INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Review Article

Chewable Toothpaste Tablets: A Novel Oral Hygiene Solution

Harshdeep Patil*, Yogeshwar Chaudhari, Gaurav Zore, Aadinath Ware, Shyam Zunzulde

[1,3,4,5]*Department Of Pharmaceutics, Poona college of Pharmacy Pune-411038.*
[2]*Department Of Pharmaceutics, Dr. Uttamrao Mahajan College of Pharmacy Chalisgaon-424101*

ARTICLE INFO

Published: 12 April. 2025
Keywords:
Chewable tablets, Toothpaste, Plaque, Halitosis, Eco-friendly, Sustainability.
DOI:
10.5281/zenodo.15205976

ABSTRACT

Nowadays, we're all conscious about oral hygiene and the products we use. The market is flooded with the medicated and herbal toothpastes, each promising better results. However, we often overlook the environmental impact of these products. Most toothpastes containers and closers end up in landfills without much throughout their reusability, where they take hundreds of years to decompose while other countries are increasingly adopting eco-friendly practices and promoting reusable products, India still lags behind in this regard. A recent report suggests significant rise in demand for toothpaste tablets, which consider a more sustainable alternative to traditional toothpaste tubes. This shift towards eco-friendly dental products is a positive trend but India needs to implement stricter regulation to ensures sustainable practices in the dental industry. This review article aims to explore the potential of chewable tablet toothpaste as a solution to reduce plastic waste, improve dental health, and promote co-effective, convenient and eco-friendly alternative to traditional and provide oral care.

INTRODUCTION

The UK's annual toothpaste consumption (300 million) results in a massive amount of plastic waste. If laid end-to-end, the tubes would circle the Earth twice. These tubes are often made of multiple types of plastic and may contain a metal layer, making them difficult to recycle. (5) Toothpaste tubes take centuries to decompose, and the traditional tube format has remained largely unchanged. To address this, chewable toothpaste tablets offer a more sustainable alternative. These tablets are easy to use, affordable, and eco-friendly, reducing plastic waste, this tablets small pill shaped and inexpensive. While they've gained popularity in other countries, their reception in India has been limited. (2,5) Toothpaste has a long history, dating back to ancient China and India where early tooth cleaning methods involved

***Corresponding Author:** Harshdeep Patil
Address: Department Of Pharmaceutics, Poona college of Pharmacy Pune-411038.
Email ✉: patilharshdeep900@gmail.com
Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

natural abrasives like bones, eggshells, and clamshells. In the 19th century, modern toothpaste formulations emerged, incorporating chalk and soap. Post-World War II, advancements in detergent technology led to the use of sodium lauryl sulphate as an emulsifier. Today, the focus in toothpaste development is on the controlled release of active ingredients to prevent and treat oral diseases. (9)

Today's focus of toothpaste development is on:

* Natural and Organic Ingredients: Consumers are increasingly seeking toothpaste with fewer chemicals and more natural ingredients. This trend has led to the development of toothpaste made with plant-based extracts, essential oils, and other natural substances. (16)

* Oral Microbiome Health: Research has shown that the balance of bacteria in the mouth, known as the oral microbiome, plays a crucial role in oral health. Toothpaste manufacturers are developing products that support a healthy oral microbiome, promoting better oral health overall.(17)

* Targeted Treatments: Toothpaste is no longer just for cleaning teeth. Today, there are toothpastes designed to address specific oral health concerns, such as sensitivity, gum disease, and whitening. These targeted treatments offer more personalized oral care solutions. (1)

*Enhanced User Experience: Toothpaste manufacturers are constantly innovating to improve the user experience. This includes developing toothpastes with improved Flavors, textures, and foaming abilities. By focusing on these areas, toothpaste manufacturers are striving to provide consumers with more effective, sustainable, and enjoyable oral care products.(16,1) People with braces find it harder to maintain good oral hygiene. The brackets make it easy for food particles to get stuck, leading to plaque buildup, tartar, and cavities. Brushing is a key way to prevent this. Toothpaste helps fight plaque and calculus. Good oral health is essential for overall well-being. Despite advancements, dental caries and gum disease remain common. Streptococcus mutans is a major cause of tooth decay. Chewable tablets are a popular dosage form, especially for children and the elderly. Toothpaste is constantly evolving to address various oral health issues, including teeth whitening. However, access to dental care remains a challenge for many. (18)

Fig.1 Traditional Toothpaste Tube

Fig.2 Chewable Toothpaste Tablet

What is exactly chewable toothpaste(tablet):

Chewable toothpaste tablets are small, round discs made from natural ingredients. To use them, you simply chew the tablet, which breaks down and mixes with your saliva to form a paste. This paste can then be used to brush your teeth, just like regular toothpaste. Chewable toothpastes tablets are a newer, more environment friendly used as a alternative options for traditional toothpaste tubes. They are small, pill shaped tablets that contain all the essential ingredients of cleaning agents, polishing agents, therapeutic agents. Most of the chewable toothpaste tablets are available do not contain fluoride. Chewable toothpaste tablets are a convenient solution for people who want to brush their teeth after every meal. Traditional toothpaste tubes can be messy and inconvenient to carry around. With chewable tablets, you can easily refresh your breath and maintain good oral hygiene, anytime, anywhere.(1,4) Dentifrices, such as toothpaste, are oral hygiene products used for cleaning, maintaining, and improving dental health. Their primary function is to remove plaque and food particles from teeth through an abrasive action. Despite advancements in oral care, dental caries remains a significant public health issue, with a prevalence of 90.05% reported in a 2004 household health survey. Streptococcus mutans, a cariogenic bacterium, ferments sugars within dental plaque, producing acids that demineralize tooth enamel, leading to caries development.(1) Chewable tablets offer several advantages over traditional toothpaste formulations, including improved patient compliance, especially in paediatric and geriatric populations. They eliminate the need for water and provide a more convenient and palatable dosage form. Additionally, chewable tablets can offer faster drug onset and improved bioavailability due to the increased surface area and rapid disintegration in the oral cavity. Furthermore, they provide a distinctive product feature for marketing purposes and can enhance the therapeutic efficacy of certain medications through size reduction during mastication. (1)

Halitosis:

Bad breath(halistosis) is an unpleasant odor in exhaled air, generally not a serious issue also known as halitosis or oral malodor, is a common problem that can be caused by various factors. Poor dental hygiene, gum disease, and a coated tongue are the most common culprits. The term "halitosis" is derived from Latin and Greek, meaning "diseased breath."(6,2) Ancient civilizations also grappled with bad breath. The Ebers Papyrus, an ancient Egyptian medical text, suggests using incense, cinnamon, myrrh, and honey tablets as remedies. Hippocratic medicine, from ancient Greece, recommended mouthwash made from red wine and spices. They also suggested marble powder for women with bad breath. In ancient China, cloves were chewed to freshen breath, while the traditional chewing stick, Miswak, was used in other cultures. Bad breath, also known as halitosis or oral malodor, is a common problem that can be caused by various factors. Poor dental hygiene, gum disease, and a coated tongue are the most common culprits. The term "halitosis" is derived from Latin and Greek, meaning "diseased breath."(1,11) Halitosis, or bad breath, is a common oral health issue characterized by persistent unpleasant breath odor. It can stem from various causes, including dietary choices, poor oral hygiene practices, improper denture care, reduced saliva production, tobacco use, or underlying medical conditions. Specific dental problems such as deep cavities, gum disease, oral infections, issues around dental implants, inflamed wisdom teeth, mouth sores, food particles, decreased saliva flow, and especially a coated

tongue, contribute to halitosis in the majority of cases. (9) Bad breath, a problem documented for millennia, can significantly impact one's social and emotional well-being. In most cases, the root cause lies within the oral cavity, often linked to dental decay, oral infections, gum disease, fungal infections, food particles, reduced saliva production, and particularly, tongue coating. Individuals suffering from halitosis often experience psychological distress, resorting to temporary fixes like mints, gum, frequent brushing, and mouthwash. However, these methods fail to address the underlying issues, necessitating a comprehensive approach. Recognized as a major social anxiety, halitosis can signal both physical health problems and psychological conditions like depression and social isolation. (1,12) A lot of people deal with bad breath, the cause of this condition are diverse, including the primary culprit is the breakdown of food particles by bacteria in the mouth. This condition has been recognized as a medical issue since the 19th century. Before the 20th century, discussions about halitosis were often based on anecdotal evidence rather than scientific research. In the 1930s, the invention of the Osmo scope allowed for a more objective assessment of breath odour, though it still relied on subjective judgment. Despite its prevalence, many individuals suffering from halitosis hesitate to seek treatment due to embarrassment. This reluctance can hinder their ability to address the underlying causes and improve their oral health.(2) Here are some causes of Halitosis: poor brushing and flossing, gum diseases, dry mouth, certain foods like onions and strong-smelling foods, smoking or tobacco.

ADVANTAGES:

1] chewable tablets are environmentally and ecologically sustainable.
2] easy and simple use while travelling.
3] reduce waste: they come in smaller, often recyclable, packaging, reducing plastic waste.
4] convenience: no need for water to rinse your brush, making them perfect for situations where water isn’t readily available.
5] fresh breath: some tablets contain ingredient that freshen breath, making them a good option for maintaining oral hygiene thought day.
6] Natural ingredient: many chewable toothpaste tablets are made up with natural ingredients, free from harsh chemicals and artificial Flavors.
7] it doesn’t required water.
8] it is alternative dosage form.
9] improves the taste and Odor of drugs, leading to better patient compliance. (1,4)

Sustainability:

Conserve the earth / environment minimizing waste, maximizing reuse, and recycling materials. We all play a role in building a sustainable future. With dwindling resources, we must be mindful of our waste and its impact on climate change. Fortunately, there are easy ways to make a difference. The key is to reduce consumption, reuse items, and recycle materials. There are countless ways to apply the principles of reduce, reuse, and recycle to our daily lives and make a genuine impact. These terms can hold different meanings for different people, depending on their individual lifestyles and consumption patterns. The importance of these concepts in your life will be influenced by your current practices and the products you use. These principles can be applied to various aspects of our lives, particularly those involving product usage. Reducing consumption, reusing items, and recycling materials are not just actions but a mindset that can be applied at any

stage of product use.(1) Buying toothpaste in large quantities can lead to cost savings and reduced waste. While extensive packaging often necessitates plastic, we can opt for more eco-friendly alternatives like jute. By leveraging social media to promote jute packaging in both rural and urban areas, we can preserve a significant number of trees each year and contribute to a greener environment. The initial step in this crucial cycle is to minimize our consumption. This involves reducing waste, buying only what we truly need, and adopting a simpler lifestyle. This principle applies not only to individuals but also to large organizations. By supporting environmentally responsible companies, we encourage innovation and push businesses to adopt sustainable practices. This can lead to a reduction in carbon emissions and reliance on traditional energy sources. Businesses can also contribute by minimizing packaging and exploring eco-friendly delivery options. Therefore, we should be mindful of our purchases, the necessity of items, the companies we buy from, their values, and ways to reduce our overall consumption. To encourage the reuse of toothpaste tubes, we can reduce their size by halving their diameter. To enhance toothpaste's effectiveness, we can remove water from its formulation. Additionally, we can introduce recyclable glass jars or containers to package toothpaste tablets for easier transportation. To reduce plastic pollution and protect marine life, consider using reusable bags for grocery shopping instead of single-use plastic bags. In the U.S. alone, billions of plastic bags end up in landfills or water bodies. By opting for reusable bags, we can promote sustainable resource use and reduce waste compared to traditional methods. Recycling is as important as reducing and reusing. When an item can no longer be reused or repurposed, it's time for responsible disposal to allow it to decompose naturally. Many paper products and household items can be recycled. Look for recycling symbols on cardboard and plastic containers. Some organizations collect used but functional items, while others offer curbside pickup for larger items. It's important to note that not all plastics are recyclable and can harm the environment. By reducing waste, we contribute to environmental sustainability. We'll delve deeper into the benefits of a waste-free lifestyle. Reducing waste helps decrease pollution by minimizing the amount of trash that ends up in landfills or oceans. By reducing consumption and minimizing waste, we can conserve natural resources for future generations. We've been wasteful for too long, and if we don't change our habits, we'll face the consequences. We use glass bottles exclusively, which are infinitely recyclable, aesthetically pleasing, and decompose naturally into sand. The aluminum lids are also infinitely recyclable and plastic-free. We ship our products in Kraft envelopes cushioned with recycled newspaper, a plastic-free, recyclable, and compostable alternative to plastic poly-mailers. Our packaging boxes are made from 100% recyclable corrugated cardboard and sealed with paper tape, a plastic-free and recyclable material. For subscription customers, we send refill packs in 100% biodegradable pouches, eliminating the need for plastic. These pouches are both compostable at home and biodegradable.(1)

DISADVANTAGES:

While chewable toothpaste tablets offer several advantages, they also come with some drawbacks:

* Unpleasant Taste and Texture: Many users find the taste and texture of chewable tablets unappealing, often describing them as chalky or having an odd aftertaste.

* Difficulty in Even Distribution: The paste formed from the tablet can be challenging to distribute evenly across all teeth, potentially leaving some areas less clean.

* Lack of Long-Term Research: Limited research exists on the long-term effectiveness of chewable tablets compared to traditional toothpaste.

* Potential for Sensitivity: Some individuals may experience sensitivity due to the abrasive nature of certain ingredients in chewable tablets.

* Higher Cost: Chewable tablets can be more expensive than traditional toothpaste, especially on a per-use basis. Also required special storage condition. It's important to consider these factors when deciding whether to switch to chewable toothpaste tablets. While they offer convenience and eco-friendliness, they may not be suitable for everyone. Consulting with a dentist can help determine the best oral hygiene practices for individual needs.(1,4)

Applications:

Here are the applications of chewable toothpaste tablets:

1. Convenient and Portable:

* Travel-friendly: Compact and lightweight, making them ideal for travel.

* Camping and Hiking: Perfect for outdoor activities where water access may be limited.

* Emergency Kits: Can be included in emergency kits for quick oral hygiene.

2. Eco-Friendly:

* Reduced Plastic Waste: Eliminates the need for plastic toothpaste tubes.

* Minimal Packaging: Often come in recyclable or compostable packaging.

3. Fresh Breath:

* Quick Refresh: Can be used on-the-go to freshen breath.

* Effective Cleaning: Removes food particles and plaque, leaving a clean mouth.

4. Unique Experience:

* Novelty: Offers a different way to clean teeth compared to traditional toothpaste.

* Sensory Experience: The act of chewing and foaming can be enjoyable for some.

5. Potential Health Benefits:

* Reduced Fluoride Exposure: Some brands offer fluoride-free options, which may be beneficial for those sensitive to fluoride.

* Natural Ingredients: Many chewable tablets are made with natural ingredients, reducing exposure to chemicals. While chewable toothpaste tablets offer several advantages, it's important to note that they may not be as effective as traditional toothpaste for everyone. It's recommended to consult with a dentist to determine the best oral hygiene practices for individual needs.(1,3)

MATERIALS AND METHODS:

1] polishing agents: The teeth cleaning tablets include a polishing agent to remove dirt and prevent cavities. This agent can be any substance that cleans teeth without damaging the underlying

tooth structure. Possible polishing agents include silica, calcium carbonate, various phosphate compounds, alumina, and resin-based materials. e.g. calcium carbonate, sodium bicarbonate Hydrated silica, microcrystalline cellulose, resinous polishing materials, calcium orthophosphate, etc.

2]Agent of healing: The toothpaste tablets can also include active ingredients to treat dental issues. These ingredients can target various problems like tooth decay, gum disease, and inflammation. Some examples of these active ingredients include:

* Antimicrobial agents: These kill or inhibit the growth of bacteria that cause dental problems.

* Anti-inflammatory substances: These reduce inflammation in the gums and oral tissues.

* Anti-calculus agents: These help prevent tartar buildup.

* Anticaries agents: These help prevent tooth decay.

e.g. fluoride, xylitol, essential oil, herbal extract, vitamins and minerals, etc.

3]Thickening Agents: The toothpaste tablets also contain thickening agents to give them a suitable consistency when they dissolve in the mouth. These agents can be natural or synthetic.

Natural thickening agents include:

* Starches

* Gums like agar, locust bean gum, guar gum, Tara gum, carrageenan, alginate, xanthan, dextran, and cellulose derivatives

* Natural gums like karaya, Arabic, and Tragacanth

Synthetic thickening agents include:

* Silicates like colloidal magnesium aluminum silicate or finely split silica. The total amount of thickening agent in the tablet composition is between 0.2% and 5.5% by weight.

4]carrying case for tablets: The toothpaste tablets also contain a tableting carrier. This is a substance that helps the tablet dissolve and break apart in the mouth. The choice of carrier depends on how well it works with the other ingredients, especially the polishing agent, and the desired properties of the final product. The carrier makes up a significant portion of the tablet, typically between 20% and 80% by weight, ideally between 38% and 65% by weight. e.g. pill bottles, Tins, Reusable pouches, travel-friendly cases.

5] oral transporter: The toothpaste tablet can include additional ingredients to improve its delivery and taste. These ingredients are called oral carriers and must be safe for human consumption. Some examples of oral carriers include:

- **Surfactants**: These help the tablet dissolve and distribute evenly in the mouth.
- **Effervescent agents:** These cause the tablet to fizz and release its ingredients more quickly.
- **Humectants:** These helps keep the tablet moist.
- **Tableting aids:** These help in the manufacturing process of the tablet.
- **Sweetening agents:** These improve the taste of the tablet.
- **Flavouring agents:** These add Flavors to the tablet.

- **Colouring agents:** These add colour to the tablet.
- **Preservatives:** These helps prevent the growth of bacteria and mold.
- **Cooling agents:** These give a cooling sensation in the mouth.
- **Buffering agents:** These helps maintain the pH of the tablet.

e.g. croscarmellose sodium, sodium starch glycolate, microcrystalline cellulose, hydroxypropyl methyllose.(1,13)

Method of preparation of chewable toothpaste tablet:

Toothpaste tablets can be made using various methods commonly used for producing traditional tablets. These methods include granulation is often preferred as it generally produces better results. However, if the ingredients allow, direct compression (without granulation)can also be used , as long as it doesn't lead to tablet defects like capping.

- **Equipment:** high speed mixer, planetary mixer, granulator, tablet press, sieves, weighing balance.

- **General considerations:**

1) **Particle Size:** Ensure appropriate particle size distribution for optimal tableting.
2) **Moisture Content:** Control moisture content to prevent sticking and capping during tableting.
3) **Tablet Hardness:** Adjust compression force to achieve desired tablet hardness.
4) **Disintegration Time:** Ensure rapid disintegration in the mouth for effective release of active ingredients.
5) **Flavour and Colour:** Select appropriate flavourings and colourings to enhance the product's appeal.
6) **Stability:** Conduct stability studies to assess the product's shelf life and ensure it maintains its quality over time. (14,15)

Fig.3 Some Marketed formulations/products

Some marketed formulations/products:

Sr.no	Brand Name	Manufacture By
1	Bite	Kind lab, CA, Toronto, U. S
2	Nature Masons	M/S Motivi Pharmaceuticals PVT.LTD.

3	Apollo Noni	HCP Wellness PVT.LTD.
4	Dent tab	Dent tabGM Bh Gerichtsrabe, Barlin, Germany
5	FORISCA	Kosmetics Lane PVT.LTD.
6	Archtek Toothpaste tablet	Archtek,USA.
7	NOBS	Biom, United states
8	Globoids Toothpaste Tablets	GloBoid, China
9	Weldental chew tab gentle whitening ToothpasteTablets Peppermint	WELdental, Carlsbads, America
10	Denttabs	Denttabs Innovative Zahnpflegegesellschaft mbH, Europe.

How to take chewable toothpaste tablets:

Two methods of application are possible:

To clean your teeth using these tablets methods:

1) **Direct Method:** Simply place the tablet in your mouth and let it dissolve.

2) **Indirect Method:** Place the tablet in your mouth, let it partially dissolve, then use your tongue to spread the dissolved tablet around your teeth to clean them. (1,13)

Future Prespective:

1. **Technological Advancements -** Advancing in the field of oral hygiene can increase the user experience as well as the efficacy of the cleaning procedure. Not only this, by the incorporation of nanotechnology for targeted dental care or probiotics can enhance oral microbiome health making the chewable toothpaste more appealing and effective.(19)
2. **Customization and Personalization** – The chewable toothpaste can be furthermore tailored as the need of the customers. For instance, children, the elderly, or individuals' consumers with unique oral health requirements like sensitivity or gum disease can have customed chewable toothpastes.(20)
3. **Sustainability Goals** – Environmental factors should also be considered for biodegradable and recyclable packaging of the chewable toothpastes essential to mitigate the environmental damage caused by plastic pollution and protect our planet's ecosystems.(21,3)
4. **Integration into Mainstream Dentistry** – Dental clinics and professionals could begin recommending chewable toothpaste tablets as part of routine oral care, especially for populations with limited access to water or traditional toothpaste.(1,2,21)
5. **Digital Innovations** – Looking at the wide use of technological devices, apps or digital trackers can be introduced to keep a track on the oral hygiene. Integrating it with the AI can provide the users with real time feedbacks, suggestion and encourage them for consistency.
6. **Collaboration with Travel and Hospitality Industries** – Chewable toothpaste tablets offer a convenient and eco-friendly solution for dental hygiene on the go. Their compact size and lack of liquid make them ideal for air travel, where liquid restrictions can be

cumbersome. Hotels can provide them as a complimentary amenity, promoting a sense of luxury and convenience. Adventure companies can include them in travel kits, catering to the needs of outdoor enthusiasts who value lightweight and versatile gear.(1)

7. **Affordable Alternatives** – With the increasing advancements in this field, the chewable toothpaste can be made more affordable and make it pocket friendly for each and every population group in the country. This would make it a sustainable oral care accessible to a broader audience.(1,2,21)
8. **Focus on Oral Disease Prevention** – Every person has different eating habits making it a bigger task to control everyone from the oral diseases. Chewable toothpastes being an convenient and affordable option, it can be promoted widely to bring the oral diseases under control. (2,1,19)
9. **Global Awareness Campaigns -** Launching international awareness campaigns highlighting the environmental and health benefits of chewable toothpaste tablets could drive global adoption. Collaborations with sustainability influencers and organizations can further amplify the message(.5,1)
10. **Partnerships with Environmental Initiatives** - Collaborations with global environmental organizations to promote chewable toothpaste tablets as part of broader waste reduction campaigns could enhance their visibility and adoption among eco-conscious consumers.(5,1,3)

Conflict of Interest:

There are no conflicts of interest related to this investigation.

CONCLUSION:

Chewable toothpaste tablets offer a practical and efficient alternative to traditional toothpaste tubes. These tablets are easy to use, provide precise dosing, and are portable, making them ideal for travel. They can protect sensitive ingredients and mask unpleasant tastes. Waterless, they can be used anytime, anywhere, and require no chemical preservatives. Available in both fluoride and fluoride-free options, they minimize product waste and promote environmental consciousness. By reducing, reusing, and recycling, we can contribute to a sustainable future. Also, it is more effective at removing plaque than traditional toothpaste. This makes them a great option for maintaining oral health.

REFERENCES

1. Deore Nisha N., R. K. Surawase. A Chewable Toothpaste Tablet: An Alternative approach to the Toothpaste. Research Journal of Pharmaceutical Dosage Forms and Technology. 2022; 14(4):336-2. doi: 10.52711/0975-4377.2022.00055.
2. Mahadeva Rao U.S., Suganya M. Utharkar, C. ShanmugaSundaram. Halitosis: Classification, Causes, and diagnostic as well as Treatment Approach – A Review. Research J. Pharm. and Tech. 8(12): Dec., 2015; Page 1707-1713. DOI: 10.5958/0974-360X.2015.00307.8
3. Debdip Khan, Sudatta Banerjee, An Alternative Approach to Waste Management: A Study On Toothpaste. Indian Journal of Waste Management. 2020;4(1):15-18. https://www.researchgate.net/publication/344071657_An_Alternative_Approach_to_Waste_Management_A_Study_on_Toothpaste
4. Chewable Tablets: A Comprehensive Review Renu, JyotiDahiya, PawanJalwal, Balvinder

Singh - The Pharma Innovation …, 2015 – thepharmajournal.com The Pharma Innovation Journal 2015; 4(5): 100-105.

5. Br. Dent. J, British Dental Association, 2021. 300 million toothpaste tubes go to landfills. 230, 390. doi:10.1038/s41415-021-2926-y.
6. NausheenMobeen. Oral Malodor: Prevention and its Treatment. Research J. Pharm. and Tech. 7(10): Oct. 2014 Page 1175-1177
7. SamrithiYuvaraj, Ghana. S. Efficacy of Different Substances in the Control of Halitosis. Research J. Pharm. and Tech. 8(8): August 2015; Page 1132-1134. DOI: 10.5958/0974-360X.2015.00200.0
8. Padmanabh, S. K. D., Makhiya, M., Mulchandani, V., Jhamb, V., Trivedi, M., & Upendrabhai, M. J. (2022). A comparative clinical evaluation of plaque removal efficacy of a chewable toothpaste tablet with conventional toothpaste in children–A randomized clinical trial. Saudi Journal of Oral Sciences, 9(3), 185-189.
9. Asha M. Jagtap*, Sudhir R. Kaulage, Shivam S. Kanse, Vishal D. Shelke, Akshata S. Gavade, Ganesh B. Vambhurkar, Rohit R. Todkar, Vidya N. Dange. Preparation and Evaluation of Toothpaste. Asian J. Pharm. Ana. 2018; 8(4): 191-194. DOI: 10.5958/2231-5675.2018.00035.2
10. Jyothi. S. Halitosis – A Growing Psychosocial Problem. Research J. Pharm. and Tech 2017; 10(11): 4024-4029. DOI: 10.5958/0974-360X.2017.00729.6
11. NausheenMobeen. Oral Malodor: Prevention and its Treatment. Research J. Pharm. and Tech. 7(10): Oct. 2014 Page 1175-1177
12. Ashwin. K.S, Karthikeyan. M, Nirmalkumar. R, Rajanivetha, Priyadarshini. R. Halitosis: a Short Review. Research J. Pharm. and Tech. 7(12): Dec. 2014; Page 1494-1497.
13. Ashok et al, Tooth cleaning composition in tablet formWO1999033437A1WIPO (PCT)
14. Lachman,L.Liebarman,H.A.and Kanig, J.L.(2000).the theory and practice of industrial pharmacy.
15. Aulton,M.E.(2013). Pharmaceutics: The science of dosage form design.
16. https://www.grandviewresearch.com/industry-analysis/herbal-toothpaste-market?hl=en-IN
17. Kilian, M., Chaves, C. M., & Marsh, P. D. (2016). The oral microbiome – a critical review. Journal of Oral Microbiology, 8(1), 31290. https://doi.org/10.3402/jom.v8.31290
18. https://www.mouthhealthy.org/?hl=en-IN
19. Saha, S., Tomar, P. C., & Singh, V. (2023). The benefits of probiotics on oral health: Systematic review of the literature. Journal of International Society of Preventive & Community Dentistry, 13(2), 124–131. https://doi.org/10.4103/jispcd.JISPCD_123_23
20. Blackbird Skincare. (n.d.). Private Label Children's Toothpaste Manufacturer. Retrieved from Web. Blackbirdskincare.Com
21. Wikipedia contributors. (2024, December). Sustainable packaging. In Wikipedia, The Free Encyclopedia. Retrieved from https://en.wikipedia.org/wiki/Sustainable_packaging.

HOW TO CITE: Harshdeep Patil*, Yogeshwar Chaudhari, Gaurav Zore, Aadinath Ware, Shyam Zunzulde, Chewable Toothpaste Tablets: A Novel Oral Hygiene Solution, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 4, 1639-1649 https://doi.org/10.5281/zenodo.15205976