



GRADUATION PROJECT

Degree in Dentistry

NON – CONVENTIONAL STRATEGIES FOR OPTIMIZING ORAL HEALTH AT HOME

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ABSTRACT

Background: Oral health is closely linked to overall health, but access to conventional dental care is often limited. This has increased interest in non-conventional methods that are natural, affordable, and accessible. **Objective:** This study aimed to evaluate the effectiveness of three natural, home-based methods *oil pulling*, herbal dentifrices, and probiotics in promoting oral health. A secondary objective was to develop a practical, evidence-based daily care protocol. **Methods:** A systematized literature review was conducted following the PICO model, analyzing randomized controlled trials related to plaque control, gingival health, halitosis, and microbial balance. **Results:** *Oil pulling* showed antimicrobial and plaque-reducing properties, comparable in some cases to chlorhexidine. Herbal dentifrices containing *neem*, clove, calendula, and aloe vera demonstrated anti-inflammatory and antibacterial effects. Probiotic strains such as *Lactobacillus reuteri* and *L. brevis* were found to support microbial balance and improve periodontal outcomes, though results varied by strain and dosage. **Conclusion:** Non-conventional oral health strategies can serve as valuable adjuncts to conventional care, particularly for individuals with limited access or sensitivity to chemical products. A combined daily protocol integrating traditional and natural methods may enhance oral hygiene and overall health.

KEYWORDS

Odontology, non-conventional strategies, *oil pulling*, herbal dentifrices, probiotics.

RESUMEN

Antecedentes: La salud bucal está estrechamente relacionada con la salud general, pero el acceso a la atención odontológica convencional a menudo es limitado. Esto ha incrementado el interés por métodos no convencionales que sean naturales, económicos y accesibles. **Objetivo:** Este estudio tuvo como objetivo evaluar la eficacia de tres métodos naturales aplicables en el hogar *oil pulling* (enjuague con aceite), dentífricos herbales y probióticos para promover la salud oral. Un objetivo secundario fue desarrollar un protocolo diario práctico y basado en la evidencia. **Métodos:** Se realizó una revisión sistematizada de la literatura siguiendo el modelo PICO, analizando ensayos clínicos aleatorizados relacionados con el control de placa, la salud gingival, la halitosis y el equilibrio microbiano. **Resultados:** El *oil pulling* mostró propiedades antimicrobianas y reductoras de placa, comparables en algunos casos con la clorhexidina. Los dentífricos herbales que contienen *neem*, clavo, caléndula y aloe vera demostraron efectos antiinflamatorios y antibacterianos. Las cepas probióticas como *Lactobacillus reuteri* y *L. brevis* ayudaron a mantener el equilibrio microbiano y a mejorar los resultados periodontales, aunque los efectos variaron según la cepa y la dosis. **Conclusión:** Las estrategias de salud oral no convencionales pueden servir como complementos valiosos a la atención dental convencional, especialmente para personas con acceso limitado o sensibilidad a productos químicos. Un protocolo diario combinado que integre métodos tradicionales y naturales puede mejorar la higiene bucal y la salud general.

PALABRAS CLAVE

Odontología, estrategias no convencionales, *oil pulling*, dentífricos herbales, probióticos.

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1. INTRODUCTION

Oral health is part of our general health. The World Health Organization defines it as the ability to bite, chew, smile, speak, and maintain psychological and social health (1). This is achieved by the absence of oral diseases such as oral cancer, infections, periodontal disease, dental caries, and tooth loss (1).

In recent years, there has been a growing interest in methods for improving oral health. Holistic methods include alternative treatments, such as dietary and natural components, in dental care (2).

Combining conventional clinical dentistry with natural healing techniques highlights the connection between excellent dental health and overall health, therefore promoting a better and less harmful way of life (2).

To promote comprehensive health, unconventional methods emphasize the importance of healthy nourishment, and the regulation of physical, mental and energy levels(2). This increasing emphasis on comprehensive care presents promising prospects for improving both oral and systemic health (2).

1.1 Oral disease

Oral disease is the most common health issue globally, with dental caries, or tooth decay, being among the most prevalent chronic diseases that affect a large percentage of the population (3). It is defined as the progressive loss and degradation of hard tooth structures, including enamel and dentine, caused by exposure to foods and beverages containing sugars (4). Additional contributing factors include insufficient preventive measures and limited access to adequate dental care.

Dental caries significantly impacts millions of people, especially children and people of all ages, throughout their lifetime (3,4).

1.1.1 Caries

Dental caries is a multifactorial disease that impedes quality of life by causing discomfort and affecting fundamental functions such as eating and speaking (5). The phenomenon arises from metabolic processes in dental plaque, in which acidogenic bacteria metabolize fermentable carbohydrates, generating acid that causes localized dissolution of tooth minerals (5). The imbalance between dental minerals and plaque leads to enamel demineralization, resulting in porous, white spot lesions. Principal pathogenic causes are cariogenic bacteria,

fermentable carbohydrates, and diminished salivary function. This process advances to cavity formation if left untreated (5).

1.1.2 Gingivitis and periodontitis

Another prevalent condition is gingivitis, characterized by the redness and swelling of the gums, usually caused by bacterial infection. If left untreated, it may lead to periodontitis, a severe disease that damages the periodontal ligament, cementum, alveolar bone, and surrounding gum tissue. This progression can result in tooth mobility and eventual tooth loss (1).

There are two categories of risk factors that contribute to the development of periodontal disease: non-modifiable risk factors and modifiable risk factors (6).

Non-modifiable risk factors are genetic, osteoporosis and ageing whereas the modifiable risk factors are smoking, diabetes mellitus, microorganism and periodontal disease (*Porphyromonas gingivalis*, *Tannerella forsythia* and *Actinobacillus actinomycetemcomitans*) and physiological factors like stress (6).

1.1.3 Oral cancer

Additionally, oral potentially malignant disorders, or (OPMDs), are conditions that have the potential to develop into malignant tumors. Examples of OPMDs include erythroplakia, erythroleukoplakia, leukoplakia, oral lichen planus (reticular, atrophic/erosive, and plaque-like), oral submucous fibrosis, and oral epithelial dysplasia (7).

These are severe conditions that are a challenge for dental surgeons. Oral cancer is more prevalent in men, older individuals, and those with lower education and income levels (1).

The major risk factors include tobacco use, alcohol consumption, sexually transmitted infections, human papillomavirus (HPV) infection, and derivatives of betel nuts (4).

Betel nuts are the fourth most widely used psychoactive chemical in the world after alcohol, caffeine and nicotine, made from the seeds of the oriental palm *Areca catechu*. Traditionally, they are eaten with *Piper betle* leaves. This is more common in Asia, including places like Bangladesh, Pakistan, India, Papua New Guinea, Southeast Asia, and the South Pacific Islands (8).

Oral cancer may manifest in many regions, such as the lip, floor of the mouth, oral mucosa, base of the tongue, and oropharynx (1).

1.1.4 Oral infections

Oral infections are caused by bacteria, viruses, or fungi, affecting various structures within the oral cavity. Common types of oral infections are caries, periodontitis, herpes (primary herpetic gingivostomatitis, recurrent intraoral herpes and Varicella-zoster) and fungi (candidiasis and linear gingival erythema) (9).

The development of dental caries is significantly influenced by bacterial infections, which are a critical factor in oral health. Bacteria infiltrate the dental pulp as caries advance, resulting in painful inflammation (pulpitis)(10). The infection can progress to the root canal, resulting in tooth necrosis, if left untreated. Further bacterial infiltration beyond the root apex can lead to apical periodontitis, which can result in the formation of cysts or granulomas and the destruction of bone (10).

Viral infections in the oral cavity negatively impact oral tissues by inducing direct cellular injury or an immune response to viral proteins (11). They are frequently characterized by a sudden onset and the development of sores or ulcers. Fever, malaise, and enlarged lymph nodes may also be present. Several viral infections are associated with the progression of periodontal disease and may be associated with the development of tumors. Their prevalence in dental practice is often exacerbated by diagnostic challenges, resulting in underdiagnosis. This underscores the significance of early detection and referral for appropriate management (11).

Oral candidiasis is the most prevalent oral fungal infection, primarily caused by *Candida albicans*, with *Candida glabrata* and *Candida. tropicalis* also commonly implicated. While *Candida sp.* is a natural commensal organism in the digestive and vaginal tracts, certain conditions can trigger its overgrowth, leading to infection (12). Symptoms may include dysphagia, burning pain, and oral discomfort, though many cases remain asymptomatic. The condition is strongly associated with systemic diseases, medications, weakened immunity, and local oral changes (12).

Maintaining proper oral hygiene, supporting immune function, and managing underlying health conditions are essential to preventing oral candidiasis and controlling fungal overgrowth (12).

2.1 Oral health and systemic health

Moreover, oral health is the reflection of the body, meaning it is more than healthy teeth and a bright smile. Multiple researchers have shown a bi-directional relationship between oral and systemic disease, such as heart disease, diabetes, respiratory infections and complications

during pregnancy. For example, the connection between diabetes and oral health is well-documented: diabetes worsens periodontal disease (3).

In people with diabetes, especially type 1, poorly controlled high blood sugar levels can worsen gum inflammation and disrupt the balance between free radicals and antioxidants (13). This disruption diminishes the immune response to infections, which can intensify gum disease and bone loss by encouraging the buildup of plaque and tartar. Furthermore, diabetes reduces the flow of oxygen and nutrients to the gums, slowing the healing process (13).

Additionally, numerous pharmacological agents used for medical treatment can lead to oral side effects, such as xerostomia (dry mouth), dysgeusia (taste disorder), and stomatitis (inflammatory disease of the mouth) (1).

This relationship shows the need for efficient oral health intervention that may be readily adopted and sustained, particularly at home, as part of a comprehensive commitment to health and disease prevention.

3.1 Strategies to maintain oral health

Oral health can be maintained through two main methods: conventional and unconventional methods.

3.1.1 Conventional methods

Conventional methods have been the primary approach to supporting dental health. The main techniques include professional dental cleaning (prophylaxis), fillings (obturations), root canal treatment, and extraction. These procedures are typically used to address existing oral health issues, such as tooth loss, periodontal disease, and decay.

Fluoride and dental sealants, along with the correct brushing technique and proper use of fluoride toothpaste, regular flossing, and routine check-ups every six months from the dentist, prevent the formation of plaque between teeth and reduce the risk of cavities and periodontal disease (14).

On the other hand, although they are effective, traditional dental treatments have some limitations. Patients requiring obturation, sealants, fluoride, or other treatments need to access dental clinics, and for some people, the cost of these treatments can be expensive compared to those who have greater financial resources, especially in nations with low income. Furthermore, there are some patients who may present anxiety or bad experiences during dental treatment, making it harder for them to get the traditional medical treatment they need (15).

Fluoride is a product that strengthens the enamel through a process known as remineralization, consequently preventing caries (16). It works by decreasing bacterial

metabolism, which lowers acid production and results in enamel remineralization. It can be present in various forms in toothpaste, mouthwash, and dental treatments and it is also commonly present in water in some regions. Although fluorides have many positive effects, there are also specific risks to being aware of when using them. Dental fluorosis is a condition that often affects younger people, it happens when they consume too much fluoride while their teeth are still forming. This is an area where recommendations from dentists and other oral health experts are crucial for encouraging the proper use of toothpaste, especially among younger children who are more likely to choke on it (16).

3.1.2 Non-conventional methods

Maintaining optimal oral health and periodontal health is essential for overall well-being, with effective plaque removal being crucial for preventing oral disease. While traditional methods such as brushing and flossing play a significant role, they are not entirely sufficient on their own. This has led to growing interest in non-conventional or alternative methods, which offer supportive measures to enhance plaque control, prevent its buildup, and reduce reliance on conventional techniques (17).

Alternative dental methods also called “holistic” or “natural”, adopt a comprehensive approach that integrates natural remedies, proper nutrition, and the avoidance of harmful toxins commonly found in dental materials. These methods not only aim to prevent and manage oral diseases but also promote overall health by addressing underlying systemic issues. For instance, the incorporation of herbal remedies, Ayurveda, aromatherapy and probiotics reflects an innovative shift toward accessible, affordable, and non-toxic solutions for oral care (2,18). In addition to their therapeutic benefits, non-conventional approaches are gaining popularity for their cost-effectiveness and convenience. Many natural remedies are readily available without prescriptions, offering individuals a practical means to improve oral hygiene and address common dental concerns(19).

The main practices in this area are: (18)

1) Herbal dentistry – herbalism:

Aloe vera, neem, and clove oil are among the plant-based remedies that herbal dentistry employs for their antibacterial and anti-inflammatory properties. Products such as toothpaste and mouth rinses are formulated with these plants to alleviate oral irritation, plaque accumulation, and periodontal disease (20).

2) Ayurvedic dentistry:

Originating from ancient Indian medicine, Ayurveda utilizes herbal formulations for oral health, including neem mouth rinses and clove oil for periodontal disease. Ayurvedic procedures, including the extraction of oils and herbal formulations, provide safe, non-toxic solutions for addressing gingivitis, dental anxiety, and oral ulcers (20).

3) Aromatic dentistry:

Essential fragrances such as lavender and bergamot are employed in aromatherapy to establish a tranquil environment during dental procedures. These oils stimulate the limbic system through olfactory nerve activation, thereby promoting relaxation and reducing anxiety (20).

4) Macrobiotics/Probiotics:

Probiotics support oral health by regulating oral pH, preventing the growth of plaque bacteria, and avoiding plaque development through antioxidant activity. They also neutralize bad smells by converting toxic gases into usable ones (18).

4.1 JUSTIFICATION

Maintaining good oral health is important to general health and a high quality of life, although many people throughout the world suffer from tooth disorders. Tooth decay, gum disease, and oral infections continue to affect a substantial portion of the population despite improvements in traditional dental care. This is due in large part to barriers such as the prohibitive cost of treatment, restricted availability of services, and the general absence of preventative care. The need for preventative and long-term solutions to dental care is further underscored by the correlation between poor dental health and systemic disorders such as diabetes and cardiovascular problems. Non-traditional approaches provide accessible and cost-effective alternatives for conventional procedures. Some people are starting to take notice of these methods because of the positive effects they may have on general health and dental hygiene. The growing need for comprehensive solutions to these gaps in dental care is driving this research.

2. OBJECTIVES

The goal of this work is to answer the following research question:

How effective are non-conventional approaches to oral health, such as probiotics and herbal remedies, in improving oral hygiene and preventing dental diseases compared to no intervention?

To address this question, the study is guided by the following objectives:

Primary objective

- To assess the efficacy of non-traditional approaches to improving oral health by focusing on their role in plaque prevention, maintaining periodontal health, and enhancing general oral hygiene.
- H0: Non-conventional oral health strategies do not improve oral health.
- H1: Non-conventional oral health strategies can improve oral health.

Secondary objective

To develop a practical, evidence-based protocol for the general public to apply non-conventional oral health techniques at home.

3. MATERIALS AND METHODS

3.1 Study Design

This study uses a systematized review methodology, organized according to the PICO (Population, Intervention, Comparison, Outcome) framework, to evaluate the efficacy of alternative oral health strategies.

PICO

- **Population (P):** Healthy individuals of all ages (children, adults, elderly), genders (female or male), and diverse ethnicities.
- **Intervention (I):** Utilization of unconventional oral health remedies, including probiotics, herbal extracts (such as cranberry, neem, and clove oil), essential oils, and oil pulling.
- **Comparison (C):** Conventional oral health strategies or no intervention
- **Outcome (O):** Improvement in oral hygiene (e.g., reduced plaque, cavity prevention, better periodontal health).

3.2 Eligibility Criteria

Inclusion Criteria:

1. Randomized controlled trials (RCTs), or cohort studies related to non-conventional oral health strategies.

2. Studies with quantitative or qualitative outcomes on plaque reduction, cavity prevention, periodontal health, patient adherence, or cost-effectiveness.
3. Studies conducted on human subjects.

Exclusion Criteria:

1. Research that exclusively focuses on conventional procedures (e.g., professional cleaning, scaling, fluoride).
2. Studies evaluating pharmaceutical mouthwashes or synthetic agents.
3. Animal and *in vitro* research, reviews, meta-analyses, case reports, or non-peer-reviewed research.

3.3 Search strategy

A comprehensive literature search was conducted using four major databases: PubMed, Scopus, Web of Science, and Google Scholar. The search strategy incorporated a combination of keywords and Boolean operators to ensure thorough coverage of the topic. The search equations used were: (*"alternative oral health" OR "holistic dentistry" OR "herbal oral care" OR "oil pulling"*) AND (*"oral hygiene" OR "plaque control" OR "periodontal health" OR "dental disease prevention"*) AND (*"clinical trial" OR "randomized controlled trial" OR "RCT" OR "interventional study"*). Boolean operators were applied as follows: "OR" was used to include synonyms and alternative expressions for each concept, while "AND" was used to link different elements of the PICO framework, ensuring that the retrieved studies were relevant to the research question.

4. RESULTS

4.1 Data extraction and analysis

The PRISMA 2000 flow diagram (Figure 1), which describes every step of the procedure from the first identification of data to the final inclusion was used in this evaluation to guarantee a methodical and transparent approach to study selection. The systematic nature of the data collecting and analysis is emphasized by this graphic representation, which also illustrates the methods used to filter and assess research.

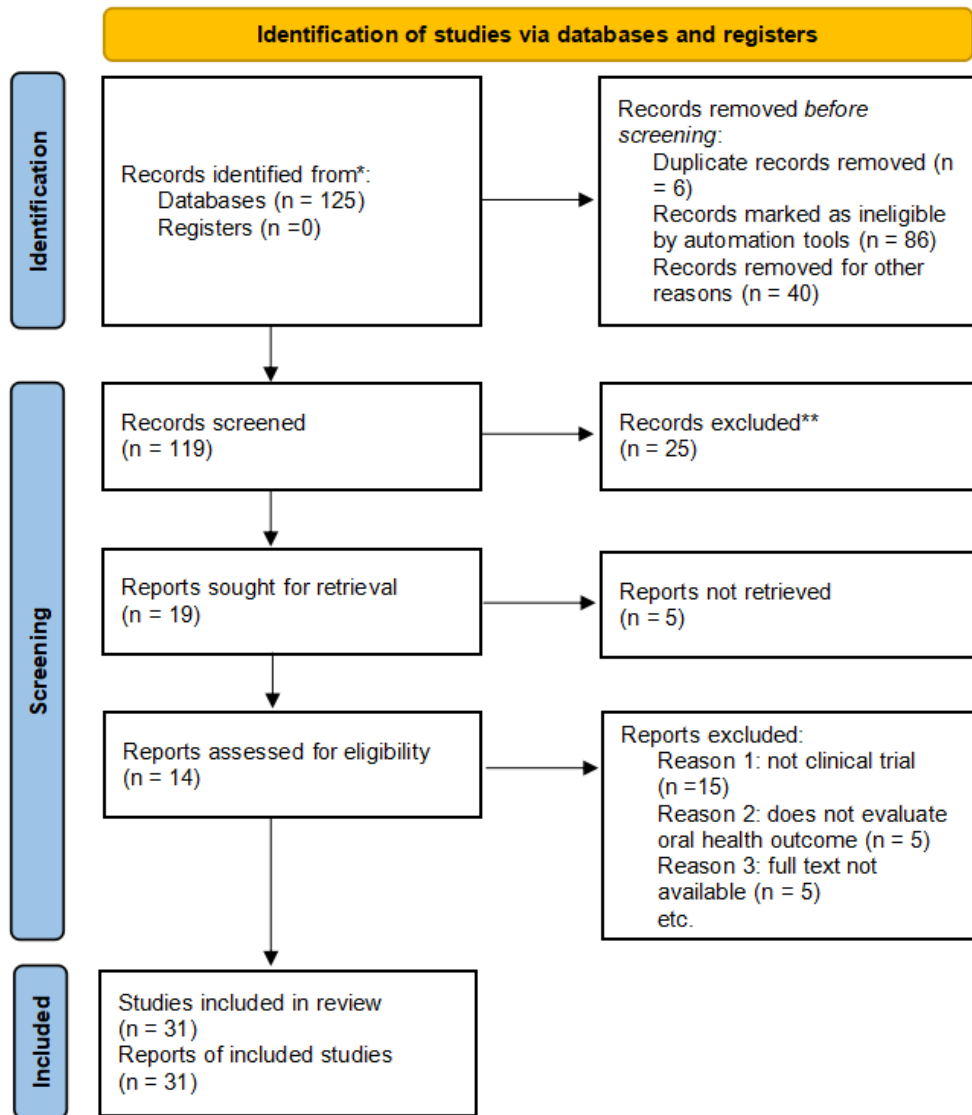


Figure 1: PRISMA 2000 Flow diagram

4.2 Results Table

Table 1: Randomized controlled trials on the efficacy of oil pulling in relation to traditional methods of oral health treatment.

Reference	Type of Study	Intervention	Control	Sample Size	Outcomes
Jauhari et al., 2015 (21)	Randomized controlled trial	Coconut oil/Oil pulling twice daily	Distilled water	52	No additional benefit compared to fluoride or herbal mouthrinse in reducing

					bacterial colonization
Kaushik et al., 2016 (22)	Randomized controlled trial	Coconut oil pulling/ oil pulling 10 ml for 10 minutes	Distilled water	60	Statistically significant reduction in Streptococcus mutans count in saliva for both coconut oil and chlorhexidine groups
Sood et al., 2014 (23)	Randomized controlled trial	Sesame oil pulling	Chlorhexidine mouthwash/ placebo	60	Significant reduction in oral malodor and microbes; efficacy similar to chlorhexidine
Nagilla et al., 2017 (24)	Randomized controlled trial	Coconut oil/ oil pulling 10-15 ml for 10 min	Mineral water. Mouthrinse.	40	Effective in reducing plaque levels; significant difference observed on day 7
Asokan et al., 2011 (25)	Randomized controlled trial	Sesame oil pulling	Chlorhexidine mouthwash	20	Reduction in halitosis and microbes; comparable efficacy to chlorhexidine

Asokan et al., 2009 (26)	Randomized controlled trial	Sesame oil pulling	Chlorhexidine mouthwash	20	Significant reduction in plaque and gingival index scores
Asokan et al., 2008 (27)	Randomized controlled trial	Sesame oil pulling	Chlorhexidine mouthwash	20	Significant reduction in Streptococcus mutans count in plaque and saliva; oil pulling had a slower effect than chlorhexidine
Vadhana et al., 2019 (28)	Randomized controlled trial	Sesame oil & ozonated sesame Oil	Chlorhexidine mouthwash	50	Significant improvement in oral hygiene; reduction in plaque and microbial count
Sezgin et al., 2019 (29)	Randomized crossover clinical trial	Coconut oil pulling 10 ml twice daily for 15-20 min.	Chlorhexidine mouthwash	58	Similar plaque inhibition activity as chlorhexidine; less tooth staining

Table 2: Comparison of traditional fluoride-based dentifrices with herbal and alternative toothpaste for the reduction of plaque and gingivitis.

Reference	Type of Study	Intervention	Control	Sample Size	Outcome
Pannuti et al., 2003 (30)	Randomized controlled trial	Herbal dentifrice (Paradontax)	Fluoride-based dentifrice	31 participants	No significant difference in plaque index; significant reduction in gingival index in the test group
Srinivasa et al., 2011 (31)	Randomized controlled trial	Herbal dentifrice	Non-herbal dentifrice	30 children (8-10 years)	Both groups showed a reduction in plaque and gingival scores; no statistically significant difference
Oliveira et al., 2008 (32)	Double-blind clinical study	Aloe vera dentifrice	Fluoride dentifrice	30 participants	Significant reduction in plaque and gingivitis in both groups; no statistically significant difference between them

Al-Kholani, 2011 (33)	Randomized controlled trial	Herbal dentifrice (Parodontax & Silca)	Conventional fluoride dentifrice	48 participants	Herbal toothpaste significantly improved oral hygiene and reduced gingivitis more than fluoride toothpaste
Kadam et al., 2011 (34)	Randomized controlled trial	Ayurvedic herbal tooth powder (UDM)	Positive control (conventional toothpaste)	30 participants	Both groups showed a significant reduction in plaque and gingival index; no significant difference between the groups
Tatikonda et al., 2014 (35)	Clinical comparative study	Herbal toothpaste (Dabur Red)	Non-herbal toothpaste (Pepsodent)	30 participants	Herbal toothpaste was as effective as non-herbal in reducing plaque and gingivitis
Mitra et al., 2015 (36)	Randomized controlled trial	Herbal toothpaste	Triclosan-based toothpaste	100 participants	Both toothpastes were effective in plaque

					reduction; no significant superiority was observed
Amoian et al., 2010 (37)	Randomized controlled trial	Calendula extract toothpaste	Conventional fluoride toothpaste	40 participants	Significant reduction in plaque index and gingival bleeding in the test group

Table 3: Probiotic-based interventions.

Reference	Type of Study	Intervention	Control	Sample Size	Outcomes
Vicario et al., 2013 (38)	Randomized controlled trial	<i>Lactobacillus reuteri</i> Prodentis tablets (30 days)	Placebo tablets	20	Significant improvement in plaque index, bleeding on probing, and probing depths in the test group.
Hallström et al., 2013 (39)	Randomized placebo- controlled crossover trial	<i>L.reuteri</i> lozenges (3 weeks)	Placebo lozenges	18	No significant effect on plaque or microbial composition; only minor immune changes.

Vivekananda et al., 2010 (40)	Randomized controlled trial	SRP + Lactobacillus reuteri Prodentis lozenges (21 days)	SRP + Placebo lozenges	30	Greater improvement in all clinical and microbial parameters the probiotic group.V
Iniesta et al., 2012 (41)	Randomized controlled trial	<i>L. reuteri</i> tablets (8 weeks)	Placebo tablets	40	Reduction in <i>P. gingivalis</i> and total anaerobes; no significant clinical changes.
Teughels et al., 2013 (42)	Randomized controlled trial	SRP + <i>L. reuteri</i> lozenges (12 weeks)	SRP + Placebo	30	Significant reduction in pocket depth and attachment gain; microbiological improvements.
Laleman et al., 2015 (43)	Randomized controlled trial	<i>Streptococcus</i> -containing probiotic (12 weeks)	Placebo	48	No significant clinical difference; minor reduction in plaque at 24 weeks.
Tekce et al., 2015 (44)	Randomized controlled trial	SRP + <i>L. reuteri</i> lozenges (1 year)	SRP + Placebo	40	Improved clinical outcomes and reduced anaerobes in

					the probiotic group.
Schlagenhauf et al., 2016 (45)	Randomized controlled trial	<i>L. reuteri</i> lozenges (3rd trimester to delivery)	Placebo	45	Significant reduction in gingival and plaque indices in the test group.
Montero et al., 2017 (46)	Randomized controlled trial	<i>L. plantarum</i> , <i>L. brevis</i> , <i>P. acidilactici</i> tablets (6 weeks)	Placebo tablets	59	No overall clinical difference; fewer sites with severe inflammation and reduced T. forsythia in the test group.
Alkaya et al., 2016 (47)	Randomized controlled trial	<i>Bacillus</i> spp. toothpaste, mouth rinse, brush cleaner (8 weeks)	Placebo versions	40	No significant difference between groups, though both improved gingival and plaque indices.
Morales et al., 2016 (48)	Randomized controlled trial	SRP + <i>Lactobacillus rhamnosus</i> SP1 sachets (3 months)	SRP + Placebo	28	Greater reduction in probing depths and fewer patients needing surgery in the probiotic group after 1 year.

Penala et al., 2016 (49)	Randomized controlled trial	SRP + subgingival probiotic delivery + probiotic mouthwash (15 days)	SRP + placebo delivery and mouthwash	32	Improved plaque, gingival, and bleeding indices; significant reduction in halitosis scores and BANA in the test group.
Lee et al., 2015 (50)	Randomized controlled trial	<i>L. brevis</i> CD2 lozenges (14 days)	Placebo lozenges	34	Delayed gingivitis development; reduced bleeding on probing; lower inflammatory response (nitric oxide).
Szkaradkiewicz et al., 2014 (51)	Controlled clinical study	<i>L. reuteri</i> Prodentis tablets (2 weeks)	No probiotic	38	Reduced TNF- α , IL-1 β , and IL-17; improved SBI, PPD, and CAL in the probiotic group.

The results of this study are presented in three tables, each one focusing on a different type of non-conventional strategy for improving oral health at home: oil pulling, herbal toothpaste, and probiotics intervention.

In the category of oil pulling (Table 1), several studies demonstrated that they have antibacterial properties and clinical benefits such as reductions in plaque levels, improvement

in gingival indices, control of halitosis, and better patient tolerance (e.g., less staining, no allergy, no lingering after taste) compared to chlorhexidine in some cases.

Asokan et al. (27) observed a significant decrease in *Streptococcus mutans* in both plaque and saliva after daily application of sesame oil for 10-15 minutes, although the reduction occurred more slowly than with chlorhexidine. Similarly, Kaushik et al. (22) reported a statistically significant decrease in salivary *Streptococcus mutans* levels using coconut oil for 10 minutes daily over two weeks, compared to those using distilled water. For general dental health, Vadhana et al. (28) studied sesame oil and ozonated sesame oil and found that both drastically decreased plaque and bacteria counts, but the ozonated form was more beneficial.

Additionally, for patients who are sensitive to chemical rinses, Sood et al. (23) showed that sesame oil pulling is just as efficient as chlorhexidine in reducing the level of bacteria and malodour.

The diagram (figure 2) summarizes these findings visually, with similar patterns across the studies. Sesame oil often worked as well as chlorhexidine, including reductions in plaque, halitosis, and gingival inflammation. This suggests it may be a valuable natural alternative for individuals seeking chemical-free options. On the other hand, coconut oil was especially effective in targeting *S. mutans* and reducing plaque accumulation likely due to its high lauric acid content, known for its antimicrobial activity. In summary, both oils offer clinical benefits, but may be suited to different goals: sesame oil for general oral health, and coconut oil for antibacterial action.

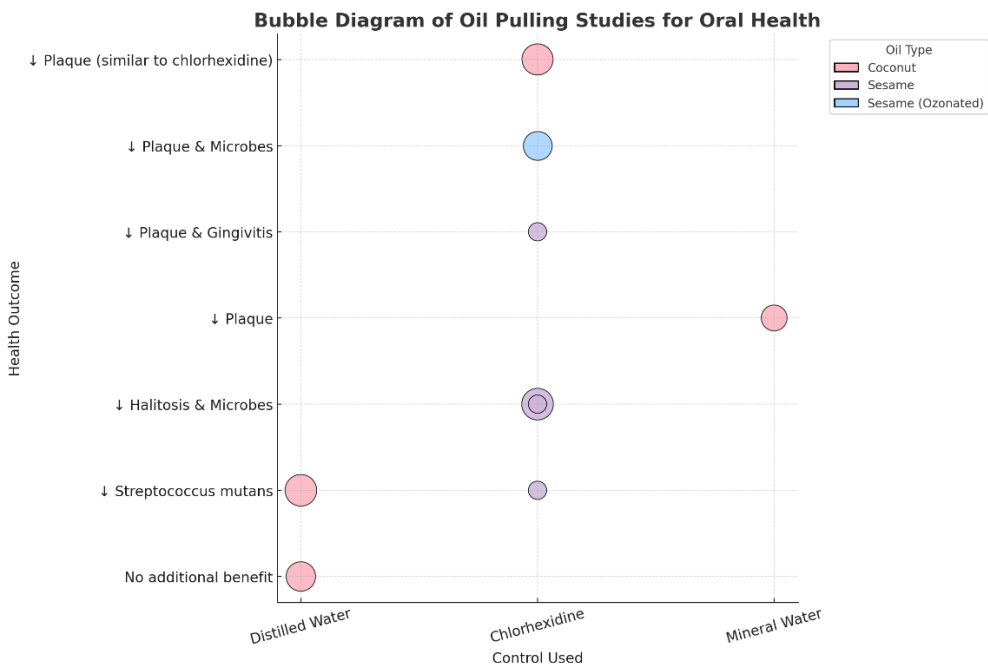


Figure 2: The bubble diagram illustrates randomized clinical trials on oil pulling. The horizontal axis shows the type of control used (distilled water, mineral water, or chlorhexidine), while the vertical axis categorizes clinical outcomes (plaque reduction, halitosis, *S. mutans* levels, and gingival health). Each bubble represents one study, with the size indicating sample size and the color denoting the type of oil used: pink for coconut oil, purple for sesame oil, and blue for ozonated sesame oil.

In the section on herbal dentifrices (Table 2), various randomized controlled studies showed that formulations derived from plants for dentifrices might improve dental hygiene just as much as traditional fluoride-based toothpaste.

According to research by Amoian et al. (37), dentifrices containing *Calendula officinalis* contain anti-inflammatory and antibacterial properties. Their study showed a significant reduction in both gingival bleeding and plaque index among participants using calendula-based toothpaste. Likewise, Al-Kholani et al. (33) noticed that over a 42-day period, the herbal toothpaste Paradontax and Silca significantly reduced gingival inflammation, bleeding on probing (BOP), and plaque compared to a conventional fluoride toothpaste.

On the other hand, Srinivasa et al (31) discovered that both herbal and triclosan-based toothpastes considerably decreased gingival and plaque level in children over 21 days, with no significant statistical difference between the groups. Similarly, Oliveria et al. (32) found no statistically significant difference between fluoride-based and aloe vera-based toothpastes in terms of improving gingival bleeding indices and plaque.

The potential of probiotics as a supportive strategy for improving periodontal health has been explored in multiple studies (Table 3). Teughels et al. (42) showed that the addition of *Lactobacillus reuteri* lozenges for 12 weeks, in conjunction with scaling and root planning, led to significant improvements in periodontal outcomes particularly in moderate and deep pockets by enhancing probing depth reduction, clinical attachment gain, and decreasing the presence of *P. gingivalis*, when compared to mechanical therapy alone. According to Penala et al. (49), probiotic mouthwash and subgingival application of *Lactobacillus reuteri* and *Lactobacillus salivarius* resulted in decreased plaque buildup, gingival inflammation, and halitosis in individuals with chronic periodontitis compared to scaling and root planning alone.

In an alternative clinical context, Schlagenhauf et al. (45) found that probiotic lozenges taken daily by pregnant women improved gingival health and reduced plaque levels, providing a safe substitute during a time when access to chemical therapies may be restricted.

Different probiotic strains showed (figure 3) very different effects on oral health. *Lactobacillus reuteri* was the most effective, consistently helping reduce plaque buildup, gum

inflammation, and even bleeding on probing across several clinical studies. In comparison, strains like *Streptococcus spp.* and *L. plantarum* showed little or no improvement in most cases. These differences clearly illustrate how important it is to choose the right probiotic since not all strains work the same way or deliver the same benefits. The results suggest that *L. reuteri* is a particularly reliable option for improving periodontal health and maintaining a healthier oral microbiome.

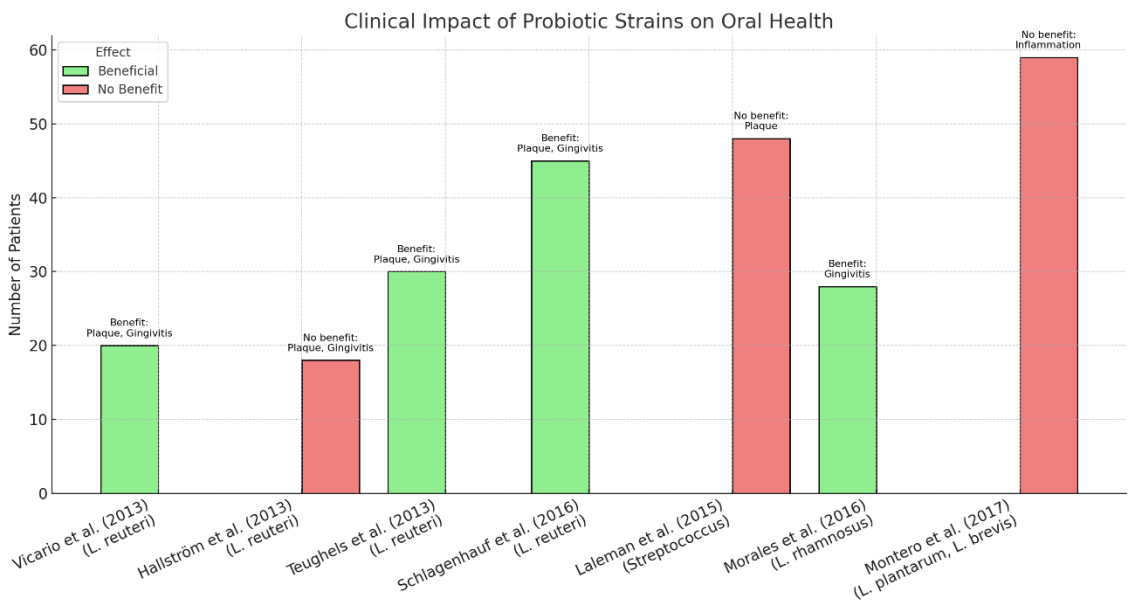


Figure 3: This chart shows the clinical impact of different probiotic strains on oral health based on randomized trials. The horizontal axis displays various probiotic strains used (e.g., *Lactobacillus reuteri*, *L. brevis*, *Bacillus spp.*, *Streptococcus spp.*), while the vertical axis shows the number of patients with or without clinical improvement. Each bar represents a study, with the height of the segments indicating how many participants showed improvement. Green bars indicate patients who improved, and pink bars indicate those who did not.

5. DISCUSSION

There is growing interest in natural, and alternative oral care methods, as many people are looking for safer, more accessible, and chemical-free options. Although conventional dental products such as mouthwash containing chlorhexidine and fluoride toothpaste, have demonstrated clinical efficacy in preventing dental caries and managing oral hygiene, their use is not without potential drawbacks. Reported adverse effects include hypersensitivity reactions, alteration in taste perception, and extrinsic tooth discoloration, promoting increased consideration of holistic and non-traditional dental care methods (23). Additionally, in certain areas, access to dental treatment is still restricted. These issues emphasize the need of safe,

reasonably priced, and scientifically supported home cures, which is a key area of emphasis for this study.

The results confirmed that the three non-conventional methods analysed oil pulling, herbal dentifrices, and probiotics all demonstrated positive effects on oral health.

Oil pulling is a traditional Ayurvedic technique that consists of swishing natural oils such as coconut, sesame, or sunflower oil in the oral cavity for several minutes (52). Traditionally, it has been used not only to prevent dental caries, but also to treat bleeding gums, halitosis, dry mouth, cracked lips, and to promote overall and systemic well-being (53).

From a molecular perspective, oil pulling may function through multiple mechanisms that facilitate the removal of harmful oral bacteria. A possible hypothesis given up is saponification, a process where the fat content of oil such as coconut or sesame undergoes alkaline hydrolysis when it interacts with bicarbonate ions naturally present in saliva. This process creates compounds that resemble soap, which improve cleaning by dispersing and emulsifying oils, thereby increasing their surface area and ability to detach plaque from tooth surfaces (52). Furthermore, the oil's viscosity may provide a barrier that prevents bacteria from sticking to the enamel minimizing the early accumulation of plaque.

According to microbiological research, oil pulling has been linked to a significant drop in *S.mutants*, a key acidogenic bacterium involved in dental caries. This antimicrobial effect is especially evident with coconut oil, which contains lauric acid, a medium-chain fatty acid that is metabolized into monolaurin in the body (52). Monolaurin and comparable compounds are recognized for their ability to break down the cell membranes, interfere with nutrient uptake, and inhibit essential enzymatic processes, resulting in the destruction of weakening of pathogenic microbes (52).

Herbal remedies, such as toothpaste containing neem, clove, aloe vera, or calendula, are another area of growing interest. These botanical ingredients are rich in bioactive compounds including eugenol, azadirachtin, flavonoids, and tannins, which exhibit antimicrobial, anti-inflammatory, and antioxidant properties (54). At the cellular level, eugenol is a key component derived from clove, has demonstrated the ability to disrupt bacterial membranes, leading to cell lysis, while also inhibiting inflammatory pathways, thereby reducing gingival inflammation (55). Azadirachtin, found in neem, exhibits antimicrobial properties by interfering with microbial replication processes and inhibiting essential enzymatic functions, which hinder the growth and

survival of pathogenic oral bacteria (56). Meanwhile, *Calendula officinalis*, commonly known as marigold, contains flavonoids, tannins, triterpenoids, and essential oils with strong anti-inflammatory and antimicrobial properties. These compounds help reduce bacterial colonization and support tissue healing by modulating the immune response (57).

Another category of non-conventional strategies gaining attention for their biological impact on oral microbiota is the use of probiotics, which represent one of the promising strategies for promoting oral health through natural means. As highlighted earlier, non-conventional methods including probiotics aim to support oral hygiene by balancing the natural bacteria in the mouth, avoiding chemical agents, and promoting holistic wellness. These methods align with the growing interest in more accessible and less invasive approaches to dental care

Probiotics are live microorganisms, often referred to as "good bacteria," that can provide health benefits when consumed in the right amounts. In the mouth, they work by preventing the growth of harmful bacteria that can cause gum disease, bad breath, and tooth decay. They do this by taking up space on the teeth and gums, making it harder for harmful bacteria to survive.

Several probiotics strains have been identified as particularly beneficial for maintaining oral health, strains such *L. reuteri*, *L. brevis*, and *bacillus species*. These beneficial bacteria work by competing with harmful pathogens like *Porphyromonas gingivalis* and *Tannerella forsythia* for adhesion sites and nutrients in the oral cavity (42,46). Through this competitive inhibition, probiotics help modulate the oral microbiome positively, which contributes to better plaque control, reduced inflammation, and improved outcomes in periodontal health(42). This mechanism involves the production of antimicrobial substances and immune modulation, ultimately supporting the prevention and management of periodontal diseases and dental caries(42).

These probiotics can also help maintain a healthy pH level in the mouth and reduce stress caused by harmful molecules, which may lead to less bad breath (halitosis) and lower the chances of developing gingivitis (49,50). For instance, Teughels et al.(42) identified significant improvements in periodontal pocket depth and microbial profiles with the adjunctive use of *L. reuteri* lozenges alongside conventional periodontal therapy. Similarly, Schlagenhauf et al. (45) showed that probiotics helped pregnant women improve their gum health without needing chemical treatments.

However, probiotics are not perfect. Not all strains are equally effective, and people may respond differently. Some studies, like those by Hallström et al. (39) and Laleman et al. (43), showed little to no improvement, which means that the type of probiotic used and how it's taken matters a lot.

Another important concern when using probiotics is the potential for dysbiosis, a condition in which the natural balance of microorganisms in the oral cavity becomes disrupted(58). Under normal circumstances, the oral microbiota plays a vital role in supporting immune function and defending against infections. However, this delicate balance can be affected by factors such as poor oral hygiene, stress, unhealthy diet, or the overuse of antibiotics. When this occurs, opportunistic pathogens like *Porphyromonas gingivalis* can become dominant, contributing to the onset and progression of oral diseases such as periodontitis and dental caries (58). Moreover, oral dysbiosis has been increasingly linked to systemic health issues, including cardiovascular disease, diabetes, and gastrointestinal disorders (58). Current research suggests that dysbiosis is not only about the types of bacteria that are present but also about how these microorganisms' function and interact with the host's immune system. This underscores the importance of maintaining a stable and healthy oral microbiome for both oral and general health (58).

Additionally, it is worth considering that non-conventional strategies may offer distinct advantages depending on the demographic and geographical context. Oil pulling, for instance, is well-suited for populations in South Asia, where it is a culturally accepted practice and natural oils like coconut or sesame are readily available and affordable (54). It is particularly beneficial for individuals who experience difficulties with brushing, such as those with oral ulcers, asthma, or strong gag reflexes (53). Herbal dentifrices may be ideal in regions where natural resources like neem, clove, or calendula are widely accessible and integrated into traditional healthcare systems, offering a cost-effective alternative to commercial products (55–57). Conversely, probiotics are more accessible in urbanized areas where nutritional supplements are commonly available and may be particularly beneficial for individuals seeking preventative care, such as pregnant women or those with chronic gingivitis(45,50).

In any case, non-conventional methods should not be viewed as replacements for regular dental care provided by professionals. Instead, they should be seen as supportive approaches that complement standard treatments. These natural methods can be especially helpful for individuals who have difficulty accessing regular dental services whether due to financial limitations, geographical barriers, or a shortage of dental professionals in their area.

They may also offer an alternative for people who experience sensitivity or adverse reactions to chemical-based oral care products, such as those containing chlorhexidine or fluoride. When combined with conventional practices like brushing, flossing, and regular dental checkups, natural remedies such as oil pulling, herbal toothpastes, and probiotics can contribute to a more holistic, accessible, and patient-friendly oral hygiene routine. This integrated approach may improve both individual compliance and overall oral health outcomes, particularly in underserved or health-conscious populations (42,45,46).

Nonetheless, it is important to consider the limitations of this review. Although the outcomes of this study are promising, certain limitations should be carefully considered. One major challenge is the significant heterogeneity among the included studies in terms of intervention protocols such as variations in the duration, dosage, frequency, and specific products used. This inconsistency makes direct comparisons across trials difficult and may limit the generalizability of the conclusions drawn. Additionally, while many of the included studies were randomized controlled trials, differences in study design quality, sample size, and outcome measurement methods further complicate efforts to synthesize results. These discrepancies highlight the urgent need for standardized clinical protocols and more rigorous reporting practices in future research. Establishing consistent methodologies would not only improve reproducibility but also facilitate meta-analyses and contribute to a more robust evidence base for non-conventional oral health strategies.

Taking into account the findings discussed previously, a comprehensive daily protocol is recommended below. This meant to be used as guidance to achieve optimal oral health by combining both conventional and non-conventional practices.

1. Morning Routine

- Initiate the day with oil pulling, using one tablespoon of coconut or sesame oil. Swish the oil gently in the oral cavity for 5 to 10 minutes, then expel and rinse thoroughly with warm water to aid in the removal of oral toxins and microorganisms (52)
- Brush the teeth for two minutes using a fluoride-containing toothpaste to remove plaque and prevent dental caries.
- Floss to eliminate interdental plaque and debris, thereby reducing the risk of gingival inflammation and periodontal disease.

2. Midday Care (Optional)

- Rinse with a herbal mouthwash formulated with natural ingredients such as neem or clove, which possess well-documented antimicrobial and anti-inflammatory properties, to provide an additional layer of oral protection (54,55)

3. Evening Routine

- Brush the teeth once more, preferably using a herbal dentifrice enriched with ingredients such as aloe vera or calendula, known for their soothing, healing, and antimicrobial effects (56,57)
- Administer a probiotic lozenge or supplement, such as those containing *Lactobacillus reuteri*, to help restore and maintain a balanced oral microbiome, particularly during the overnight period when salivary flow is reduced (42,45,50).

4. Daily Lifestyle Habits

- Maintain a balanced diet that is low in refined sugars and high in nutrients to support both oral and systemic health.
- Ensure adequate hydration throughout the day to promote salivary production and natural oral cleansing mechanisms.
- Implement stress management strategies, as psychological stress has been linked to immune suppression and increased susceptibility to oral diseases (58).

5. Routine Dental Care

- Schedule biannual dental visits for professional examination, scaling, and early detection of potential oral health issues. Preventive care remains essential to complement daily maintenance and address conditions that require professional intervention.

Non-conventional methods offer unique benefits. Although they are not intended to replace professional dental care, these approaches can effectively support oral hygiene particularly among underserved or at-risk populations. Based on the reviewed studies showing positive outcomes from oil pulling, herbal toothpaste, and probiotics, the following daily oral care routine is suggested as a practical approach to improving and maintaining oral health.

6. CONCLUSIONS

This study met its primary objective by evaluating the effectiveness of three non-conventional oral health methods: oil pulling, herbal dentifrices, and probiotics. The results showed that all three approaches can improve oral hygiene by reducing plaque, controlling inflammation, and supporting a balanced oral microbiome.

The secondary objective was also achieved through the development of a practical, step-by-step protocol that combines conventional practices with these natural alternatives. This integrated approach offers a cost-effective and accessible option, especially for individuals with limited access to dental care or those seeking chemical-free solutions.

In summary, while these methods should not replace professional dental treatments, they can serve as valuable adjuncts to enhance daily oral care. Future research should focus on standardizing treatment protocols to improve comparability and clinical application.

7. SUSTAINABILITY

This Final Degree Project promotes sustainability by evaluating natural, home-based strategies such as oil pulling, herbal products, and probiotics that offer alternative ways to maintain oral health.

From an environmental standpoint, these methods rely on natural, biodegradable ingredients and avoid harmful chemicals and single-use plastics, helping to reduce ecological impact. This aligns with the goals of SDG 12: Responsible Consumption and Production by encouraging sustainable habits in personal care.

In terms of economic sustainability, these approaches are low-cost and widely accessible, offering a practical alternative to expensive clinical treatments and supporting SDG 3: Good Health and Well-being.

Socially, these strategies enhance health equity by providing affordable, easy-to-use solutions for people in underserved communities. They promote autonomy and preventive care, which aligns with SDG 10: Reduced Inequalities. By focusing on prevention, education, and natural alternatives, this work demonstrates a responsible and forward-thinking approach to public health, contributing to both academic quality and the broader goals of sustainable development.

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