

The Impact of Miswak (Salvadora Persica) on Periodontal Health: A Review

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KEYWORDS

Miswak, Salvadora Persica, Chewing Stick, Periodontal health, Periodontal disease.

ABSTRACT

The importance of periodontal health is being emphasized worldwide, highlighting the need for effective oral hygiene practices. Miswak (Salvadora persica) is a traditional tool with potential oral health benefits. This study aims to review and assess the evidence regarding the effectiveness of Miswak for maintaining periodontal health. A comprehensive literature search was conducted across multiple databases, including Wiley, SCOPUS, CINAHL, MEDLINE, and the Cochrane Library, focusing on studies published from 2019 to 2024. The search was methodically carried out to ensure thorough coverage. Inclusion criteria consisted of English-language, peer-reviewed studies that assessed the impact of Salvadora persica (Miswak) on oral health, specifically concerning periodontal disease or periodontitis, as directly addressed in original research publications, systematic reviews, or clinical trials published in English. Exclusion criteria involved editorials, opinion pieces, references unrelated to Salvadora persica's effects on oral health, and references not available in full text. A total of 97 studies were screened, yielding five eligible studies: one systematic review and meta-analysis, three randomized controlled trials (RCTs), and one randomized crossover trial. Across the reviewed studies, Miswak demonstrated notable effectiveness in controlling plaque and gingivitis compared to standard oral hygiene methods. The studies collectively demonstrate the effectiveness of Salvadora persica (Miswak) as an oral hygiene tool, particularly in reducing plaque and gingivitis. In several instances, Miswak performed better than traditional toothbrushes, as seen in plaque reduction and improvements in gingival health metrics.

1. Introduction

The significance of periodontal health is gaining increased recognition on a global scale. Oral hygiene practices have seen substantial improvements worldwide, with developing nations experiencing similar progress (Taha et al., 2022). Empowering local communities and implementing health promotion programs are essential components for achieving effective, efficient, and accessible periodontal healthcare and education (Al-Worafi, 2023). The practice of tooth cleaning dates back to ancient civilizations such as Babylonia, Egypt, Greece, and Romania, where individuals manually cleaned their mouths using sticks and materials such as silver, gold, ivory, and various metals. Subsequently, introducing brushes, in conjunction with water and salt, enhanced oral hygiene practices (Adam et al., 2021). Throughout history, various natural materials, including charcoal particles, twigs, and Miswak, as well as synthesized or processed dental products, have been utilized for oral cleaning (Muntean et al., 2024). The primary objective of this paper is to conduct a comprehensive review and assessment of the existing evidence regarding the effectiveness of Miswak on periodontal health. By examining the current literature, this paper aims to elucidate the potential benefits of Miswak (Salvadora persica) as a natural, complementary, feasible, and accessible intervention for maintaining periodontal health.

2. Methodology

The literature review seeks to evaluate previous studies pertaining to the effectiveness of Miswak (Salvadora persica) on periodontal health. Consequently, a comprehensive search strategy is required to identify studies that are directly relevant to the subject, followed by a rigorous selection process to yield high-quality evidence. The methodology section below outlines the review and analysis of the existing literature, encompassing the search strategy, inclusion and exclusion criteria, data extraction, and the analysis and synthesis of the evidence.

The search strategy employed the following databases: Wiley, SCOPUS, CINAHL, MEDLINE, and the Cochrane Library. The literature review specifically focused on the use of Miswak (Salvadora persica) and its effects on periodontal health. The search was limited to the past five years to evaluate the most recent evidence related to the selected topic. Details of the search strategy employed across the different databases are presented in Table 1.

Table 1 The Search Strategy According to Different Databases

Database	Keywords and search strategy
PubMed	(Miswak" OR "Salvadora Persica "OR "Chewing stick") AND ("Periodontal Health" OR "Periodontal Disease").
Medline	(Miswak" OR "Salvadora Persica "OR "Chewing stick") AND ("Periodontal Health" OR "Periodontal Disease").
Scopus	(Miswak" OR "Salvadora Persica "OR "Chewing stick") AND ("Periodontal Health" OR "Periodontal Disease").
Cochrane Library	(Miswak" OR "Salvadora Persica "OR "Chewing stick") AND ("Periodontal Health" OR "Periodontal Disease").
Wiley	(Miswak" OR "Salvadora Persica "OR "Chewing stick") AND ("Periodontal Health" OR "Periodontal Disease").
CINAHL	(Miswak" OR "Salvadora Persica "OR "Chewing stick") AND ("Periodontal Health" OR "Periodontal Disease").

The inclusion criteria for studies were studies in English, published in peer-reviewed journals, and published between 2019 and 2024; participants were assessed for periodontal Health (plaque index and gingival index) as an outcome. Exclusion criteria were studies that measure other variables related to oral health, such as the dental caries studies, with inaccessible full-text articles, and study protocol articles. By applying criteria for inclusion and exclusion, we carefully selected, reviewed, and assessed studies to identify those that met the requirements. This process is illustrated in Figure 1. The chosen studies then underwent scrutiny to evaluate the quality of their methodologies, and then data were extracted according to a predesigned matrix for this review.

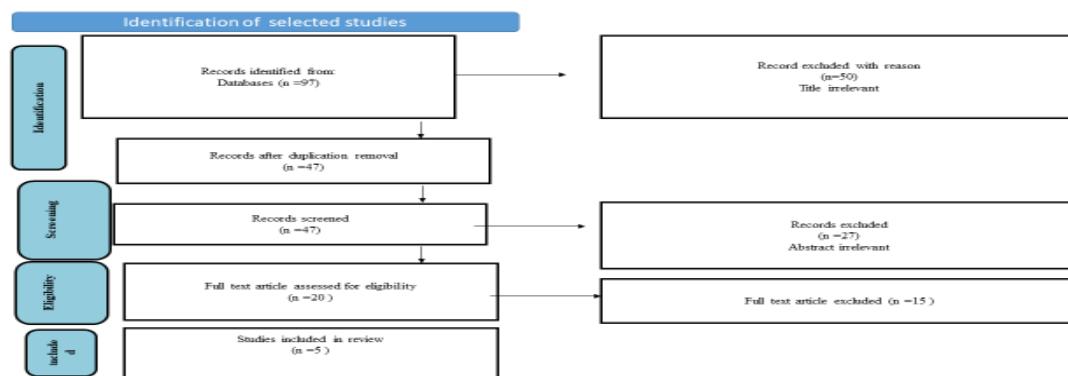


Figure 1. PRISMA Flow diagram of literature search.

Figure 1: PRISMA Flow Diagram of the Search and Selection Process.

3. Results of the Literature Review

Across databases, a total of 97 studies were found. Endnote software helps in removing duplications. Assessments have been done for titles and abstracts to eliminate 92 studies. In the final screening, five studies were eligible for the current review. Of those, one systematic review and meta-analysis, three randomized controlled trials (RCTs) and one Randomized crossover trial. A summary of the main results is presented in Table 2. The following section reviews these studies.

Table 2:Summary Table of the Study Title, Design, and Major Findings

Authors	Title	Design	Sample	Tool and duration of intervention	Major findings
Azizan, et al. (2023). Malaysia	Effectiveness of <i>Salvadora persica</i> toothbrush and <i>Salvadora persica</i> chewing stick in plaque and gingivitis control: a randomized control trial	single-blinded and parallel randomized controlled trial	78 participants were randomly divided into three groups to either use (i) <i>S. persica</i> toothbrush (MTB); (ii) <i>S. persica</i> chewing stick (MCS); or (iii) standard toothbrush (STB) in a standardized manner	Plaque Index (PI) and Periodontal Inflamed Surface Area (PISA) values, measuring plaque levels and severity of gingivitis, respectively three weeks.	The MCS group demonstrated a notable improvement in the mean PISA values for the anterior teeth, decreasing from 16.35 ± 10.03 to 3.41 ± 1.14 . This was significantly better compared to the MTB and STB groups, which had PISA values of 3.57 ± 1.19 and 6.17 ± 0.86 , respectively ($p < .050$). All three groups (MCS, MTB, and STB) reported significant improvements in plaque levels and gingivitis severity from baseline to three weeks after the intervention ($p < .001$). This indicates that both the <i>S. persica</i> toothbrush and chewing stick are as effective as the standard toothbrush in promoting oral health. The study concluded that when used correctly, both the <i>S. persica</i> toothbrush and chewing stick are effective tools for plaque control and improving gingival health, supporting the traditional use of <i>S. persica</i> for oral hygiene.

Authors	Title	Design	Sample	Tool and duration of intervention	Major findings
Adam et al (2023). Malaysia	A systematic review and meta-analysis on the comparative effectiveness of <i>Salvadora persica</i> - extract mouthwash with chlorhexidine gluconate in periodontal health	Systematic Review and meta-analysis	22 studies for systematic review, 16 studies for meta-analysis: both parallel-arm randomized controlled trials (RCTs) and crossover trials	plaque scores: plaque accumulation assessment, bleeding scores: evaluate gingivitis. duration range :24 hours -2 months	<p>Anti-Plaque Effectiveness: The <i>Salvadora persica</i> extract mouthwash showed a significant reduction in plaque accumulation with a standardized mean difference (SMD) of 0.89 (95% CI: 0.09 to 1.69), indicating its effectiveness as an anti-plaque agent, although it was less effective than chlorhexidine.</p> <p>Anti-Gingivitis Effectiveness: The mouthwash also demonstrated a notable effect on gingival inflammation, with a SMD of 0.12 (95% CI: -0.43 to 0.67) for reduction in bleeding scores, suggesting its potential role in managing gingivitis.</p> <p>Comparison with Chlorhexidine: While <i>Salvadora persica</i> extract mouthwash is effective, its overall improvement is inferior to that of chlorhexidine gluconate. Nonetheless, it serves as a viable herbal alternative for individuals seeking natural oral hygiene options.</p> <p>Health Implications: Given the side effects associated with long-term use of chlorhexidine, such as taste disturbances and mucosal irritation, the findings support the use of <i>Salvadora persica</i> extract as a safer, natural option for maintaining periodontal health.</p>
Sabbagh et al. (2020). Saudi Arabia	The effect of brushing with <i>Salvadora persica</i> (Miswak) stick on salivary <i>Streptococcus mutans</i> and plaque levels in children: a clinical trial	Randomized double-blinded clinical trial design	Sample size: 94 healthy, high caries-risk children	Saliva sampling and plaque score assessments were conducted duration :3 months Specifically, the participants underwent a preparatory period (PPP) of three weeks before the main study evaluations began. This was followed by follow-up visits where plaque scores and saliva samples were collected at baseline, one month, and three months	<p>Miswak and FTP significantly reduced plaque scores in children. Miswak increased <i>S. sanguinis</i> levels after three months</p>
Riasat et al. (2021). Pakistan.	Comparison of <i>Salvadora Persica</i> Chewing stick and Manual Tooth Brush for Efficacy of Plaque Removal : A Randomized Controlled Trial	Randomized Controlled Trial (RCT)	80 participant aged 18-45	Plaque Assessment: Modified Quigley-Hein Plaque Index (QHPI) was used to measure plaque levels at baseline and after 4 weeks.	<p>Baseline Plaque Scores: Group A (Toothbrush): Mean = 5.001 Group B (Miswak): Mean = 4.923</p> <p>Post-Intervention Plaque Scores: Group A: Mean = 2.52 Group B: Mean = 1.37</p> <p>Statistical Significance: Both groups showed significant reductions in plaque ($p < 0.001$), with the Miswak group demonstrating a greater reduction in plaque levels compared to the toothbrush group.</p> <p>Conclusion: <i>Salvadora persica</i> chewing stick was found to be a more effective anti-plaque agent than traditional toothbrushes in this study population.</p>

Authors	Title	Design	Sample	Tool and duration of intervention	Major findings
Refaey et al. (2020). Kuwait	A clinical investigation into the efficacy of Miswak chewing sticks as an oral hygiene aid: A crossover randomized trial	Randomized Crossover Trial	participants: 20 healthy individuals with mild to moderate gingivitis. Gender Distribution: 8 males, 12 females. Mean Age: 24 ± 3 years. Allocation: Randomly divided into two groups of 10 participants each, using Miswak and toothbrush in a crossover manner.	Clinical Measurements: <ul style="list-style-type: none"> Gingival Index (GI) Plaque Index (PI) Bleeding on Probing (BOP) Microbial Analysis: Plaque samples were analyzed for the presence of <i>Streptococcus mutans</i> and <i>Aggregatibacter actinomycetemcomitans</i> using quantitative real-time polymerase chain reaction (qPCR). Intervention Duration: Each participant used the assigned oral hygiene methods for 2 weeks, followed by a crossover to the alternative method for another 2 weeks.	Clinical Improvements: Both groups showed significant improvements in GI, PI, and BOP scores after 2 weeks of using the methods. The TB+M group (toothbrush and Miswak) showed a greater reduction in BOP compared to the TB group (toothbrush only). Statistical Significance: At the end of the study, significant differences in PI, GI, and BOP were found between the TB+M and TB groups, with the TB+M group showing better results. Microbial Counts: There was no significant difference in the microbial counts of <i>S. mutans</i> and <i>A. actinomycetemcomitans</i> between the two groups at the conclusion of the study.

Miswak as a Traditional Oral Hygiene Aid

Miswak is a natural tooth-cleaning stick that has been used since ancient times in Asia, the Middle East, and Africa as part of traditional oral hygiene practices, serving as an alternative to toothbrushes and toothpaste (Hunaydi et al., 2023). Sourced from the *Salvadora persica* tree, Miswak features tough twigs that possess unique medicinal and antibacterial properties, making it both distinctive and effective (Stankovic, 2020). It is rich in essential micronutrients, including vitamin C, zinc, chloride, and silica, which occur naturally in the plant (Varma & Zope, 2020). The active chemical constituents found in Miswak extract contribute to the prevention of periodontal diseases such as gingivitis, periodontitis, and tooth caries (Ersa & Ervina, 2024). Given these health benefits, Miswak is recognized for its significant role in enhancing oral health. Importantly, the use of Miswak is considered a prophetic practice for maintaining dental health, a notion that is also supported by research (Bramantoro et al., 2020).

Miswak is recognized for its medicinal properties and chemical constituents that possess antimicrobial effects, which contribute to improved oral health (Nordin et al., 2020). Numerous studies on the use of Miswak among adults have demonstrated positive outcomes regarding periodontal health, indicating that it can serve as a beneficial oral hygiene aid. Additionally, the natural antibacterial and anti-inflammatory properties of Miswak make it a safe and effective option for maintaining oral health (Ersa & Ervina, 2024). Research on the Miswak derived from *Salvadora persica* (L.) has explored the reasons behind its use. The active ingredients and therapeutic effects significant to the chemical composition of *Salvadora persica* have been well-documented, revealing that Miswak is a rich source of several essential micronutrients, including vitamin C, zinc, silica, and chloride (Ishtiaq et al., 2023).

Miswak exemplifies the functional use of naturally occurring plant-based chemicals. Both children and adults utilize Miswak not only to prevent tooth deposits, toothaches, and halitosis but also as a cultural and social symbol. Unlike a conventional toothbrush, this simple tooth-cleaning twig naturally functions as both a portable toothbrush and toothpaste, requiring no water or additional paste, and it can be reused. Miswak holds aesthetic and symbolic significance, embodying cultural connotations and social representations. Its use is often associated with the cleansing of both body and spirit. The combination of its aesthetic appeal, physical properties, and chemical composition may account for the growing popularity of Miswak in treating oral health disorders, wounds, and aphthous ulcers.

3.1. Historical and Cultural Significance

The Miswak stick is a twig from the *Salvadora persica* tree, used for centuries to maintain oral hygiene and the natural health of oral tissue. The modern toothbrush is a mass-manufactured, commercial product that often undermines traditional health practices. Miswak holds significant importance in Islamic culture, as it is considered the traditional toothbrush. Islam encourages its followers to clean their teeth and gums with Miswak

because it is pure, clean, and well-known for its beneficial effects on oral health. Interpretations of the Hadith suggest that using Miswak offers both spiritual and physical rewards. Muslims believe that Miswak cleanses the mouth and pleases Allah. Many Islamic scholars and the World Health Organization continue to recommend the daily use of Miswak. During Ramadan and other fasts, using Miswak is advised to reduce bad breath and promote a sense of purity when Muslims cannot use regular toothpaste and toothbrushes, as the use of water is limited to a small amount in the mouth. Today, in the twenty-first century, Miswak sticks are gaining international popularity. Research on Miswak continues to expand due to its alleged therapeutic properties and its potential as a natural substitute for less natural commercial products. Numerous studies have reported the antibacterial, antifungal, anticariogenic, and antiplaque properties of Miswak. Furthermore, clinical studies have enhanced our understanding of the potential benefits of using Miswak as a natural orthodontic substance in the care of patients awaiting dental treatment. Given the growing interest and use of Miswak today, this review aims to provide a narrative overview of its effects on periodontal health and to analyze the relevant literature from a multidisciplinary scientific perspective.

Scientific Evidence on the Effectiveness of Miswak

A literature search was conducted in Wiley, SCOPUS, CINAHL, CINAHL Complete, MEDLINE, MEDLINE Complete, and the Cochrane Library with the following search terms: Miswak and periodontal health, *Salvadora persica*, chewing sticks, and periodontal health. The databases were searched using the "OR" Boolean operator to combine each two or three keywords. Applications of phrases in quotation marks were also used, and search limits utilized included "human" to filter out animal studies and ensure at least some research was conducted in vivo, and dates of 2019 and after to focus on more recent studies. Studies presenting primary data on the effects of Miswak usage on periodontal health were included. The studies were reviewed for pertinent data, including methodology, independence of study populations, measurement of periodontal health, and results.

Several clinical studies have documented the effectiveness of Miswak on microorganisms implicated in periodontal disease in vivo. These studies have consistently shown that the use of Miswak can significantly reduce the microbial load, including pathogenic bacteria such as *Porphyromonas gingivalis* and *Aggregatibacter actinomycetemcomitans*, both of which are strongly associated with periodontal infections. A randomized controlled trial by Khalil et al. (2023) demonstrated that Miswak users exhibited a notable decrease in plaque accumulation and gingival inflammation compared to conventional toothbrush users. Additionally, Al-Otaibi et al. (2022) reported that regular Miswak use enhanced periodontal health by promoting better gingival conditions and reducing bleeding on probing. Furthermore, recent microbiological analyses have identified that the phytochemicals in Miswak, such as salvadorine and benzyl isothiocyanate, contribute to its antimicrobial properties, offering a sustainable and traditional alternative to modern oral hygiene methods (Al Sadhan & Ahmad, 2021). These findings reinforce the potential role of Miswak as an adjunctive tool in periodontal disease prevention and management. This support is essential for the present review as it is essential to assess the effectiveness of using Miswak (*Salvadora persica*) on periodontal health.

4. Results:

Across the reviewed studies, *Salvadora persica* (Miswaak) has demonstrated notable efficacy in the management of plaque and gingivitis compared to conventional oral hygiene practices. The principal findings are summarized as follows: In a randomized controlled trial, participants utilizing *Salvadora persica* chewing sticks (MCS) exhibited a significantly greater improvement in gingival health, particularly in Periodontal Inflamed Surface Area (PISA) values, compared to those employing *Salvadora persica* toothbrushes (MTB) or standard toothbrushes (STB). All three groups showed significant improvements in plaque control and reduction of gingivitis over a three-week period ($p < .001$) (Azizan et al., 2023).

This systematic review and meta-analysis indicated that mouthwash containing *Salvadora persica* extract effectively diminished plaque and gingival inflammation, with a standardized mean difference (SMD) of 0.89 for plaque accumulation. However, the results were less favorable than those achieved with chlorhexidine gluconate. Nonetheless, *Salvadora persica* was considered a viable herbal alternative for individuals seeking natural oral hygiene solutions, with fewer associated side effects (Adam et al., 2023).

Sabbagh et al. (2020) reported that the use of Miswak resulted in significant reductions in plaque scores and increased levels of beneficial bacteria, such as *Streptococcus sanguinis*, in children after three months of use. These findings support the effectiveness of Miswak in pediatric populations at high risk for caries. In another study, Riasat et al. (2021) conducted a randomized controlled trial that found Miswak significantly reduced

plaque levels compared to traditional toothbrushes ($p < 0.001$). The Miswak group demonstrated a greater reduction in plaque scores from baseline (Mean = 1.37) compared to the toothbrush group (Mean = 2.52). Additionally, Refaey et al. (2020) conducted a crossover trial in which participants using both Miswak and toothbrushes (TB+M) exhibited superior reductions in gingival inflammation (GI), plaque accumulation (PI), and bleeding on probing (BOP) compared to users of toothbrushes alone. No significant difference in microbial counts (e.g., *Streptococcus mutans* or *Aggregatibacter actinomycetemcomitans*) was observed between the two groups.

5. Conclusion:

The studies collectively demonstrate the effectiveness of *Salvadora persica* (Miswak) as an oral hygiene tool, particularly in reducing plaque and gingivitis. In several cases, Miswak outperformed traditional toothbrushes in plaque reduction and improvements in gingival health metrics. Specifically, the studies by Azizan et al. and Riasat et al. emphasize its superiority in plaque control compared to conventional methods, while Adam et al. indicate its potential as a natural mouthwash alternative, though it is less effective than chlorhexidine gluconate. *Salvadora persica* presents a promising natural option for oral hygiene, especially for populations seeking traditional, side-effect-free alternatives. However, while it is effective in both clinical and controlled environments, its benefits may vary based on factors such as usage, population, and comparison agents (e.g., chlorhexidine). Overall, the findings support *Salvadora persica* as a valuable tool in both modern and traditional oral hygiene practices.

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Authors' contributions

NA and BA conceptualized, wrote, and reviewed the entire manuscript

Conflict of Interest

There is no conflict to declare

Ethics approval and consent to participate

Not applicable

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