

Can the Adoption of *Salvadora Persica* among School-aged Learners Lead to Improved Oral Hygiene Practices?

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Oral hygiene is essential to general health and well-being, especially in the formative years. Thus, establishing proper oral hygiene practices early in life can benefit a person's health in the long term. School-aged children and adolescents commonly struggle to maintain good oral health for various reasons, including but not limited to poor nutrition, poor socio-economic status, lack of hygiene education or poor oral hygiene practices (1). Therefore, this commentary aims to promote the adoption and usage of *Salvadora persica* (Miswak) as an inexpensive and accessible natural product alongside the conventional method of toothbrushing to minimise the effect of long hours spent during the school day without recourse to oral hygiene as well minimise some of the drawbacks associated with chemical toothpastes. These include chemical allergies in certain individuals especially children; high cost, which makes it less affordable for those with lower incomes or those who live in areas with limited access to dental care products; environmental impact from the plastic tubes and potential carcinogens such as triclosan (2). Exploring complementary and organic methods of oral hygiene is therefore pertinent.

Salvadora persica, also called “toothbrush tree” or “Miswak,” is one of these fascinating possibilities. It has been used for ages throughout many civilizations, especially in Africa, the Middle East, and some parts of Asia as a traditional means of maintaining oral health. This approach entails using a part of the tree, its stem or root, as a tool for brushing teeth (3). This all-natural dental cleaner offers a viable option to explore

how conventional methods and unorthodox treatments can help students' oral health. In this commentary, we would like to emphasize the value of natural products in maintaining oral hygiene, particularly in the context of school-aged learners. This is because they are relatively effective, affordable, simple to use, and time-efficient (3) than the orthodox teeth brushing with chemical toothpastes, which calls for a sterilization facility and the supervision of students while performing this activity. A clinical study conducted by Rifaey and colleagues concluded that using Miswak alongside toothbrushing significantly improved Gingival index (GI), plaque index (PI) and bleeding on probing (BOP) (4).

World Health Organisation (WHO) guidelines urge education providers to facilitate a supportive environment that promotes children's oral health so that the approach to oral health becomes more preventative than curative (5). Knowledge of oral health is, thus, a necessity for healthy behaviour, which enables someone to take action to safeguard their health. For instance, in a cross-sectional study aimed to examine the knowledge of oral health and assess the oral hygiene habits among healthcare and non-healthcare students, Tadin and colleagues found a positive correlation between extensive knowledge of oral health and better health-related behaviours. (1). Also, some studies have addressed the habits and knowledge of students, regarding oral hygiene (1, 6). This commentary highlights the need for the adoption of natural products by school-aged learners in Kazakhstan, Central Asia, for simple, complementary and effective oral health practice.

Oral hygiene of school-aged children is a major issue that requires the attention and collaboration of families, schools, and health agencies. It is well-accepted that a prominent reason behind plaque formation and oral diseases is the lack of tooth-brushing and oral hygiene maintenance (7). Tashiro and co-workers concluded that a school-based environment supportive of oral health was significantly associated with a zero DMFT (Decayed, missing due to caries, and Filled Teeth in the permanent teeth index) status in children in a study conducted in Taiwan (8). This study indicates the significance of promoting oral hygiene habits and their rules in enhancing one's oral health.

It is currently well-established that most infections are caused by the aggregation of bacteria in the form of biofilms. Oral biofilms are formed when microorganisms attach themselves to teeth surface and get embedded into self-produced glycoprotein materials which offer protection to them from the surrounding environment. This implies that for teeth cleaning to be effective, administering an antimicrobial, such as toothpaste, to reduce the population of opportunistic bacteria is needed. That being mentioned, it is often overlooked that most dental diseases can be prevented by reducing early bacterial adhesion and colonization, a precursor to mature dental plaque (9).

Implementing a school-based toothbrushing program with the support of staff and active engagement of children can help children develop a toothbrushing habit, as established in Taiwan and England. More barriers to implementing such programs can be found in the case of Brazil and the Philippines due to many factors (7).

The earlier mentioned consideration led the authors to believe that a more simplified approach to toothbrushing is necessary to make the activity more motivating, through raising awareness, more user-friendly and linked to the STEM curriculum. These criteria can be fit a natural product, in our case, *S. persica*, which has been used in oral hygiene, and cosmetics, due to the presence of secondary metabolites such as flavonoids, glycosides, sterols, terpenes, carbohydrates and alkaloids and other organic compounds such as sulfur compounds (10).

S. persica is a tree that belongs to the Salvadorian family. It is a huge, densely branched, evergreen shrub or tree with soft, whitish-yellow wood.

Its branches are many; the leaves are slightly fleshy and have many flowers in the upper axils. It is mostly cultivated in the Indian subcontinent, as well as dry and subtropical areas of Africa and the Middle East, where (11) *S. persica* is regarded to be a natural toothbrush due to the presence of two criteria of teeth-brushing apparatus; that is, the ability to disrupt the biofilm through mechanical movement as well as the ability to kill or inhibit the bacteria due to the presence of phytochemicals such as benzyl isothiocyanate compound which has demonstrated comparable antimicrobial efficacy with chlorhexidine digluconate (CHX) and clove oil, well known antimicrobial agents for oral hygiene (10). Several other studies drew a comparability of the effect of Miswak with conventional toothpaste (11-13).

S. persica has undergone clinical testing on children of school age. A randomized double-blinded clinical trial assessed the effect of tooth brushing with *S. persica*, compared with brushing with fluoridated toothpaste (FTP), on the count of *Streptococcus mutans* and the average plaque score. The results showed a significant statistical decrease in the mean plaque score in both groups (14). Another study examined the disparity between those who use miswak and those who do not. The study revealed a significant increase in the occurrence of dental cavities among non-users. A total of 240 school pupils were included in this research, and their decayed-missing-filled (DMF) score was assessed during a two-year period (15).

Although there are many advantages linked to the use of Miswak, it is equally important to acknowledge potential challenges and limitations in our quest for its wider adoption and usage among school-aged kids. The level of cultural acceptability of Miswak may differ greatly across various areas, with some civilizations (i.e., Western nations), perhaps considering it as obsolete in comparison with contemporary oral hygiene treatments. Information about the benefits of Miswak must, therefore, be spread through extensive education - as one of the objectives of this commentary. Moreover, the feasibility of obtaining *S. persica* might present challenges, especially in regions where the plant is not indigenous. This limited regional distribution may constrain the sourcing of the product, making it difficult and costly in other regions. Furthermore, the fibrous texture of the stick may cause irritation for those with sensitive

oral tissues. While uncommon, some people may experience allergic reactions to the inherent compounds present in *S. persica*. Thus, it is critical to monitor for any negative responses when starting to use Miswak. In addition, those with pre-existing gum illnesses, such as periodontitis, may experience a worsening of their condition if they do not use Miswak correctly. Prior to integrating it into their dental hygiene regimen, individuals should seek professional guidance.

In conclusion, we suggest that the topic of oral hygiene can serve the purpose of combining the theoretical (oral hygiene education) and applied science (usage of *S. persica*) in one curriculum, as a model topic; this is thought to make science and its application to be more appealing to young learners along with promoting self-motivating oral hygiene habits. Finally, when considering the viability and adoption of this natural alternative, it is crucial to consider variables like cultural acceptance, availability, accessibility, and sustainability.

Authors' Contribution

Mohamed Elshikh: Contributions to the conception of the work, literature review, manuscript revising. Kayode William Olaifa: Contributions to the conception of the work, literature review, manuscript revising. Yusuf Haggag: Contributions to the conception of the work, manuscript drafting and revising. Aayah McMullen: Contributions to the conception of the work, manuscript drafting and revising.

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