

The miswak (chewing stick) and oral health. Studies on oral hygiene practices of urban Saudi Arabians.

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The miswak, a traditional chewing stick for cleaning teeth, is made from the plant *Salvadora persica*. For religious and cultural reasons, miswak use is firmly established and widespread in Saudi Arabia and most other Muslim countries. Only recently has scientific evaluation of the miswak been undertaken. The aims of the thesis were: 1) to explore current oral hygiene habits and oral health awareness among urban Saudi Arabians in relation to age, gender and educational level (papers I and II); 2) to compare mechanical plaque removal and gingival health after miswak use and toothbrushing (paper III); 3) to compare the effect of miswak use and toothbrushing on subgingival plaque microflora (paper IV). In papers I and II, structured interviews were conducted with 1200 regular patients at two centres in the city of Makkah, providing dental care for university and military staff and their families, respectively. Consecutive patients were stratified according to gender and age, into 6 age groups from 10 to 60 years, with 50 male or female subjects in each group at each centre. Oral hygiene habits were correlated with the subjects' age, gender, and educational levels and analysed statistically by a generalized linear model and ANOVA. In papers III and IV, the subjects comprised 15 healthy Saudi Arabian male volunteers aged 21 to 36 years, attending the Dental Center at Al-Noor Specialist Hospital in Makkah City. A single-blind, randomised crossover design was used. The Turesky modified Quigley-Hein plaque and L oe-Silness gingival indices and digital photographs of plaque distribution were recorded in Paper III and in Paper IV plaque was sampled for DNA-testing. Inhibition zones around miswak material were examined on agar plates with *Actinobacillus actinomycetemcomitans* and the leukotoxicity of this bacterium was analysed in a bioassay with macrophages +/- miswak extracts (paper IV). In papers I and II, 73% of the subjects used a toothbrush and 65% used a miswak daily. There were significant differences between genders and age groups, and between the centres. Regular miswak use was more prevalent among men ($p < 0.01$), while women used a toothbrush more often than a miswak ($p < 0.05$). For the majority (88%) of the individuals, oral hygiene began late, after the age of 7 yrs. Oral hygiene habits were strongly correlated to educational level ($p < 0.001$). The miswak was preferred by less educated people. Tooth brushing started earlier among the better educated ($p < 0.001$). In paper III, compared to tooth brushing, use of the miswak resulted in significant reductions in plaque ($p < 0.001$) and gingival ($p < 0.01$) indices. In paper IV, *A. actinomycetemcomitans* was significantly reduced by miswak use ($p <$

0.05) but not by tooth brushing. These results were supported by the in vitro observations that extracts from *S. persica* interfered with growth and leukotoxicity of *A. actinomycetemcomitans*. It was concluded that oral hygiene practice is introduced very late, is strongly correlated to educational level, and that more women prefer toothbrushing to miswak use. It was further concluded that miswak use was at least as effective as toothbrushing for reducing plaque and gingivitis, and that the antimicrobial effect of *S. persica* is beneficial for prevention/treatment of periodontal disease. There is clearly a need for further oral health education in Saudi Arabia. Because of its close association with Islam, maximum benefits may be achieved by encouraging optimum use of the miswak. Oral hygiene may be improved by complementing traditional miswak use with modern technological developments such as toothbrushing and by tailoring oral hygiene recommendations to educational level