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# The miswak (*Salvadora persica L.*) chewing stick: Cultural implications in oral health promotion



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## KEYWORDS

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**Abstract** *Introduction:* With the increasing incidence of oral diseases attributed to poor oral hygiene, mechanical removal of dental plaque has been regarded as an effective means in the prevention of dental caries and periodontal diseases. The methods for oral hygiene vary from culture to culture and the dimensions regarding the global need for alternative prevention and effective treatment methods have expanded.

*Discussion:* Evidence-based studies and clinical trials have revealed the use of *Salvadora persica* (miswak) as an effective oral hygiene aid by which different cultures have attached functional value since ancient times.

*Conclusion:* The World Health Organization recommends and encourages the use of miswak as an inexpensive and effective oral hygiene tool in areas where it is customary. Its availability, low-cost, simplicity, and use have been extensively studied in regions around the world where miswak can play a significant role in the promotion of oral hygiene. As a result, current and upcoming public health practitioners and the dental profession should become familiar with the application of miswak within its traditional customs. Furthermore, efficacy studies are warranted to determine the effectiveness and usefulness of any potential didactic training involving miswak use to educate health professionals.

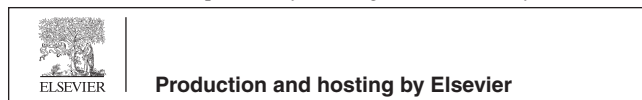
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## 1. Introduction

Dental caries and oral infections are common health concerns among people worldwide while oral hygiene practices continue to be the leading preventive measures against oral infections and gum diseases. Various methods exist to maintain and preserve oral and dental hygiene.<sup>1,2</sup> Since antiquities, prior to the advent of the modern toothbrush, civilized people used some type of cleaning instrument to preserve their teeth. A few of these early devices include the toothpick, twig brush, and finger wrapped cloth. Toothpicks have been traced as far back as prehistoric times, having been excavated in the ancient

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Babylonian city of Ur among other articles of toiletry. During the antiquities, the laws of Manu of ancient Vedic India stipulated that the teeth be cleaned as part of the daily hygienic rituals.<sup>3,4</sup> Medical books of ancient India, Susruta Samhita and Charaka Samhita, have also stressed on oral hygiene using herbal sticks.<sup>5</sup> During the 2nd century BC, the Greek sophist, Alciphron, recommended a toothpick to clean the “fibrous residue” that remained between the teeth after meals. The Greek word, *karpnos*, Alciphron used to describe the toothpick, is roughly translated to ‘blade of straw’. The Romans had also used toothpicks from the mastic tree (*Pistacia lentiscus*). The Gospel of Buddhism mentions Buddha receiving a “tooth stick from the god, Sakka”. The Talmud mentions “quesem”, a splinter or wooden chip that was “divided at one end by chewing and biting” and used like a toothbrush.<sup>3</sup>

The Babylonian fiber brush, the “chew stick” which might be considered the historical forerunner of the modern toothbrush was used as early as 3500 BC. It was made up of a wooden stick cut to five or six inches in length of which one end was macerated to separate the fibers to about one quarter of an inch. It was known to the Arabs as *siwak* or *miswak*.<sup>3,6</sup> The advances in medieval Arab medicine during the Golden age of the Islamic civilization naturally applied to preventive dentistry as well. The great Arab polymaths during this Golden Age considered the oral cavity as an essential part of the human body and treated it with corresponding interest as it relates to personal dental hygiene.<sup>7,8</sup> Many of these principles of Islamic dental hygiene were attributed directly to Prophet Mohammed himself, a proponent in the use of the *miswak*, as the development of the primitive Middle Eastern dentifrice. The use of *miswak* was a constant practice of Prophet Mohammed upon awakening, after meals, before recitations of prayers and of the holy texts.<sup>7</sup> According to prophetic traditions, known as the *hadith*, the Prophet recommended to rinse the mouth three times prior to each of the five daily Islamic prayers as prescribed in Islam and to “make a regular practice of *miswak*; for verily it is the purification for the mouth and a means of the pleasure of the Lord”.<sup>9(p134)</sup>

In the early Islamic period, the use of *miswak* became a part of a cultivated and elegant mode of life and as a prominent feature of Islamic hygienic jurisprudence. Today, cross-cultural knowledge can help motivate public health dentists and dental hygienists to recognize culturally accepted behaviors for the purpose of strengthening patient-provider relationships and optimizing public health outcomes. Such recommendations can offer ways to blend western healthcare with Islamic practices and precepts surrounding the use of *miswak* and dental hygiene practices considering that healthcare providers live and work in a global society.

## 2. Methods

The aim of this narrative review is to provide evidence-based information about *miswak* as one of the traditional Islamic methods of oral cleansing within the global health context of today’s multicultural healthcare settings and to encourage dental and public health professionals to regard culturally competent communication, dental literacy, and overall oral health as it relates to *miswak* use. A review of the literature was carried out by applying search strategies to four biomedical electronic databases, PubMed, Scopus, Science Direct, and EBSCO for

the years 1991 through March 2013. A combination of search terms included ‘*miswak*’, ‘*siwak*’, ‘*Salvadora persica*’, and ‘chewing stick’. The results generated by the search were limited to the English and Arabic language. Publications were reviewed for relevance to the topic. References from retrieved articles were reviewed to identify additional applicable publications.

## 3. Discussion

### 3.1. *Salvadora persica* (*miswak* chewing stick)

Chewing sticks, though the term may be a misnomer considering that the stick is chewed only briefly to fray the fibers which is then used as a brush, are obtained from a variety of plant species and have been traditionally used for cleaning teeth in Africa, Asia, Latin America, and the Near East. Chewing sticks are known by different names in different cultures: *miswak* in Arabic, *koyoji* in Japanese, *quesam* in Hebrew, *mastic* in Latin, *Mefaka* in Amharic, and *Datun* in Hindi. The spread of Islamic culture had a profound influence on the propagation and use of *Miswak*, which as noted earlier was a pre-Islamic custom that was adhered to by the Arabs to get their teeth cleaned.<sup>10</sup> The use of *miswak* has also been reflected in classical Arab poetry where it stands as a symbol for white teeth and fragrant mouth. The Persian physician Abu Bakr Al-Razi, known in the West as Rhazes, had remarked that *miswak* was “good for the foul breath of the mouth, polishes the teeth, and strengthens the gums”.<sup>11(p76)</sup>

The *miswak* [*Salvadora persica* Linn.] belongs to the family *Salvadoraceae*, and has been widely cultivated and distributed in the arid regions of the world, from India in the east through the Arabian peninsula, Iraq, Sudan, Northern, and Central Africa to Mauritania in the west. *Salvadora persica*, or the Arak tree known in English as the “tooth brush tree” is a large, well-branched evergreen tree or shrub with white branches, aromatic roots, soft white yellowish wood, and leaves that are glaucous and somewhat fleshy.<sup>6,12,13</sup>

Various communities in different regions of the world depend on *miswak* as their primary oral hygiene device. Although oral health surveys have confirmed the widespread use of chewing sticks, scientific evaluation has only been recently undertaken as the need to identify *miswak*’s effects on dental health arose. The positive clinical effects of *miswak* on plaque reduction, gingival indices, as well as, its antibacterial activity have been demonstrated in clinical studies and trials, suggesting that *miswak* is a favorable oral health device.<sup>14–20</sup> Clinical studies have linked Benzyl isothiocyanate, a component of *Salvadora persica*, to rapid and strong bactericidal effects against oral pathogens, involved in periodontal disease as well as against other Gram-negative bacteria and to growth inhibition among certain Gram-positive bacteria. Several epidemiological studies have also revealed that *miswak* had potentially strong anticariogenic properties. *Miswak* also contained cleaners such as *sinigrin*, sodium bicarbonate, calcium oxalate, as well as astringents such as gallic acid and volatile oils, which some authors suggested strengthen gingival tissues.<sup>21–30</sup>

Other parts of the Arak tree have been found to contain phytochemical properties conducive to therapeutic and dietary value. In Eastern Africa, it was found that the leaves were

consumed as a vegetable preparation or as drink.<sup>31,32</sup> The beneficial effects of miswak in respect to oral hygiene and dental health have been linked to its dual mechanical and pharmacologic action. Consequently, the World Health Organization has encouraged its use as an effective oral hygiene device in remote regions of the world.<sup>13,33,34</sup>

Although no primary reference exists regarding the precise brushing procedures of the miswak in the Koran (the Islamic book of divine revelation) nor in the hadith, miswak users typically clean their teeth 5–10 min per day with an up-and-down technique or with a circulating action.<sup>35</sup> Hirschfeld proposed the following procedures,

“the miswak should be held between the little finger, the index, middle, and ring fingers and point downward with the thumb extended along the handle toward the bristles. The anterior teeth are to be brush first, then the labial and lingual surfaces of the posterior teeth, and, lastly, the occlusal surfaces”.<sup>36(p9)</sup>

### 3.2. Cultural implications

As the French philosopher Auguste Comte (1798–1857) stated, “demography is destiny”. With world populations becoming more culturally diverse, healthcare providers must practice cultural awareness and sensitivities to achieve trust, and to direct the patient-provider relationship toward the ultimate goal of quality oral health care for all population segments. Unfortunately, ignorance of customs can undermine the establishment of trusting relationship. As in the case of the miswak chewing stick; dental professionals should review miswak use with patients to ensure proper use and angulation to maximize bacterial plaque removal.<sup>37,38</sup>

One of the ways to meet the challenges presented by multicultural patient populations is to develop a public health and dental workforce that is both culturally and linguistically competent. A study in Jeddah, Saudi Arabia assessing the knowledge, attitude, and behavior among Saudi school students in relation to periodontal health status revealed that regular tooth brushing was the method with the highest frequency (80%) followed immediately by miswak use (40%). The toothbrush was used more frequently among private school subjects, while miswak was used more frequently among governmental school students.<sup>39</sup> Consequently, future generation of dentists must be culturally prepared to serve diverse patient populations that utilize miswak as their primary oral hygiene aid.<sup>40</sup>

According to the National Center for Cultural Competence, critical factors in the provision of culturally competent health care services include understanding of the values, beliefs, traditions, and practices of a culture. Dental schools must strive to prepare their students in such areas of focus. Ideally, future generations of public health practitioners and dentists should be knowledgeable about the cultures they will treat and well-versed in cultural practices. As a result, a study was conducted to examine self-rated knowledge of dental students about the cultures they are likely to encounter in dental practice and students’ belief about the importance of culturally sensitive practices in dental care.<sup>41</sup> The authors found that overall students reported low knowledge of the cultures of the patients they were likely to see in practice. The majority of students could not identify a cultural group whom they know well

and they recognized the importance of cultural sensitivity in dental practice. These findings are consistent with the recent literature that suggests that gaining student core competency knowledge of specific cultural groups is an important part of improving provision of culturally sensitive oral health care in diverse populations.<sup>42–45</sup>

Dental services remain one of the areas of health care with incomplete coverage in the Arab regions. Dental supplies among governmental sectors may be limited and, consequently, pushing clients to seek care in the private sector. Even though the proportion of dentists to the general population has only become adequate recently in most Arab countries, these dentists practice predominantly in the private sector. In countries that have adopted social health insurance, dental care has not been covered yet. Moreover, the concentration of dentists in the cities and in the private sector of the Arab region has severely limited the access to dental care in rural areas.<sup>46</sup> Thus, such remote regions of the Islamic world with limited access to dental care would benefit greatly from the convenient use of miswak and other traditional methods of oral hygiene as observed in studies among Jordanian and Sudanese populations.<sup>47,48</sup>

### 4. Conclusion and public health implications

Oral health has gained growing attention as a considerable public health concern. From the ancient miswak to the electric toothbrush, oral hygiene practices has come into daily use throughout the world being either mechanical or manual. Miswak offers itself as an effective and affordable oral hygiene device. Its history has demonstrated the changing attitude toward dental hygiene and the necessity for healthcare professionals to take careful notes within the public health annals of cultural competency for the purpose of promoting cultural diversity in the field of oral hygiene and to acknowledge that alternative oral hygiene aids have a significant role within certain communities. In this regard, the cultural competence of oral health care providers merits examination of miswak use as a point of intervention. The growing diversity in populations, together with the importance of acknowledging and understanding cultural beliefs and behaviors that affect health outcomes, will require culturally sensitive techniques that serve to enhance provider-patient communications and oral health literacy.

As developed countries attempt to engage in oral health inequalities, the implications of cultural diversity on global oral health promotion need to be considered. While overcoming cultural and language barriers is a necessary prerequisite, it is not always sufficient. It is critical that health professionals approach rituals of relevance to public health dentistry such as traditional oral hygiene devices with an openness to explore and become aware of alternative oral health practices. While it has become clear that language skills of health professionals have major implications for public health practice, the necessity to address cultural familiarities and awareness has become equally important to fully meet the dynamic needs of culturally and linguistically diverse populations. Clearly, cultural competency in oral health education is at its early stages of development, and there remain substantial variations within and between the health professions on core cultural competency knowledge and experiences. Public health education serves as an avenue for the health professions with regard to the

designation of cultural competency core knowledge and the development of curriculum. Building didactic frameworks for dental and health professions to understand the complex beliefs, behaviors, and expectations of rural communities rooted in cultural and religious foundations will assist in reducing oral health inequalities. Public health and dental schools with the assistance of international student support programs can collaborate in developing training courses that discuss miswak and other traditional oral health aids. Consequently, such training courses can be studied for their efficacy and value as instruments that measure student cultural competency knowledge regarding alternative oral hygiene devices. The miswak provides itself not only as a culturally enriching example that has its deep religious, health, social and cultural origins, but also serves as a model to educate the use of culturally sensitive oral health care practices worldwide.

### 5. Limitations

There are several limitations to this narrative review that may have influenced the conclusions. Although the author searched several biomedical databases using various search terms, relevant citations may have been missed. Another limitation has to do with the narrative review methodology that was used, which is less strict than that of a systematic review. This review did not differentiate how many references were ascertained from each of the searched databases. Also, narrative reviews that do not employ methodologically solid methods, as in the case of systematic reviews, are prone to bias and confounding. Narrative reviews serve mainly to discuss an issue rather than present an accurate summary of the literature. Narrative reviews are considered one of the lowest levels of evidence and therefore caution should be considered with regard to its conclusion.

### References

- Muhammad S, Lawal MT. Oral hygiene and the use of plants. *Sci Res Essays* 2010;**5**(14):1788–95.
- Bairwa R, Gupta P, Gupta VK, Srivastava B. Traditional medicinal plants: use in oral hygiene. *Int J Pharm Chem Sci* 2012;**1**(4):1529–38.
- Hyson JM. History of the toothbrush. *J Hist Dent* 2003;**51**(2):73–80.
- Wolf W. A history of personal hygiene – customs, methods and instruments – yesterday, today, tomorrow. *Bull Hist Dent* 1966;**14**(4):54–66.
- Dahiya P, Kamal R, Luthra RP, Mishra R, Saini G. Miswak: a periodontist's perspective. *J Ayurveda Integr Med* 2012;**3**(4):184–7.
- Wu CD, Darout IA, Skaug N. Chewing sticks: timeless natural toothbrushes for oral cleansing. *J Periodontol Res* 2001;**36**(5):275–84.
- Aziz SR. Dentistry during the golden age of Islam. *J N J Dent Assoc* 1992;**63**(4):49–51.
- Herschfeld JJ. Dentistry in the writings of Albucahis during the golden age of Arabian medicine. *Bull Hist Dent* 1987;**35**(2):110–4.
- Khan MM. *The translation of the meanings of summarized Sahih Al-Bukhari*. Riyadh, Saudi Arabia: Darussalam Publications; 1996.
- Halawany HS. A review on miswak (*Salvadora persica*) and its effect on various aspects of oral health. *Saudi Dent J* 2012;**24**(2):63–9.
- Bos G. The miswak, an aspect of dental care in Islam. *Med Hist* 1993;**37**(1):68–79.
- Hooda A, Rathee M, Singh J. Chewing sticks in the era of toothbrush: a review. *Internet J Family Pract* <<http://www.ispub.com/journal/the-internet-journal-of-family-practice/volume-9-number-2/chewing-sticks-in-the-era-of-toothbrush-a-review.html#sthash.MaF4bXlx.dpbs>>; 2011; 9 (2), 1. accessed 12. 01.13.
- Khatak M, Khatak S, Siddiqui AA, Vasudeva N, Aggarwal A, Aggarwal P. *Salvadora persica*. *Pharmacogn Rev* 2010;**4**(8):209–14.
- Sofrata A, Brito F, Al-Otaibi M, Gustafsson A. Short term clinical effect of active and inactive *Salvadora persica* miswak on dental plaque and gingivitis. *J Ethnopharmacol* 2011;**137**(3):1130–4.
- Darout IA, Christy AA, Skaug N, Egeberg PK. Identification and quantification of some potentially antimicrobial anionic components in miswak extract. *Ind J Pharmacol* 2000;**32**(1):11–4.
- Chelli-Chentouf N, Tir Touil Meddah A, Mullie C, Aoues A, Meddah B. In vitro and in vivo antimicrobial activity of Algerian Hoggar *Salvadora persica* L. Extracts against microbial strains from children's oral cavity. *J Ethnopharmacol* 2012;**144**(1):57–66.
- Patel PV, Shruthi S, Kumar S. Clinical effect of miswak as an adjunct to tooth brushing on gingivitis. *J Indian Soc Periodontol* 2012;**16**(1):84–8.
- Sofrata A, Santangelo EM, Azeem M, Borg-Karlson AK, Gustafsson A, Putsep K. Benzyl isothiocyanate, a major component from the roots of *Salvadora persica* is highly active against Gram-negative bacteria. *PLoS One* 2011;**6**(8):e23045.
- Ahmad H, Ahamed N. Therapeutic properties of meswak chewing sticks: a review. *Afr J Biotechnol* 2012;**11**(83):14850–7.
- Darout IA, Albandar JM, Skaug N. Periodontal status of adult Sudanese habitual users of miswak chewing sticks or toothbrushes. *Acta Odontol Scand* 2000;**58**(1):25–30.
- Van Vuuren SF, Viljoen AM. The in vitro antimicrobial activity of toothbrush sticks used in Ethiopia. *S Afr J Bot* 2006;**72**(4):646–8.
- Batwa M, Bergstrom J, Batwa S, Al-Otaibi MF. The effectiveness of chewing stick miswak on plaque removal. *Saudi Dent J* 2006;**18**(3):125–33.
- Sofrata A, Lingstrom P, Baljoon M, Gustafsson A. The effect of miswak extract on plaque pH. An in vivo study. *Caries Res* 2007;**41**(6):451–4.
- Almas K. The antimicrobial effects of seven different types of Asian chewing sticks. *Odontostomatol Trop* 2001;**24**(96):17–20.
- Almas K, Al-Bagieh N. The antimicrobial effects of bark and pulp extracts of miswak, *Salvadora persica*. *Biomed Lett* 1999;**60**(235):71–5.
- Al-Otaibi M, Al-Harthy M, Gustafsson A, Johansson A, Claesson B, Angmar-Mansson B. Subgingival plaque microbiota in Saudi Arabians after use of miswak chewing stick and toothbrush. *J Clin Periodontol* 2004;**31**(12):1048–53.
- Sofrata AH, Claesson RL, Lingstrom PK, Gustafsson AK. Strong antibacterial effect of miswak against oral microorganisms associated with periodontitis and caries. *J Periodontol* 2008;**79**(8):1474–9.
- Darout IA, Albandar JM, Skaug N, Ali RW. Salivary microbiota levels in relation to periodontal status, experience of caries and miswak use in Sudanese adults. *J Clin Periodontol* 2002;**29**(5):411–20.
- Al-Khateeb TL, O'Mullane DM, Whelton H, Sulaiman MI. Periodontal treatment needs among Saudi Arabian adults and their relationship to the use of the miswak. *Community Dent Health* 1991;**8**(4):323–8.
- Almas K, Al-Zeid Z. The immediate antimicrobial effect of a toothbrush and miswak on cariogenic bacteria: a clinical study. *J Contemp Dent Pract* 2004;**5**(1):105–14.
- Akhtar J, Siddique KM, Bi S, Mujeeb M. A review on phytochemical and pharmacological investigations of miswak (*Salvadora persica* Linn). *J Pharm Bioallied Sci* 2011;**3**(1):113–7.

32. Al Sadhan RI, Alma K. Miswak (chewing stick): a cultural and scientific heritage. *Saudi Dent J* 1999;**11**(2):80–8.
33. World Health Organization. *Prevention of oral diseases*. Geneva, Switzerland: WHO; 1987.
34. Amoian B, Moghadamnia AA, Barzi S, Sheykholeslami S, Rangiani A. *Salvadora Persica* extract chewing gum and gingival health: improvement of gingival and probe-bleeding index. *Complement Ther Clin Pract* 2010;**16**(3):121–3.
35. Eid MA, Selim HA. A retrospective study on the relationship between miswak chewing stick and periodontal health. *Egypt Dent J* 1994;**40**(1):589–92.
36. Hirschfeld I. *The toothbrush – its use and abuse: a treatise on preventive dentistry and periodontia as related to dental hygiene*. Brooklyn, NY: Dental Items of Interest Publishing; 1939.
37. Sirois M, Darby M, Tolle S. Understanding Muslim patients: cross-cultural dental hygiene care. *Int J Dent Hyg*. <<http://onlinelibrary.wiley.com/doi/10.1111/j.1601-5037.2012.00559.x/abstract;jsessionid=675BF4DE1DFB2EB379460F619005598D.d02t02>>; 2012 accessed 11.01.13.
38. Garcia RI, Cadoret C, Henshaw M. Multicultural issues in oral health. *Dent Clin North Am* 2008;**52**(2):319–32.
39. Farsi JM, Farghaly MM, Farsi N. Oral health knowledge, attitude and behaviour among Saudi school students in Jeddah city. *J Dent* 2004;**32**(1):47–53.
40. Darwish S. The management of the Muslim dental patient. *Br Dent J* 2005;**199**(8):503–4.
41. Wagner JA, Redford-Badwal D. Dental students' beliefs about culture in patient care: self-reported knowledge and importance. *J Dent Educ* 2008;**72**(5):571–6.
42. Gregorczyk SM, Bailit HL. Assessing the cultural competency of dental students and residents. *J Dent Educ* 2008;**72**(10):1122–7.
43. Hewlett ER, Davidson PL, Nakazono TT, Baumeister SE, Carreon DC, Freed JR. Effect of school environment on dental students' perceptions of cultural competency curricula and preparedness to care for diverse populations. *J Dent Educ* 2007;**71**(6):810–8.
44. Marino R, Morgan M, Hopcraft M. Transcultural dental training: addressing the oral health care needs of people from culturally diverse backgrounds. *Commun Dent Oral Epidemiol* 2012;**40**(2):134–40.
45. Marino R, Hawthorne L, Morgan M, Bata M. Transcultural skills content in a dental curriculum: a comparative study. *Eur J Dent Educ* 2012;**16**(1):e33–40.
46. Kronfol NM. Access and barriers to health care delivery in Arab countries: a review. *East Mediterr Health J* 2012;**18**(12):1239–46.
47. Darout IA, Skaug N. Comparative oral health status of an adult Sudanese population using miswak or toothbrush regularly. *Saudi Dent J* 2004;**16**(1):29–38.
48. Tubaihat RS, Darby ML, Bauman DB, Box CE. Use of miswak versus toothbrushes: oral health beliefs and behaviours among a sample of Jordanian adults. *Int J Dent Hyg* 2005;**3**(3):126–36.