

**TONGUE BIOFILM DISRUPTION BY FRICTION RIDGES (MICROBRUSH) OF  
FINGER, MOVEMENT OF FINGERS AND WATER SWISHING**Suraj M. Math<sup>\*1</sup>, Mahantayya V. Math<sup>2</sup><sup>1</sup>Senior Clinical Fellow, Surgery, Royal Albert Edward Infirmary, Wigan, WN1 2NN, United Kingdom.<sup>2</sup>Honorary Associate Professor, Department of Physiology, MGM Medical College Navi Mumbai Maharashtra State, India.**\*Corresponding Author: Suraj M. Math**

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**ABSTRACT**

Oral diseases are the most common non communicable diseases in the world. Good oral hygiene helps to keep good oral health. Oral health can be maintained with frequent disruption of tongue biofilm by rubbing of dorsum of tongue with friction ridges(microbrush) of index and middle fingers and oral mucosa with fingers along with water swishing after intake of each meal, snack or a drink. Friction ridges are present along the length of fingers on palmar surface. There are about 150 to 200 friction ridges in the index finger and middle finger. Friction ridges are coated with natural oils and sweat. They have high density of sensory receptors and they help in removal or disruption of tongue biofilm because they help in gripping the biofilm and rubbing movement of fingers from back to front over dorsum of tongue and rotatory movement in oral cavity, hard palate, soft palate, gums, inside of cheeks over buccal mucosa, vestibule of mouth (labial vestibule and buccal vestibule) teeth and gums. Swishing with water helps to remove the debris dead cells, viscous saliva containing mucin, bacteria, viruses, proteins and carbohydrates deposited on tongue and other areas in the oral cavity. Friction ridges help as micro brush for cleaning of tongue, oral cavity, gums and teeth to keep good oral hygiene. Fingers are helpful to clean tongue and oral cavity with water.

**KEYWORDS:** Friction ridges microbrush, tongue, saliva, tongue biofilm, oral biofilm.**INTRODUCTION**

Oral health is a key indicator of overall health, well-being and quality of life. Oral diseases are the most common noncommunicable diseases worldwide, affecting an estimated 3.5 billion people. The dorsal surface of tongue is colonized by large amounts of bacteria, mostly in the presence of fissures, crypts and high mucosal papillae. Complex bacterial biofilm is present on the dorsum of tongue where periodontal pathogens are frequently found. The dorsum of the tongue acts as a reservoir of bacteria, storing 75 to 80 percent of the total bacterial population in the oral cavity.<sup>[1]</sup> Tongue cleaning aids like stainless steel tongue scraper, tongue cleaning brush and Oral health is a key indicator of overall health, well-being and quality of life. South-East Asia is home to countries which are major consumers of carcinogens causing oral cancer, such as smokeless tobacco and areca nut.<sup>[1]</sup> Oral diseases cause physical symptoms, functional limitations, and a detrimental impact on emotional, mental and social well-being<sup>[1-3]</sup> South east Asia has approximately 900 million cases of oral diseases and conditions (1): WHO global oral health meeting held at Bangkok suggested Universal

health coverage for oral health by 2030.<sup>[3]</sup>

India is facing a silent epidemic. Nearly nine out of ten Indians suffer from some kind of oral diseases. Awareness of oral health is not there even among literates. Moreover, majority of the patients are not aware that oral health has an effect on systemic health. About 45% of Indians brushed their teeth twice compared to 83% in Japan. Only about 36.7% brushed their teeth before bed.<sup>[4-6]</sup> In Jain and colleagues study Only 20% of the subjects cleaned their tongue .29% of study sample rinsed their mouth after eating a meal<sup>[5]</sup> The latest Global Burden of Disease study highlights the urgent need for improved oral health policies, and targeted interventions to curb the rising burden of oral diseases. The progress in reducing oral diseases has been minimal.<sup>[6]</sup> Water is vital for oral health because of its ability to cleanse the mouth. hydrated is essential for salivary production. Saliva is a natural defense mechanism that our bodies employ to protect teeth and gums. Drinking water helps wash away food particles and debris that can accumulate on the surface of teeth and along the gumline after eating. water does not

contribute to the growth of harmful bacteria in the mouth, making it an ideal choice for maintaining a clean oral environment. People have lack of oral hygiene awareness and there is limited knowledge of oral hygiene practices.<sup>[7]</sup> Good hydration is essential for salivary production. Saliva is a natural defence mechanism that helps to protect teeth and gums. Drinking water at regular intervals can help to keep the mouth hydrated, support saliva production, and flush away food particles and bacteria. Rinsing the mouth with water (15ml) and drinking a glass of water (200ml) cause reduction in volatile sulphur compounds (VSCs- hydrogen sulphide( $H_2S$ ), methyl mercaptan ( $CH_3SH$ )),<sup>[8]</sup> Both regimens resulted in a reduction of methyl mercaptan approximately 60%, and the reduction in hydrogen sulphide was between 30% and 50% respectively.<sup>[8]</sup> Mechanical brushing with toothpaste removes a significant number of bacteria, tongue cleaning further enhances the cleaning effects of brushing,

The tongue hygiene, combined with a healthy diet and lifestyle, could be considered for primary prevention of caries.<sup>[8]</sup> The tongue biofilm is considered to be the principal site for the generation of volatile sulphur compounds (VSC) accounting for 60–70% of the total.<sup>[9]</sup> Biofilms are aggregates of bacteria, in most cases on the tongue which contain food particles, dead cells and bacteria mixed with saliva. Vigorous swishing with water after rubbing of surfaces of oral cavity with fingers also helps to remove residual food particles and bacteria.

India faces significant challenges in oral health due to low awareness, insufficient infrastructure, and economic barriers<sup>[10]</sup> Narang metal tongue scraper are used for tongue cleaning.

The tooth and mouth cleaning has significantly improved the oral health of Americans, and it concomitantly created a competitive industry of oral hygiene products. Recently, tongue cleaning has received more attention because of the development of so called “bad breath” or “clean breath” clinics, which emphasize the various reasons why people have oral malodour and the ways to prevent this disagreeable phenomenon. From the 15th century to the 19th century, tongue cleaning was known to be practiced primarily by the affluent leisure class. More recently, during the 19th and early 20th centuries, tongue cleaning was not a popular concept, and only a few references are mentioned in the dental literature. The dorsal posterior part of tongue has a coating of millions of organisms. During swallowing, soft foods that most of us eat do not abrade the tongue coating significantly, and the resultant whitish-grey layer of debris and microorganisms remains intact. During the putrefaction of debris on the tongue, hydrogen sulphide and methyl mercaptan are produced, both of which have been related directly to oral malodour. It has been estimated that the debris in the mouth may be responsible for up to 90 percent of oral malodour. The formation of dental biofilm begins with saliva containing food particles,

minerals, and proteins. These substances provide nutrients for bacteria to grow in the mouth. Individuals with mental illness often cannot perform day to day activities due to a psychiatric or emotional disorder. Schizophrenia is one such psychiatric disorder characterized by worsening self-care ability with progressing mental illness. This disease may potentially deteriorate oral health by affecting the subject's ability to perform oral hygiene measures.

There are about 150 to 200 friction ridges in the index finger and also in middle finger. Friction ridges are coated with natural oils and sweat and they have high density of sensory receptors. They help in removal or disruption of tongue biofilm because they help in gripping the biofilm and rubbing movement of fingers from back to front over dorsum of tongue and rotatory movement in oral cavity. Friction ridges have and sweat glands and their openings are on friction ridges are located along the tops of the ridges.<sup>[15-18]</sup> (Individuals with mental illness often cannot perform day to day activities due to a psychiatric or emotional disorder. Schizophrenia is one such psychiatric disorder characterized by worsening self-care ability with progressing mental illness. This disease may potentially deteriorate oral health by affecting the subject's ability to perform oral hygiene measures. Literature on oral disease manifestations in schizophrenia is limited. Lack of desire for oral health care as well as generally poor awareness of oral health issues in these patients, compounded further by side effects of medications, may complicate dental management in schizophrenic patients.

## MATERIALS AND METHODS

Friction ridges are present on palmar surface of all fingers. There are about 150 to 200 friction ridges in the index finger and also in middle finger. Friction ridges are coated with natural oils and sweat and they have high density of sensory receptors. They help in removal or disruption of tongue biofilm because they help in gripping the biofilm and rubbing movement of fingers from back to front over dorsum of tongue and rotatory movement in oral cavity. Friction ridges have and sweat glands and their openings are on friction ridges and they are located along the tops of the ridges. In a study by Matsuda et al use of brush for the purpose of tongue cleaning, 346 (64.9%) participants replied, "to remove the tongue stain", 192 (36.0%) participants replied, "to remove the tongue coating", and 240 (45.0%) participants replied, "to manage halitosis."<sup>[16]</sup> Chhaliyil and colleagues have observed that GIFTS method helps in frequent disruption of tongue biofilm (tongue coating) and reduces damaging bacteria in the dental microbiota.<sup>[19]</sup>

In this modified GIFTS method --the friction ridges of fingers (index finger, middle finger and thumb) help like a microbrush and this can be used when tooth brush and tooth paste are not accessible for tongue and oral cleaning. The tongue cleaning can be done easily with

palmar surface of both index and middle finger (which provide larger area where friction ridges are present). The rubbing of mucosa of oral cavity with friction ridges with water helps in removal of deposit from the dorsal surface of tongue, and other parts of oral cavity. The deposit is visible on fingertip of index finger. Gums and teeth can be cleaned with index finger and hard plate and soft palate can be cleaned with thumb and index finger.

The minor changes in the global burden of oral diseases over the past 30 years demonstrate that past and current efforts to control oral diseases have not been successful and that different approaches are needed.

The tongue surface is colonized by large amounts of bacteria, mostly in the presence of fissures, crypts and high mucosal papillae. These anatomical niches create an environmental condition where microorganisms are embedded and well-protected from the flushing action of the saliva. More than 100 bacterial species were found attached to a single epithelial cell on the dorsum of the tongue, whereas only about 25 bacteria adhere to each cell in other areas of the oral cavity.<sup>[9]</sup> India faces significant challenges in oral health due to low awareness, insufficient infrastructure, and economic barriers. Strengthening preventive strategies, increasing public-private partnerships, and oral health education can dramatically reduce costs to keep good oral hygiene.<sup>[10]</sup> Therefore, for frequent cleaning methods that cause minimal abrasion of teeth are ideal for oral hygiene,

Ridge density for females ranged from 12 to 15.9 ridges/25mm<sup>2</sup> with a mean of 14.198 ridges/25 mm<sup>2</sup> and for males from 9.6 to 12.5 ridges/25mm<sup>2</sup>. Friction ridges serve as oral brush as they help to clean the oral cavity (tongue, gums, teeth hard palate and soft palate) with the help of water to swish. Friction ridge skin is slightly elastic in nature and assists in gripping objects and surfaces. It has been recognized as valuable and reliable for personal identification. While the surface of the epidermis has alternating ridges and furrows, the bottom of the epidermis (where it is attached to the dermis), has alternating primary and secondary ridges. The primary ridges of the epidermis correspond to the surface ridges. The secondary ridges of the epidermis correspond to the surface furrow. Fingerprint is an impression of the friction ridges of the finger-ball.<sup>[11-14]</sup> Water swishing has an important role keeping good oral hygiene.<sup>[16,17]</sup> Salivary glands massage program increases the salivary flow rate.<sup>[18]</sup> The salivary-gland and oral-mucosa massage helps in alleviating xerostomia in patients with schizophrenia.<sup>[19]</sup> Oral health care by dental hygienists reduced respiratory infections in elderly persons requiring nursing care.<sup>[20]</sup>

Tongue cleaning helps to protect elderly against respiratory infections and oral care could decrease the risk of pneumonia in the institutionalized elderly.<sup>[20,21]</sup> Swishing with water helps in removal of food particles, debris, dead cells and bacteria present in the mouth after

a meal, snack or a soft drink.<sup>[22,23]</sup>

## RESULTS, DISCUSSION AND CONCLUSION

With GIFTS method Chhaliyil and colleagues have observed a significant reduction in total bacterial count in saliva than with other methods like daily brushing, twice daily using tooth paste,

Oral health care by using friction ridges of fingers along with water helps to maintain good oral health. Oral diseases affect the quality of life of more than half of children and adolescents globally. Huge variations were observed in the prevalence of oral diseases across different regions. The Oral Health Foundation is drawing attention to the often-overlooked link between oral health and mental well-being (increases self-confidence, self-esteem and more comfortable in social situations) according to Dr. Nigel Carter, Chief Executive of the Oral Health Foundation).<sup>[24]</sup> Friction ridges also have an important role in massage and manipulation in physiotherapy.

Individuals with mental illness often cannot perform day to day activities due to a psychiatric or emotional disorder. Schizophrenia is one such psychiatric disorder characterized by worsening self-care ability with progressing mental illness. This disease may potentially deteriorate oral health by affecting the subject's ability to perform oral hygiene measures. Massage of oral mucosa and salivary glands increases salivary flow in the oral cavity this helps to remove residual food particles, mucin and bacteria.<sup>[25-27]</sup>

Oral diseases affect the oral health-related quality of life of large number of children and adolescents globally.<sup>[28]</sup> National Smile Month aims to unite the dental profession, community partners, and sponsors in promoting better oral health for all. Dr Carter also highlighted a key concern around infant nutrition to promote healthier options right from the start (29, the GIFTS method is a safe way to remove food particles debris, thick saliva and bacteria in the oral cavity that might cause acid damage and plaque formation.<sup>[19]</sup> Using a tongue scraper twice a day noticeably decreased the concentration of bacteria, volatile sulphur compounds, that cause bad breath, in comparison to just tooth brushing<sup>[6]</sup> Encouraging the use of tongue cleaners can bring about important public health advantages from a preventative healthcare point of view. Educating individuals about the use of friction ridges in finger for massaging oral mucosa and tongue significantly improves tongue hygiene. and swishing water enables them to improve their oral health.

In summary, a clean tongue creates a sense of freshness, but at the same time assures a pleasant breath as well as promote overall health. Prioritizing oral hygiene, including tongue cleaning, is crucial for achieving good health and well-being, contributing significantly to SDG 3: Good Health and Well-being. Oral hygiene is

important for oral and mental health and to prevent oral diseases. Oral hygiene, including tongue cleaning, is crucial for achieving good health and well-being to SDG 3(Sustainable Development Goal 3 (SDG 3 of the United Nations 2015, this helps aims to ensure healthy lives and promote well-being at all ages.<sup>[30]</sup>

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