

# Chewable Toothbrush: A New Horizon In Dental Plaque Removal For Diabetics Patients

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## **ABSTRACT:**

Diabetic patients are more prone to get gingival & periodontal diseases as their body glycemic level aggravates the periodontal destruction caused by plaque and calculus, good plaque control facilitates good gingival and periodontal health, prevents tooth decay, and preserves oral health. Thus oral hygiene is the key to the prevention and successful treatment of inflammatory periodontal disease. Toothbrushes being an adjunct part of daily life are the oldest and simplest method for maintaining oral hygiene. There has been an evolution from the ancient chew sticks to the modern era of smart toothbrushes. Among such toothbrushes, one such popular one is the chewable toothbrush. A chewable toothbrush is a miniature plastic molded toothbrush that can be placed inside the mouth no water is available. They are most commonly available from bathroom vending machines and are available in different flavors such as mint or bubblegum and should be disposed of after use. These brushes prove to be quite handy for travelers and are available commercially in various forms. Studies have also shown its effectiveness in plaque removal when used in care-dependent elderly population who are more prone to have diabetes, school children, including children with disabilities.

**KEYWORDS:** Toothbrushing, Dental plaque, Oral hygiene, Chewable toothbrush.

## Introduction:

Dental plaque is defined as the biofilm adhering to tooth surfaces that are formed by soft deposits in the oral cavity.<sup>1</sup> Microbial plaque plays a dominant role in the causation of both dental caries and periodontal disease. Patients suffering from diabetes mellitus are more prone to get gingival & periodontal diseases, as it aggravates the periodontal destruction caused by dental plaque and calculus when compared with healthy individuals, a good plaque control facilitates good gingival and periodontal health, prevents tooth decay, and preserves oral health. Thus oral hygiene is the key to the prevention and successful treatment of inflammatory periodontal disease.

Toothbrushes being an adjunct part of daily life are the oldest and simplest method for maintaining oral hygiene. The toothbrush as we know it today was not invented until 1938. However, early forms of toothbrushes have been in existence since 3000 BC. Ancient civilizations used a "chew stick" which was a thin twig with a frayed end. These 'chewsticks' were rubbed against the teeth.<sup>[2]</sup>

There are mainly two types of toothbrushes: manual and powered. The size and shape of the brush should fit our mouth comfortably, allowing us to reach all areas easily. Powered toothbrushes were introduced to facilitate tooth cleaning in children.<sup>[1]</sup> However, studies have found manual toothbrushes to be equally effective.<sup>[3-4]</sup> In this new era of "smart toothbrushes", a newer form- chewable toothbrush has been in the limelight for quite some time now. This review discusses the historical background of toothbrushes along with inventions of its newer forms, composition, and uses of chewable toothbrushes in diabetic patients and healthy individuals, its commercial availability, and various studies conducted to find its effectiveness in plaque removal.

## Historical background of toothbrushes:

Toothbrushing tools date back to **3500-3000 BC** when the Babylonians and the Egyptians made a brush by fraying the end of a twig. Tombs of the ancient Egyptians have been found containing tooth sticks alongside their owners.

Around **1600BC**, the Chinese developed "**chewing sticks**" which were made from aromatic tree twigs to freshen breath. The Chinese are believed to have invented the first natural bristle toothbrush made from the bristles from pigs' necks in the 15th century, with the bristles attached to a bone or bamboo handle. When it was brought from China to Europe, this design was adapted and often used softer horsehairs which many Europeans preferred. Other designs in Europe used feathers.

The first toothbrush of a more modern design was made by **William Addis** in England around **1780** – the handle was carved from cattle bone and the brush portion was still made from swine bristles. In **1844**, the first **3-row bristle brush** was designed.

Natural bristles were the only source of bristles until Du Pont invented nylon. The invention of nylon started the development of the **truly modern toothbrush** in **1938**, and by the **1950s** softer **nylon bristles** were being made, as people preferred these.

The first electric toothbrush was made in 1939 and the first electric toothbrush in the US was the Broxodont in 1960.

Today, both manual and electric toothbrushes come in many shapes and sizes and are typically made of plastic molded handles and nylon bristles. The most recent toothbrush models include handles that are straight, angled, curved, and contoured with grips and soft rubber areas to make them easier to hold and use.

However, with time different other modifications of toothbrushes have been introduced. The **21st century** is considered the era of smart toothbrushes. Some of them are:

#### **A) Ultrasonic toothbrushes:**

Ultrasonic toothbrushes work motionlessly with their non-abrasive Nano-bubble toothpaste to kill bacteria, reduce periodontal disease and remove stains. It destroyed bacteria, removed stains of coffee, wine, nicotine, and food, returned teeth to their natural white color within days. It worked under braces, cleaning and removing stains.

#### **B) Ultra Violet Sterilized Toothbrush System:**

On average 10,000,000 bacteria live on a toothbrush. With this UV Sterilized toothbrush system, UV base will help to sterilize the toothbrush whenever it is placed. Toothbrushes have color-coding.

#### **C) Ionic Toothbrush:**

It Uses Light and Water to Clean Teeth. Ionic toothbrushes were developed in Japan and now have become increasingly popular in the US and other countries.

#### **D) End-tufted brush:**

An end-tufted brush is a type of toothbrush used specifically for cleaning along the gumline adjacent to the teeth.

#### **E) Sulcabrush:**

It is a type of toothbrush used specifically for cleaning along the gumline adjacent to the teeth. The bristles are usually shaped in a pointed arrow pattern to allow closer adaptation to the gums<sup>2</sup>.

#### **F) Chewable toothbrushes:**

A chewable toothbrush is a miniature plastic molded toothbrush that can be placed inside the mouth. While not commonly used they are useful to travelers and are sometimes available from bathroom vending machines.

## Chewable toothbrush:-

A chewable toothbrush is a miniature plastic molded toothbrush that can be used when no water is available [Figure 1]. They tend to be very small, but should not be swallowed. They are most commonly available from bathroom vending machines <sup>3</sup>. They are available in different flavors such as mint or bubblegum and should be disposed of after use <sup>4</sup>. Other types of disposable toothbrushes include those that are a small breakable plastic ball of toothpaste on the bristles which can be used without water and prove to be quite handy to travelers <sup>5</sup>.

These brushes should be used between the teeth, to swivel from left to right and then the tongue needs to be used to move the brush around the mouth similar to the way one would use chewing gum.



**Figure 1:** Chewable brush

## Commercial Availability:

- Colgate wisp (maxfresh) minibrush is available in peppermint flavor.
- ROLLY (USA) produced the world's smallest chewable toothbrush i.e. sugar-free containing xylitol which is beneficial for diabetic patients & fluoride.
- The chewable toothbrush (CB) (Fuzzy brush, Fuzzy Brush Ltd, London, UK) is a recent innovation in oral hygiene. [Figure 2]. This disposable, all-in-one brush is comprised of xylitol, flavoring, aqua, and soluble fiber i.e. Polydextrose <sup>1</sup>.





**Figure 2: Different Commercially available brands of chewable toothbrushes**

### **Studies related to Chewable toothbrush:-**

*Myoken Y, Nishida T et al*<sup>6</sup> in 2005 conducted a pilot study on Plaque removal with an experimental chewable toothbrush and a control manual toothbrush in a care dependent elderly population. From this study, they concluded that an experimental brush was able to remove a significant amount of plaque, particularly on the lingual surfaces. Thus it demonstrated the effectiveness of chewable brushes for plaque removal when used by care dependent elderly subjects.

*Nurhan Ozalp et al*<sup>1</sup> in 2015 also conducted a pilot study on 20 patients aged 10-12 years on the effectiveness of chewable brush in removing plaque in children. From the study, it was concluded that there were no adverse clinical signs or symptoms caused by the toothbrushes and the chewable brush may be an appropriate oral hygiene adjunct for school children, including children with disabilities.

## Conclusion

In this era of "smart toothbrushes", the chewable toothbrush can be an effective tool in plaque removal in diabetic patients, where the regular toothbrush causes more gingival bleedings in diabetic patients and are usually used along with toothpaste that contains sugar. It can also be used for travelers and care dependant elderly population. Very few studies have been conducted to evaluate its effectiveness in plaque removal and so further studies need to be conducted on a variety of age groups. A new horizon of chewable toothbrushes can hog the limelight in the years to come<sup>7</sup>.

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