Association between Traditional Oral Hygiene Methods with Tooth Wear, Gingival Bleeding, and Recession: A Descriptive Cross-Sectional Study

Abstract

Background: Oral hygiene maintenance is crucial for the prevention of various oral diseases. Oral hygiene practices across the country vary largely and people in peri-urban and rural areas use traditional methods of oral hygiene like powders, bark, oil, and salt etc. Their effect on oral soft and hard tissues need to be studied to understand their beneficial and/or harmful effects on maintenance of oral hygiene and prevention or causation of oral diseases. Objectives: This study aimed to assess the plaque-cleaning efficacy, gingival bleeding, recession and tooth wear with different traditional oral hygiene methods as compared to use of toothpaste-toothbrush, the most accepted method of oral hygiene practice. Study Design: Hospital based cross sectional analytical study. Results: Total 1062 traditional oral hygiene method users were compared with same number of toothpaste-brush users. The maximum number in the former group used tooth powder (76%) as compared to other indigenous methods, such as use of bark of trees etc and out of tooth powder users; almost 75% reported using red toothpowder. The plaque scores and gingival bleeding & recession were found to be more in traditional oral hygiene method users. The toothwear was also more severe among the toothpowder users. Conclusions: Traditional methods were found to be inferior in plaque control as was documented by increased bleeding and gingival recession. Its effect on hard tissues of teeth was very damaging with higher tooth wear scores on all surfaces.

Keywords: Gingival bleeding, gingival recession, oral hygiene methods, tooth wear, toothpowders

Introduction

India is a vast country with a large population of over 1.27 billion people; 70% resides in rural areas and a vast majority in urban area resides in slums or the less developed peri-urban areas.[1] Traditional methods of oral hygiene practices in India include commercial toothpowders or custom made charcoal or tobacco-based toothpowders, bark of neem or mango tree, or simply water and finger method.[2] These are mostly used in rural and semi-urban areas, especially in slums. However, even in urban areas, people with lower literacy level and lower socioeconomic groups often use traditional oral hygiene methods, as these are comparatively cheaper and also due to certain misconceptions regarding their beneficial effects.[3]

According to the Dental Council of India survey of 2003, 31.3% of rural and 15.1% of urban respondents in the age group of 35–44 years used toothpowder and approximately 3.7% urban and 18.8% rural respondents used datun (tree stick) for cleaning their teeth.[3] In our clinical experience, it was observed that use of these products, even for short duration of 6–12 months, had resulted in excessive tooth wear with the result that clinical crown height was reduced, bite was collapsed, and exposure of dentin and sometimes even pulp caused chronic apical abscesses. Another disturbing finding was that such extensive tooth wear was observed in comparatively younger age group, i.e., in their third or fourth decade of life, sometimes even in their 20s. Such excessive tooth wear could be explained by the theory of “Tribological wear,” i.e., friction, lubrication, and wear. The “softening effect” of dentifrices and mechanical action of rubbing can lead to increased and faster removal of tooth tissue.

Many toothpowders claim to have several beneficial effects, such as controlling the bleeding from gums, preventing dental caries, reducing sensitivity, and causing teeth whitening. However, in contrast to the claims made, extensive tooth substance loss, leading to crippled dentition, was...
observed in our clinical practice. Along with this, poor plaque control, gingival recession, and periodontal disease were also observed in individuals using traditional oral hygiene methods.

The extensive and generalized tooth wear requires fillings, endodontic treatment, and sometimes even extraction of teeth and their subsequent replacement. In few cases, it requires highly technique-sensitive procedures of full-mouth rehabilitation, where the entire occlusion needs to be reestablished and restored. All these procedures place additional economic burden, are time-consuming, and require multiple sittings, leading to loss of precious man-hours, besides being completely avoidable.

In view of the above clinical observations and contrary claims by toothpowder industry, it was planned to conduct a descriptive cross-sectional study to evaluate the impact of these traditional oral hygiene methods on tooth substance loss, gingival recession, and gingival bleeding (as an indirect measure of their plaque-removing ability).

**Methodology**

The study population: The study was conducted at a tertiary care institute in north India between January and September 2011. Institutional ethical clearance was obtained, and patients’ informed consent was taken. After a quick survey of patients attending OPD of the institute for 3 consecutive days, it was found that almost 21% were using traditional oral hygiene methods; the sample size was calculated as follows:

\[
n = \frac{16 \times p (100 - p)}{\text{CI}^2}
\]

\[
n = 16 \times 21 (79)/25 = 1061.76 \text{ or say } 1062
\]

(Confidence interval = 5%)

Therefore, a total of 1062 individuals using traditional oral hygiene methods and an equal number using toothpaste and toothbrush were included as controls in the study.

The traditional methods of oral hygiene included use of toothpowder with finger or with toothbrush, charcoal powder with salt/oil, bark of a tree (neem, babool, or miswak sticks), tobacco powder, or ayurvedic toothpowder (commercially available). Due to mixed use of several items for tooth cleaning, large numbers of subcategories were made initially. However, for final evaluation, segregation was done on the basis of any type of toothpowder use, tree bark or stick use, and other methods.

The WHO Oral Health assessment form (2004)\(^5\) was used for data collection. Tooth wear index given by Smith and Knight\(^6\) to measure tooth wear, Ramfjord index\(^7\) to measure gingival bleeding, Oral Hygiene Index-Simplified\(^8\) to measure debris and calculus present, and a calibrated probe to measure gingival recession from CE junction were used. The recession was graded as follows:

- 0 = No recession
- 1 = Recession <3 mm
- 2 = >3 mm but <6 mm
- 3 = >6 mm
- X = Excluded
- 9 = Not recorded.

A structured proforma was designed to record demographic details, medical history, duration and frequency of various dietary habits, and oral hygiene practices. For pre-testing and validation of proforma, 40 individuals of 18–60 years were randomly selected from the Oral Medicine Department of Centre for Dental Education and Research. They were interviewed and examined by the research officer under direct observation of the supervisors. The same individuals were examined twice and the data were entered into Microsoft Excel (MS Office 7.0). The kappa statistic was applied to ensure the operator–supervisor agreement. While interviewing the individuals, some communicator–respondent gaps and errors were noted and corrected in 3 questions. A preliminary analysis was also done to find out whether the research tools thus developed was able to answer the research question and fulfill the objectives of the study. The finalized proforma was then used for data collection. The data were entered into SPSS software for final analysis and interpretation.

**Results**

A total of 2124 individuals, 1062 each in the study and the control groups, were included in the study. The age- and gender-wise distribution of individuals is shown in Table 1. It was found that about 76% of the individuals in the study group were using toothpowder as the primary method of oral hygiene. Bark of neem, kikar, babool, or mango tree was used by 20% and only 4% were using other methods such as charcoal/tobacco powder, salt, and oil. There were a few individuals who used both, toothbrush-toothpaste along with other traditional oral hygiene methods and materials [Table 1].

**Oral Hygiene Index-Simplified**

The difference between the study and control group was calculated by independent Student’s t-test, which was

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**Table 1: Use of different traditional oral hygiene methods**

| Method | Study group | Control group |
|-------|-------------|---------------|
|       | Toothpowder | Bark of tree  | Other traditional methods | Toothpaste and brush |
|       | Male | Female | Total | Male | Female | Total | Male | Female | Total | Male | Female | Total |
|       | 458 (43.1) | 347 (32.7) | 805 (75.7) | 162 (15.3) | 53 (5.0) | 214 (20.3) | 5 (0.5) | 38 (3.5) | 43 (4.0) | 558 (52.5) | 504 (47.5) | 1062 (100) |
found statistically significant \((P = 0.000)\). The traditional methods compared very poorly with toothpaste-toothbrush method [Table 2].

**Gingival recession and bleeding**

There was statistically significant difference in gingival recession \((P = 0.000)\) and bleeding between the two groups \((P = 0.000)\), being much higher in study group as compared to the control group [Tables 3 and 4].

**Tooth wear**

It was analyzed by applying one-way ANOVA and was found significantly higher on all surfaces: buccal, lingual, cervical, and occlusal \((P = 0.000)\) in the study group as compared to the control group [Table 5]. Tooth wear was higher in individuals above the age of 41 years (63.26%) (46.3%) as compared to those in 25 to <40 years (24.9%). However, there was only a small difference between toothpowder users (47.08%) and other traditional method users (43.96%) in severity of tooth wear (Tooth wear score higher than 3 and 4) [Table 6].

The severity of tooth wear caused by different toothpowders was also analyzed and was found to be the highest with the use of black toothpowder followed by red toothpowder [Table 7]. Although black toothpowder caused more tooth wear, the number of users was significantly lower than red toothpowder users (64 vs. 581 of total 805 toothpowder users).

### Table 2: Simplified Oral Hygiene Index score in the study and control groups

| Groups | OHI-S score | Total |
|--------|-------------|-------|
|        | Good (0-1.0) | Average (1.1-2.0) | Poor (2.1-3.0) |
| Study group, \(n\) (%) | 496 (46.7) | 219 (20.6) | 347 (32.7) | 1062 (100) |
| Control group, \(n\) (%) | 902 (84.9) | 125 (11.8) | 35 (3.3) | 1062 (100) |

\(P=0.000\). OHI-S=Simplified Oral Hygiene Index

### Table 3: Gingival recession in the study and control groups

| Group | Recession score | Total |
|-------|----------------|-------|
|       | 0 | 1 | 2 | 3 |
| Study group, \(n\) (%) | 576 (54.2) | 342 (32.2) | 139 (13.1) | 1062 (100) |
| Control group, \(n\) (%) | 873 (82.2) | 152 (14.3) | 31 (2.9) | 1062 (100) |

\(P=0.000\)

### Table 4: Bleeding in the study and control groups

| Groups | No bleeding | Bleeding gums | Total |
|--------|-------------|---------------|-------|
| Study group, \(n\) (%) | 295 (27.8) | 767 (72.2) | 1062 (100) |
| Control group, \(n\) (%) | 805 (75.8) | 257 (24.2) | 1062 (100) |

\(P=0.000\)

### Table 5: Tooth wear score between the study and control groups

| Groups | Highest tooth wear score | Total |
|--------|--------------------------|-------|
|        | 0 | 1 | 2 | 3 | 4 |       |
| Study group, \(n\) (%) | 18 (1.7) | 156 (14.7) | 396 (37.3) | 407 (38.3) | 85 (8.0) | 1062 (100) |
| Control group, \(n\) (%) | 73 (6.9) | 318 (29.9) | 407 (38.3) | 230 (21.7) | 34 (3.2) | 1062 (100) |

\(P=0.000\)

### Table 6: Tooth wear score with different toothpowders

| Tooth wear score | Total |
|-----------------|-------|
|                 | 1 | 2 | 3 | 4 | 5 |
| White, \(n\) (%) | 1 (0.89) | 18 (16.07) | 48 (42.85) | 35 (31.25) | 10 (8.9) | 112 |
| Red, \(n\) (%)   | 8 (1.37) | 81 (13.94) | 210 (36.14) | 223 (38.38) | 59 (10.13) | 581 |
| Black, \(n\) (%) | 2 (3.12) | 9 (14.06) | 18 (28.12) | 31 (48.4) | 4 (6.25) | 64 |
| More than one type, \(n\) (%) | 0 | 1 (5.26) | 10 (52.63) | 4 (21.05) | 4 (21.05) | 19 |
| Total            | 11 | 109 | 276 | 293 | 77 | 766 |

Dental plaque is an important etiological factor for the initiation of dental caries, gingivitis, and periodontitis.\(^{12-14}\) The effective removal of plaque can significantly reduce oral diseases. Use of toothbrush and toothpaste is an effective method of plaque removal. It was also shown that poor oral hygiene, dental plaque, and calculus leads to gingival recession.\(^{12-14}\)

The present study demonstrated that traditional methods of oral hygiene practices were less effective than use of toothpaste-toothbrush in their plaque removing efficacy, caused increased gingival bleeding and recession, though few earlier studies had shown that toothpowder, tree sticks, and toothbrush and paste were equally effective in plaque removal.\(^{12,13}\)

The important finding of the present study was the excessive tooth wear observed with traditional hygiene methods. Tooth wear can be localized or generalized.\(^{15-17}\) Localized tooth wear is related to habit or occupation such as pipe smoking, nut and seed cracking, nail biting, and hairpin holding.\(^{17-20}\) Generalized tooth wear is commonly related to oral hygiene methods and products used, time and frequency of teeth cleaning, brush bristle design, and...
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Several authors have tried to explain the phenomena of tooth substance loss in different ways. One hypothesis is “Tribology;” softening caused by the dentifrices, followed by removal of hard dental tissues with abrasive and gritty particles of the dentifrice [Figures 1-3]. Another hypothesis is “Biocorrosion” caused by chemical, biochemical, or electrochemical loss of tooth tissues.[21] In the present study, excessive tooth wear could be due to “Tribology” as >75% of study group individuals were using toothpowders, which are known to be coarser than the toothpaste.

The result of the present study showed that tooth wear score on all surfaces was significantly higher in all form of traditional oral hygiene methods; the maximum is associated with the use of toothpowders, as compared to those who used brush and paste. According to IRS data (2011), 66% of Indian households use toothpaste, 24% use toothpowder, and 18% are nondentifrice users.[22] Toothpowder industry targets unbrushed population (who neither use toothpaste-toothbrush nor any other dentifrices) and offer a huge potential of their growth.

Of the toothpowder users, almost 75% were found to be using red toothpowder, which is reported to be containing tobacco. As it contains tobacco, its nicotine content makes its users addicted and probably its numbing (anesthetic) effect numbs the pain sensation, which allows the progression of tooth wear unchecked, without the patient suffering much pain. It is reported that 5 samples of red toothpowder that did not declare tobacco as an ingredient, when tested, were found to contain 9.3–248 mg tobacco per gram of toothpowder.[23] It is reported that use of tobacco as dentifrice among adolescents is from 6% (Goa) to 68% (Bihar).[24] The most common of the tobacco dentifrices used were creamy snuff and Lal Dant Manjan (red toothpowder).

The highest score of tooth wear among toothpowder users was found in individuals using black/red toothpowder. It is possible that these may contain coarser, gritty particles as compared to other toothpowders.

Björn[25] showed that dentifrices play a major role in causing abrasion as compared to type and design of toothbrush bristle. De Boer, Duinkerke AS, Arends[26] noted larger particle size in dentifrices leading to higher abrasion rate as compared to finer-particle dentifrices. Other study also proved that fine particles were less abrasive than the coarse particles of the same materials.[27]

| Tooth wear index | Total |
|------------------|-------|
| 0                | 14    |
| 1                | 119   |
| 2                | 293   |
| 3                | 301   |
| 4                | 78    |

| Toothpowder users | 805 |
|-------------------|-----|
| Other methods     | 257 |
| Total             | 1062|

Table 7: Comparison of tooth wear between toothpowder users and other traditional methods in the study group

In this study, the index used for recording tooth wear was the one proposed by Smith and Knight. The main drawback of the index is that the highest score on
any of the tooth will be counted as the score for that person. In case one particular tooth is affected because of some localized etiological factor, the index may give misleading interpretation. However, in the present study, the individuals were chosen as either using or not using traditional methods of oral hygiene and therefore, most of them had generalized wear pattern.

An important limitation of the study is that the etiologies of tooth wear, bleeding, and gingival recession are complex and multifactorial. Therefore, a cause–effect relationship between use of traditional methods of oral hygiene and the harmful effects observed cannot be established. At best, these could be said to be associated. Further studies are required to evaluate the abrasivity, pH, and particle size and shapes of the abrasives used in different toothpowders in a standardized laboratory setup to eliminate other confounding factors.

Conclusions

The present study documents that the traditional methods of oral hygiene such as use of toothpowders and tree sticks caused excessive tooth wear, increased gingival recession, and were also inferior in plaque control as compared to toothpaste and brush use. Although the study does not prove cause and effect theory against traditional methods of oral hygiene, it provides a significant analytical finding for further research in the direction.

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Conflicts of interest

There are no conflicts of interest.

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