 (64.5)	48 (13.8)	76 (21.8)***
Charcoal powder	519	361 (69.6)	113 (21.8)**	45 (8.7)
Dental attendance				
Never	763	528 (69.2)**	153 (20.1)**	82 (10.7)
Once/year or more	105	58 (55.2)	8 (7.6)	39 (37.1)***

*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$ (chi-square test of significance).

treatment, root canal treatment and fixed prosthesis is expensive for the general population. For example, root canal treatment per single tooth root is about US$55, whereas 36% of the nation lives below US$1 per day. Therefore, the amount of people that can receive such kind of service is limited. On the other hand, the other treatments including tooth extraction or removable denture application are relatively cheap, and the Dhaka Dental College Hospital, the biggest Government Dental College Hospital in Bangladesh, provides these kinds of treatments without any charge as a public health service. In addition, about 90% of the population lives in rural areas, where they cannot receive any

Table 4 Stepwise logistic regression modelling for tooth loss due to caries

Variable	Regression coefficient	*P* value	Odds ratio	Confidence limits
Age				
11 to 50 years			1	
≥ 51 years	−2.161	0.0001	0.115	0.073–0.182
Extracted tooth				
Anterior			1	
Posterior	0.512	0.013	1.669	1.113–2.501
Consumption of sweet foods				
1 to 3 times/week			1	
> 3 times/week	2.353	0.0001	10.517	6.896–16.039
Consumption of sugary drinks				
1 to 3 times/week			1	
> 3 times/week	1.477	0.0001	4.379	2.195–8.738
Frequency of teeth cleaning				
≤ once/day			1	
> once/day	−0.802	0.007	0.448	0.251–0.801
Dental attendance				
Never			1	
Once/year or more	−0.830	0.004	0.436	0.249–0.764

Table 5 Stepwise logistic regression modelling for tooth loss due to periodontal disease

Variable	Regression coefficient	*P* value	Odds ratio	Confidence limits
Age				
11 to 50 years			1	
≥ 51 years	2.392	0.001	10.932	6.458–18.505
Education				
Secondary level or less			1	
Higher than secondary level	0.873	0.018	0.418	0.203–0.859
Extracted tooth				
Anterior			1	
Posterior	−0.593	0.024	0.553	0.331–0.924
Consumption of sweet foods				
1 to 3 times/week			1	
> 3 times/week	−2.238	0.001	0.107	0.057–0.199
History of smoking				
Non-smoker			1	
Recent smoker	0.621	0.032	1.860	1.053–3.286
Previous smoker	0.816	0.145	2.262	0.755–6.780
History of betel quid chewing				
Absence			1	
Presence	2.097	0.0001	8.146	4.746–13.980
Method of teeth cleaning (adjuvant)				
Toothbrush			1	
Miswak/fingers	1.363	0.001	3.908	2.135–7.151
Dentifrices used				
Toothpaste			1	
Powder/charcoal	0.604	0.024	1.829	1.082–3.091

dental health services. Therefore, the majority of people with emergency dental problems visit the Government Dental College Hospital to receive free dental treatment, indicating that patients participated in this study at their own wish and could be a true representative of poor Bangladeshi population.

The methodology for classifying extractions used in the present study has been used in previous studies (Murray et al, 1996; Hull et al, 1997; Chestnutt et al, 2000; McCaul et al, 2001; Sayegh et al, 2004; Oginni, 2005; Da'ameh, 2006). The results are, therefore, comparable. In the present study, 67.5% of teeth were lost due to caries, indicating that caries remains a major problem in this Bangladeshi population. This percentage is higher than the percentages found in recent studies conducted in developing countries, including Jordan (46.9% – Sayegh et al, 2004), Nigeria (56.4% – Oginni, 2005), Afghanistan (59.2% – Da'ameh, 2006) and Kuwait (43.7% – Al-Shammari et al, 2006). One of the possible reasons for this difference may be that our subjects were poor inhabitants of slum areas. The Nigerian study population looked at suburban residents who were treated in a fee-paying hospital (Oginni, 2005). Compared with developed countries such as the UK (37% – Hull et al, 1997), Canada (28.9% – Murray et al, 1996), Italy (34.4% – Angelillo et al, 1996) and Germany (20.7% – Reich and Hiller, 1993), the percentage of caries is shown to be much lower than that of this study. These differences may be due to variation of study designs or differences in practice patterns and attitudes towards the retention of teeth by both the patients and the dental care providers in different countries. The study population used by the authors tended to seek treatment only at the onset of severe pain in caries lesions when preventive and conservative treatment options are not presented to them. Although these problems were encountered in some European countries a few decades ago, the efficient implementation of caries preventive measures (especially fluoridation) has reduced the incidence of dental caries (Reich, 2001). However, no such attempt has been made in Bangladesh.

Pulpitis has been reported to be the dominant reason for patients seeking dental care (Vignarajah, 1993). In this study, 69.1% of all caries extractions were performed because of pulpitis. Of course, extraction is not always the best choice. As described previously, restorative treatment in Bangladesh is very expensive and mainly provided by the private sector. The poor population cannot afford to receive conservative treatments and tooth extraction is not always the best option in case of pulpitis, severe periodontitis or dental caries. Financial abilities or dental IQ of the patients is also a deciding factor in tooth extraction. It is possible that some teeth were extracted despite the fact the prognosis was not hopeless. In other words, the patient's willingness to receive prompt and free treatment was the main reason for tooth extraction. It might have been better to use 'patient willingness' as another reason for tooth extraction. However, in this study, we wanted to know the type of disease that enforced the subjects to visit dental hospital to receive free dental treatment.

This study showed that higher frequencies of intake of sweet food and drinks were associated with tooth loss due to caries. This trend has been commonly accepted in developing countries where sugar consumption has been increasing (Van Palenstein Helderman et al, 1996). Therefore, the result is not surprising. However, according to WHO (2002), mean per capita consumption of sugar in Bangladeshi adults was 2.7 kg, which is greater than the amounts consumed in other Asian countries such as Afghanistan (2.0 kg), Myanmar (2.0 kg) and Korea (2.6 kg). Bangladeshi people have little knowledge of cariogenic foods and frequently consume cheap refined carbohydrates (e.g., local sugar items such as sticky chocolate and caramel). It is possible that this population is more likely to be affected by dental caries compared with people in other developing countries. Changing the dietary pattern by effective dietary counselling and encouraging patients to consume intrinsic sugars and starchy foods are needed (Daly et al, 2003). In addition, malnutrition increases caries risk in primary teeth and also in permanent teeth (Van Palenstein Helderman et al, 1996). Alvarez et al (1993) found that a single, moderate malnutrition episode occurring in infancy resulted in an increased incidence of dental caries.

Periodontal disease was the second most frequent reason for extraction (18.5% of the total teeth extracted). Higher rates of tooth loss due to periodontitis have been reported in Jordan (33% – Haddad et al, 1999) and in Ontario (36% – Murray et al, 1996). One possible reason for the discrepancy between the results of this study and other studies may be the difference in the study period. The survey period in the above two studies was only 2 weeks, and the subjects regularly visited dental clinics. As two or more teeth extractions in one visit are more likely to be due to periodontal disease (Murray et al, 1996), the percentage of tooth loss due to periodontal disease may have increased in those short-period studies. Another reason may be that poor Bangladeshi people do not want to visit a dental

hospital for periodontal reasons and would rather pull out a tooth by themselves when it is mobile.

It is well recognised that smoking and betel quid chewing have adverse effects on periodontal health (Ling et al, 2001; Teng et al, 2003). In this study, the odds ratio for tooth loss due to periodontal disease was much greater in betel quid chewers (OR = 8.15) compared with smokers (OR = 1.86). Betel quid chewing is an integral part of the culture of Bangladeshi adults (Van Palenstein Helderman et al, 1996). More effort should be made to educate people not to habitually chew betel quid with the aim of preventing periodontal disease as well as oral cancer. Although the reason was not clearly stated, it was suggested that evidence of a lifetime's history of betel quid chewing had an impact on caries levels in a Bangladeshi population living in the UK (Williams et al, 1996). However, this study did not reveal any association between betel quid chewing and tooth loss due to caries. Further investigation is needed to determine the role of betel quid chewing in the process of caries progression.

Traditional oral hygiene methods such as the use of miswak and using the fingers with toothpowder/charcoal are commonly used in Bangladesh rather than using a toothbrush and toothpaste. Logistic regression analysis showed that subjects with a history of tooth cleaning once per day or less by using miswak or their fingers and using toothpowder or charcoal had more tooth losses due to caries and periodontal disease compared with subjects who had a history of tooth cleaning more than once per day with a toothbrush and toothpaste. However, limited availability and the comparatively high costs of oral hygiene aids (toothbrush, interdental brush, fluoride toothpaste, etc.) is a problem in this population (Arvidson-Bufano and Holm, 1990).

Education has also been associated with tooth loss (Burt et al, 1990; Susin et al, 2005). In this study, educational level was found to be significantly associated with periodontal reasons for tooth extraction. The reason why educational level is not significantly associated with dental caries is not clear. Subjects with a higher level of education have a higher economic status and are more likely to have conservative dental treatment to retain their teeth (Susin et al, 2005).

Because of limited time and man power, the authors used the self-applied questionnaire. However, it is hard to collect much information through a self-applied questionnaire and it might have been better to use an interviewing method. However, to increase accuracy, before tooth extraction, the patients were asked to clarify when an unclear answer was seen in the questionnaire.

CONCLUSIONS

Dental caries and its sequelae are the main reasons for tooth extraction in people receiving free dental treatment in Bangladesh. The risk indicators for tooth loss due to dental caries and periodontal disease were age, frequent consumption of sweets, snacks and soft drinks, betel quid chewing, smoking, oral hygiene behaviour and dental attendance pattern. Levels of dental awareness generally need to be increased in Bangladeshi adults. A reduction in tooth loss in Bangladeshi adults may be achieved by implementation of community programmes for the prevention and treatment of dental caries and periodontal disease. Effective low-cost interventions, such as regularly brushing the teeth after taking sweet food and refraining from betel quid chewing, could also be promoted.

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