

## Comparative Evaluation of Tooth Surface Abrasiveness of Herbal and Non-herbal Toothpaste.

### Abstract:

**Background:** Abrasion is the mechanical wearing of dental hard tissue and commonly affects cervical tooth structure. The main predisposing factors for abrasion are the tooth brushing method and the type of toothpaste used. Toothpaste is an important component in the etiology of abrasion. Most toothpaste contains abrasive agents for cleaning, maintaining, and improving tooth health. There are two types of toothpaste commercially available; synthetic and herbal formulations. Synthetic toothpastes typically contain abrasive agents, such as calcium phosphate, calcium carbonate, silica or hydrated silica for removing debris and stains. High amounts of abrasives in toothpastes may damage hard and soft tissues and dental restorations, leading to gingival recession, cervical abrasion and dentinal hypersensitivity. The purpose of this study is to investigate the abrasive effect of herbal toothpastes compared with non-herbal toothpaste.

**Methods:** 300 patients were randomly selected those who fulfilled the eligibility criteria. Subjects participating in this study were equally divided into 2 groups. Group A: Herbal toothpaste, Group B: Non Herbal tooth gel. The presence and type of cervical defects in each person will be diagnosing using the tooth wear index (TWI).

**Results:** Statistically significant difference was observed in value of enamel abrasion amongst Group A and B ( $p < 0.05$ ). Statistical analysis used in this study was one-way analysis of variance (ANOVA)

**Conclusions:** The least enamel abrasion was observed in non herbal tooth gel when compared with herbal toothpaste.

**Key-words:** Cervical abrasion; Herbal; Non herbal

### Introduction:

Toothpaste is a gel or paste formulation product and is used to clean and maintain oral hygiene with the aid of toothbrush. It is a common product used by the community for dental care. Tooth brushing with toothpaste is considered the major contributor to dental abrasion. [1-3] Abrasion is defined as the physical wear of dental hard tissue produced by the interaction between teeth and other materials, such as toothpaste and toothbrushes. [4, 5] In 1907 Miller was the first to state the effects of toothpaste abrasivity on dental hard tissue. [6, 7] However, the abrasivity of the toothpaste is the most important parameter that affects the abrasion process of dental hard tissue. Toothpaste abrasivity is dependent on several parameters including the type of abrasive (chemical composition), concentration, particle size, size distribution, surface structure of the abrasive particle, diluents, and the

dilution rate of toothpaste.[8, 9] There is a linear relation between abrasive wear and size and the concentration of abrasive particles. As particle size and concentration increase, abrasive wear increases as well. [10-12]

The most important component of toothpaste is its abrasive agent along with astringent, flavouring agent, desensitizing

<sup>1</sup>SIVAIBHAV TANDON, <sup>2</sup>DIYA KUMARI,  
<sup>3</sup>SYED AMAAN ALI

<sup>1-2</sup>Department of Public Health Dentistry  
Kothiwal Dental College and Research Centre, Moradabad  
<sup>3</sup>Department of Periodontics and Community Dentistry  
Dr. Z.A. Dental College, Aligarh Muslim University, Aligarh

**Address for Correspondence:** Dr. Vaibhav Tandon  
Reader,  
Moradabad, Uttar Pradesh, Postal Code: 244001, India  
Email: vaibhavtandon35@gmail.com

**Received :** 27 July, 2022, **Published :** 30 June, 2023

Access this article online	
<b>Website:</b> www.ujds.in	<b>Quick Response Code</b> 
<b>DOI:</b> https://doi.org/10.21276/ujds.2023.9.2.3	

**How to cite this article:** Vaibhav Tandon, Diya Kumari, & Syed Amaan Ali. (2023). Comparative evaluation of Tooth Surface Abrasiveness of Herbal and Non-herbal Toothpaste. UNIVERSITY JOURNAL OF DENTAL SCIENCES, 9(2). 13 - 16

agent, fluoride, antimicrobial, polishing agents and whitening agent. The cleansing effect of toothpastes depends on their abrasive and polishing agent content.[13] The Abrasives are mainly carbonates, phosphates, silica, aluminium and organic abrasives.[14] Silica possesses both the abrasion and polishing properties. The most commonly used abrasives are silica and calcium carbonate. A high quality dentifrice contains silica, but its use increases the cost and hence low quality calcium carbonate, iron oxide, etc are used to bring down the cost. High amounts of abrasives in toothpastes may damage hard and soft tissues and dental restorations, leading to gingival recession, cervical abrasion and dentinal hypersensitivity. [15-17] Herbal dentifrices normally do not contain artificial substances such as sweeteners, colours, preservatives, etc. Instead they are formulated from naturally derived components which are considered to be safe and efficient. [18] Some people prefer herbal toothpastes because their components come from natural plants and avoid the side effects of allergy irritation from synthetic formulations. The aim of this study was to evaluate the enamel surface abrasion using herbal toothpaste and non herbal tooth gel.

**Methodology:**

A sample of 300 patients who fulfilled the eligibility criteria was randomly selected from the OPD of the department of Public Health Dentistry. All 300 patients were equally divided into 2 groups each having 150 subjects. Ethical Approval was obtained from the institutional review board and signed consent form was obtained from the subjects.

Group A: Subject using herbal Tooth Paste

Group B: Subject using non herbal tooth gel

**Inclusion Criteria:**

- Age between 20 to 40 years
- Those who have given the written informed consent
- Healthy males and females with no systemic disease.
- Brush once a day using soft bristle brus
- Duration of brushing between one and two minute
- Horizontal brushing method only
- Patient not having any cervical restoration
- Duration of using gel and paste : 1 year and above

**Exclusion Criteria:**

- Orthodontic treatment
- Congenital abnormalities
- Oral lesion or conditions

- Periodontally compromised teeth
- Those who use electronic tooth brush

Before conducting the study the examiner was trained and calibrated and kappa stastical value was found to be 0.88 and the examination was performed by a single trained calibrated examiner using a standard operating light, an explorer and a mouth mirror. The presence and type of cervical defects in each person was diagnosed using the tooth wear index (TWI) by B.G.N Smith and J.K Knight in 1984.

Data description, analysis and presentation were performed using Statistical Package for social Science [SPSS version 19].

**Results:**

Table 1 shows comparison of tooth wear index in group A among male and female and it was found that there was no stastically significant differences between male and female.

	Mean	N	Std. Deviation	Sig.
Pair 1 Male	4.15	75	.800	.615
Female	3.93	75	.935	

Table 2 shows comparison of tooth wear index in group B among male and female and it was found that there was no stastically significant differences between male and female.

	Mean	N	Std. Deviation	Sig.
Pair 1 Male	1.16	75	.369	.447
Female	1.04	75	.197	

Table 3 shows comparison of tooth wear index among two groups. On comparing, it was found stastically significant between two groups (P<0.000).

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.856	1	.856	1.012	.002
Within Groups	112.904	148	.763		
Total	113.760	149			

**Discussion:**

With the return of the time honoured herbal era, several natural products have been tried against caries, gum infections, for treating dentinal hypersensitivity and tooth whitening. [18] Due to an increased awareness of indigenous medical practices in various parts of the world, the use of “herbal” medicine has engendered interest and facilitated the growth of complementary and alternative therapies in health care promotion.

Toothpaste includes hydrated silica, calcium carbonate, dicalcium phosphate dihydrate (DCPD), calcium pyrophosphate, alumina, perlite and sodium bicarbonate. They are the key ingredient for cleaning of the teeth and they function by a process termed abrasion. Abrasion can be defined as the removal of material from the bulk of the substrate, during relative movement of the abrasive and substrate and as such the term can be used to include the removal of tooth surface films, such as pellicle. There are a number of key parameters that have been demonstrated to influence the abrasion process, and include particle hardness, shape, size, size distribution and concentration. [19] There is a perpetual demand for the use of natural products and various herbal extracts have been incorporated in the dentifrices.[18]

In our study it was found that there was statistically significant difference in tooth wear index between herbal toothpaste and non herbal tooth gel. Enamel abrasivity showed more in herbal toothpaste due to the presence of Calcium carbonate which is a base component present may give a more abrasivity on enamel surface, [20] whereas non herbal tooth gel showed less abrasion due to the presence of hydrated silica and protects tooth enamel. The depth of cervical abrasion is more in herbal toothpaste as compared to non herbal tooth gel, but it is not associated with any kind of pain or severe sensitivity, it is due to the presence of Laung Oil (*Syzygium Aromaticum*) and Akarkara (*Anacyclus Pyrethrum*). **Clove oil** is a popular remedy for toothache due to its potent antiseptic and analgesic activity. Akarkara helps to reduce toothache when its powder form is rubbed on the gums and teeth.

### Conclusions:

Thus in the present study the herbal toothpaste showed more enamel abrasivity in comparison with non-herbal tooth gel.

### References:

1. Hooper S, West NX, Pickles MJ, et al. Investigation of erosion and abrasion on enamel and dentine: a model in situ using toothpastes of different abrasivity. *J Clin Periodontol* 2003;30(9):802-8.
2. Addy M, Hunter ML. Can tooth brushing damage your health? Effects on oral and dental tissues. *Int Dent J* 2003;53 Suppl 3:177-86.
3. Tellefsen G, Liljeborg A, Johannsen A, Johannsen G. The role of the toothbrush in the abrasion process. *Int J Dent Hyg* 2011;9(4):284-90.
4. Addy M, Shellis RP. Interaction between attrition,abrasion and erosion in tooth wear. *Monogr Oral Sci* 2006;20:17-31.
5. Kaifu Y, Kasai K, Townsend GC, Richards LC. Tooth wear and the "design" of the human dentition: a perspective from evolutionary medicine. *Am J Phys Anthropol* 2003;Suppl 37:47-61
6. Harte DB, Manly RS. Effect of toothbrush variables on wear of dentin produced by four abrasives. *J Dent Res* 1975;54(5):993-8.
7. Harte DB, Manly RS. Four variables affecting magnitude of dentifrice abrasiveness. *J Dent Res* 1976;55(3):322-7.
8. Schemehorn BR, Moore MH, Putt MS. Abrasion, polishing, and stain removal characteristics of various commercial dentifrices in vitro. *J Clin Dent* 2011;22(1):11-8.
9. Franzo D, Philpotts CJ, Cox TF, Joiner A. The effect of toothpaste concentration on enamel and dentine wear in vitro. *J Dent* 2010;38(12):974-9.
10. De Boer P, Duinkerke AS, Arends J. Influence of tooth paste particle size and tooth brush stiffness on dentine abrasion in vitro. *Caries Res* 1985;19(3):232-9.
11. Joiner A. Whitening toothpastes: a review of the literature. *J Dent* 2010;38 Suppl 2:e17-24.
12. Davis WB. Cleaning and polishing of teeth by brushing. *Community Dent Oral Epidemiol* 1980;8(5):237-43.
13. Craig RG. Restorative dental material. 10th Ed. St Louis: The C.V Mosby co: 2002; chap 3: 66-63.
14. Ebadifar A, Naghibi A. 2008. Comparison of 3 colourspooneh toothpaste in prevention of formation of microbial plaque. *J Dent Med Tehran Uni Med Sci.*, 55: 140 – 144.
15. Joiner A, Pickles MJ, Lynch S, Cox TF. The measurement of enamel wear by four toothpastes. *Int Dent J.* 2008 Feb;58(1):23-8.
16. Whitehead SA, Shearer AC, Watts DC, Wilson NH. Surface texture changes of a composite brushed with "tooth whitening" dentifrices. *Dental Materials.* 1996 Sep;12(5):315-18.
17. Wulknitz P. Cleaning power and abrasivity of European toothpastes. *Adv Dent Res.* 1997 Nov;11(4):576-9.
18. Dr. Karthika Krishna Kumar, Dr. Yashwanth Gowda, Dr. Veena S Pai, Dr. Ashwath H. and Dr. Roopa R Nadig. 2018. "Abrasivity of herbal and non herbal tooth paste: a profilometric study", *International Journal of Current Research*, 10, (11), 75716-75723.

19. Joiner A. The cleaning of teeth. In: Johansson I, Somasundaran P, editors. Handbook for cleaning/decontamination of surfaces, 1st ed., vol. 1. Amsterdam: Elsevier; 2007. p. 371–405
20. Shah S, Patel M, Patel N, Jadav R, Kesharani P, Hirpara V. A Comparative Evaluation Of Enamel Surface Abrasion Of Three Different Herbal Dentifrices Using A Customized Brushing Model: An In Vitro Profilometric Study. Natl J Integr Res Med 2021; Vol.12(2): 39-44