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# Use of dental clinics and oral hygiene practices in the Kingdom of Saudi Arabia, 2013

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**Objectives:** We conducted a large household survey in 2013 to determine the current status of oral health practices and use of oral health services in the Kingdom of Saudi Arabia (KSA). **Methods:** The Saudi Health Information Survey is a national multistage survey of individuals ≥ 15 years of age. We used a backward elimination multivariate logistic regression model to measure the association between having been to a dental clinic during the last year, and sex, age, marital status, education, time since last routine medical examination, history of diagnosis with a cardiovascular chronic condition, brushing or flossing teeth and use of Miswak (a chewing stick). **Results:** Between April and June 2013, 10,735 participants completed the survey (89.4% of the households contacted). An estimated 1.5 million (11.5%) and 6.3 million (48.6%) Saudi Arabian people, ≥ 15 years of age, had visited a dental clinic for a routine check-up and for a complaint during the last year, respectively. In total, 16.3%, 85.0% and 52% of Saudi Arabian people never brush their teeth, never floss their teeth or never use Miswak, respectively. The probability of visiting a dental clinic increased with education, among individuals who brushed or flossed their teeth and who used Miswak. **Conclusions:** Oral hygiene practices are not common among Saudi Arabian people, and use of health care for prevention of oral disease is limited. Hence, the need for oral health promotion is pressing. The KSA Ministry of Health should develop and implement programmes, through its primary health clinics, to increase the awareness of the importance of good oral health.

***Key words:*** *Flossing, dental diseases, brushing, Miswak, Saudi Arabia, prevention*

## INTRODUCTION

The rapid shift in disease patterns throughout the world, and specifically in the Kingdom of Saudi Arabia (KSA), is a result of control of communicable diseases, and is closely correlated with changes in lifestyle. This includes changes in dietary habits, marked by an increased consumption of sweetened food products and tobacco. As a result, the burden of oral diseases is increasing in most of the developing world[1]. Oral health is directly impacted by lifestyle, as increased sugar intake can cause dental caries, gingivitis and periodontitis, ultimately leading to tooth loss[2,3]. Tobacco consumption can also be harmful as it can cause several oral diseases, including smoker's palate, dental caries, periodontal disease, implant failure, oral precancer and cancer[4–7]. Regular oral hygiene practices, such as brushing and flossing, can help to maintain a healthy oral cavity, prevent these conditions[8] and even prevent other conditions outside the oral cavity, such as transient bacteraemia[9]. Although brushing and flossing are the most common oral hygiene practices in developed countries, other practices exist around the world. The use of Miswak, a chewing stick with extract of *Salvadora persica*, is widespread in many Islamic countries, including the KSA[10,11].

Oral disease is considered a major health problem owing to its high prevalence, and contributes to the total number of disability-adjusted life years (DALYs) in the developed world. It contributes up to 0.7% of DALYs in the USA and up to 0.8% in the KSA[12]. The use of oral hygiene practices has not been studied in the KSA, nor has the use of the free oral health services offered by the kingdom. To determine the current status of oral health practices and use of oral health services in the KSA, we analysed data from a large household survey conducted to assess the burden of chronic diseases and their risk factors in the KSA in 2013.

## METHODS

The Saudi Health Information Survey is a national multistage survey of individuals ≥ 15 years of age. Households of Saudi citizens were randomly selected from a national sampling frame maintained and updated by the Census Bureau. The Ministry of Health divides the KSA into 13 health regions, each with its own health department. We divided each region into subregions and blocks used by the KSA Department of Statistics. All regions were included, and a probability proportional to size was used to randomly select subregions and blocks. Households were randomly selected from each block. Surveyors attempted to conduct the survey in each selected household. They first requested to speak with the head of the household or the most knowledgeable adult about the household. The survey was presented to that adult who was then asked whether they would like to participate in this survey. If consent was obtained, a roster of household members was collected, and an adult ≥ 15 years of age was randomly selected to be surveyed. The age of 15 years as a cut-off to participate in this study was determined by the Saudi Ministry of Health. Through the household roster, demographic data, including age, sex, educational level and marital status, were collected on all members of the household. If the randomly selected adult was not present, our surveyors made an appointment to return, and a total of three visits were made before the household was considered as a non-response. If the randomly selected adult was found, consent was obtained before their participation in the survey. Surveyors were medical staff from primary health clinics operated by the Saudi Ministry of Health.

### Ethics statement

The Saudi Ministry of Health and its IRB approved the study protocol. The University of Washington IRB deemed the study as IRB exempt because The Institute for Health Metrics and Evaluation received de-identified data for this analysis. All respondents were required to provide verbal consent and agree to participate in the study. This practice is commonly used and accepted in the KSA. Two verbal consents were obtained: a first one for the household roster (obtained from the head of the household or the most knowledgeable person in the house), and a second one from the randomly selected respondent. If the randomly selected respondent was between 15 and 17 years of age, then the parent(s) or legal guardian of that individual consented on their behalf to participate in the study. The KSA Ministry of Health and The University of Washington IRB approved the verbal consents obtained in this study. This research was conducted in full accordance with the World Medical Association Declaration of Helsinki.

The survey included questions on sociodemographic characteristics, tobacco consumption, health care utilisation, different health-related behaviours and self-reported cardiovascular chronic conditions. These conditions included stroke, myocardial infarction, atrial fibrillation, cardiac arrest, congestive heart failure and chronic obstructive pulmonary disease. We considered a person to have a chronic condition if they reported being diagnosed with any of these conditions.

To determine the number of visits to dental clinics during the last year and the reason behind these visits, respondents were asked, 'During the past 12 months how many times did you visit a dental clinic for (i) a check-up (without any dental problem), (ii) a dental complaint?'.

Participants were asked how many times per day they brush their teeth, floss or use Miswak.

### Statistical analysis

We used a backward elimination multivariate logistic regression model to measure association between having been to a dental clinic for (i) a routine check-up or (ii) a dental complaint during the last year with sex, age, marital status, education, time since the last routine medical examination, history of diagnosis with a cardiovascular chronic condition, brushing or flossing teeth and use of Miswak. Data were weighted to account for the probability of selection and age and sex poststratification based on census data for age and sex distribution of the Saudi Arabian population. We used SAS 9.3 (SAS Institute Inc., Cary, NC, USA) for the analyses and to account for the complex sampling design.

## RESULTS

Between April and June 2013, a total of 12,000 households were contacted and 10,735 participants completed the survey (a response rate of 89.4%). Respondents and non-respondents had similar demographic profiles, with no significant difference in age, sex, educational level and marital status.

Within the previous year, an estimated 1.5 million (11.5%) Saudi Arabian people ≥ 15 years of age visited a dental clinic for a routine check-up, whilst 6.3 million (48.6%) visited a dental clinic because of a complaint. Of Saudi Arabian people ≥ 15 years of age, 71.5% reported brushing their teeth at least once a day, but only 6.3% reported flossing at the same frequency. Up to 30.3% used Miswak at least once a day. Among those who never brushed their teeth (16.3%), 93.2% also never flossed, but only 47.9% never used Miswak.

**Table 1** Sociodemographic, health and oral hygiene-related behavioural characteristics associated with visiting a dental clinic for a routine check-up within the last year, for Saudi Arabian people, ≥15 years of age, in the Kingdom of Saudi Arabia, 2013

| Sociodemographic and behavioural characteristics | Visiting a dental clinic for a routine check-up last year | | | |
|---|---|---|---|---|
| | Never | At least once | Multivariate logistic regression | |
| | *n* (weighted%; SE) | *n* (weighted%; SE) | AOR | 95% CI |
| Sex | | | REF | |
| Male | 4618 (88.48; 0.62) | 594 (11.52; 0.62) | 0.84 | 0.67–1.06 |
| Female | 4811 (88.51; 0.62) | 598 (11.49; 0.62) | 0.94 | 0.88–1.01 |
| Age (years) | | | | |
| 15–24 | 2108 (89.01; 0.81) | 254 (10.99; 0.81) | | |
| 25–34 | 2389 (85.42; 0.96) | 347 (14.58; 0.96) | | |
| 35–44 | 2030 (88.75; 0.81) | 281 (11.25; 0.81) | | |
| 45–54 | 1343 (89.39; 1.03) | 158 (10.61; 1.03) | | |
| 55–64 | 763 (90.97; 1.16) | 83 (9.03; 1.16) | | |
| 65+ | 796 (92.01; 1.24) | 69 (7.99; 1.24) | | |
| Marital status | | | | |
| Currently married | 6094 (88.05; 0.52) | 806 (11.95; 0.52) | | |
| Never married | 2497 (88.94; 0.75) | 309 (11.06; 0.75) | | |
| Separated, divorced or widowed | 810 (88.76; 1.63) | 74 (11.24; 1.63) | | |
| Education | | | | |
| Primary school or less | 3006 (92.13; 0.73) | 235 (7.87; 0.73) | REF | |
| Elementary or high school completed | 4270 (88.41; 0.64) | 551 (11.59; 0.64) | 1.15 | 0.87–1.54 |
| College degree or higher education | 2138 (84.01; 0.98) | 405 (15.99; 0.98) | 1.35 | 1.01–1.80 |
| Smoking status | | | | |
| Never smoked | 7823 (88.66; 0.48) | 970 (11.34; 0.48) | REF | |
| Ex-smoker | 398 (85.20; 2.56) | 60 (14.80; 2.56) | 1.42 | 0.87–2.32 |
| Current smoker | 1192 (88.77; 1.17) | 156 (11.23; 1.17) | 1.02 | 0.77–1.36 |
| Last routine medical check-up | | | | |
| Within the last year | 1492 (82.18; 1.27) | 295 (17.82; 1.27) | REF | |
| 1–3 years ago | 802 (81.08; 1.65) | 184 (18.92; 1.65) | 0.97 | 0.72–1.30 |
| 4+ years ago | 7066 (90.66; 0.48) | 701 (9.34; 0.48) | 0.51 | 0.41–0.63 |
| History of diagnosis with a chronic condition | | | | |
| No | 8398 (88.48; 0.46) | 1077 (11.52; 0.46) | | |
| Yes | 1026 (88.78; 1.28) | 114 (11.22; 1.28) | | |
| Daily use of a toothbrush | | | | |
| Never | 2009 (96.63; 0.54) | 77 (3.37; 0.54) | REF | |
| Less than once | 1191 (93.57; 1.03) | 81 (6.43; 1.03) | 1.94 | 1.19–3.19 |
| Once | 3245 (89.17; 0.70) | 411 (10.83; 0.70) | 3.41 | 2.33–5.00 |
| Twice or more | 2924 (82.25; 0.89) | 619 (17.75; 0.89) | 5.77 | 3.93–8.48 |
| Daily use of dental floss | | | | |
| Never | 8079 (90.13; 0.45) | 858 (9.87; 0.45) | REF | |
| Less than once | 711 (81.81; 1.77) | 162 (18.19; 1.77) | 1.69 | 1.29–2.22 |
| Once | 392 (79.09; 2.43) | 101 (20.91; 2.43) | 1.65 | 1.20–2.29 |
| Twice or more | 161 (71.76; 4.71) | 45 (28.24; 4.71) | 2.56 | 1.51–4.35 |
| Daily use of Miswak | | | | |
| Never | 4661 (88.78; 0.63) | 524 (11.22; 0.63) | REF | |
| Less than once | 1561 (90.56; 1.03) | 157 (9.44; 1.03) | 0.88 | 0.66–1.16 |
| Once | 1359 (87.47; 1.09) | 219 (12.53; 1.09) | 1.07 | 0.84–1.38 |
| Twice or more | 1726 (86.69; 1.03) | 270 (13.31; 1.03) | 1.28 | 1.01–1.64 |

AOR, adjusted odds ratio; CI, confidence interval; REF, reference.

Among those who visited a dental clinic at least once during the last year for a regular check-up, 4.8%, 73.5% and 51.5% never brushed their teeth, flossed their teeth or used Miswak, respectively. Among those who visited a dental clinic at least once during the last year because of a complaint, 12.5%, 81.5% and 48.8% never brushed their teeth, flossed their teeth or used Miswak, respectively.

The likelihood of visiting a dental clinic for a regular check-up increased among the most educated and among those who practiced oral hygiene habits, but decreased for those whose last routine medical examination was ≥ 4 years ago (*Table 1*).

The likelihood of visiting a dental clinic because of a complaint increased among female respondents, older individuals, the most educated, current smokers and with oral hygiene practices (*Table 2*).

## DISCUSSION

This is the first nationally representative study to report on oral health practices among adults in the KSA.

 

**Table 2** Sociodemographic, health and oral hygiene-related behavioural characteristics associated with visiting a dental clinic for a complaint within the last year, for Saudi Arabian people, ≥15 years of age, in the Kingdom of Saudi Arabia, 2013

| Sociodemographic and behavioural characteristics | Visiting a dental clinic for a complaint last year | | | |
|---|---|---|---|---|
| | Never | At least once | Multivariate logistic regression | |
| | *n* (weighted%; SE) | *n* (weighted%; SE) | AOR | 95% CI |
| Sex | | | REF | |
| Male | 2844 (56.05; 0.97) | 2374 (43.95; 0.97) | 1.71 | 1.49–1.96 |
| Female | 2424 (46.56; 0.98) | 2992 (53.44; 0.98) | 1.12 | 1.06–1.18 |
| Age (years) | | | | |
| 15–24 | 1380 (57.42; 1.31) | 982 (42.58; 1.31) | | |
| 25–34 | 1348 (49.32; 1.30) | 1390 (50.68; 1.30) | | |
| 35–44 | 1038 (44.16; 1.36) | 1281 (55.84; 1.36) | | |
| 45–54 | 638 (43.85; 1.66) | 868 (56.15; 1.66) | | |
| 55–64 | 397 (48.54; 2.35) | 449 (51.46; 2.35) | | |
| 65+ | 467 (56.65; 2.30) | 396 (43.36; 2.30) | | |
| Marital status | | | | |
| Currently married | 3209 (47.11; 0.79) | 3705 (52.89; 0.79) | REF | |
| Never married | 1602 (55.98; 1.22) | 1208 (44.02; 1.22) | 0.94 | 0.80–1.09 |
| Separated, divorced or widowed | 441 (52.18; 2.40) | 438 (47.82; 2.40) | 0.72 | 0.58–0.90 |
| Education | | | | |
| Primary school or less | 1663 (52.90; 1.25) | 1579 (47.10; 1.25) | REF | |
| Elementary or high school completed | 2472 (53.23; 1.01) | 2358 (46.77; 1.01) | 1.19 | 1.02–1.39 |
| College degree or higher education | 1125 (44.88; 1.40) | 1421 (55.12; 1.40) | 1.38 | 1.15–1.65 |
| Smoking status | | | | |
| Never smoked | 4308 (51.24; 0.76) | 4499 (48.76; 0.76) | REF | |
| Ex-smoker | 238 (52.94; 3.20) | 220 (47.06; 3.20) | 1.05 | 0.79–1.40 |
| Current smoker | 711 (52.17; 1.95) | 636 (47.83; 1.95) | 1.26 | 1.05–1.53 |
| Last routine medical check-up | | | | |
| Within the last year | 799 (45.04; 1.65) | 1004 (54.96; 1.65) | REF | |
| 1–3 years ago | 447 (50.42; 2.23) | 539 (49.58; 2.23) | 0.83 | 0.67–1.04 |
| 4+ years ago | 3987 (52.89; 0.81) | 3779 (47.11; 0.81) | 0.86 | 0.74–1.00 |
| History of diagnosis with a chronic condition | | | | |
| No | 4716 (51.65; 0.73) | 4774 (48.35; 0.73) | | |
| Yes | 548 (48.32; 2.02) | 590 (51.68; 2.08) | | |
| Daily use of a toothbrush | | | | |
| Never | 1279 (62.69; 1.58) | 797 (37.31; 1.58) | REF | |
| Less than once | 643 (53.90; 2.06) | 625 (46.10; 2.06) | 1.52 | 1.22–1.91 |
| Once | 1681 (48.65; 1.17) | 1996 (51.35; 1.17) | 1.69 | 1.41–2.01 |
| Twice or more | 1626 (48.06; 1.17) | 1923 (51.94; 1.17) | 1.60 | 1.33–1.93 |
| Daily use of dental floss | | | | |
| Never | 4616 (53.39; 0.76) | 4333 (46.61; 0.76) | REF | |
| Less than once | 331 (40.26; 2.35) | 542 (59.74; 2.35) | 1.50 | 1.21–1.85 |
| Once | 183 (40.86; 3.03) | 312 (59.14; 3.03) | 1.42 | 1.10–1.84 |
| Twice or more | 81 (37.62; 4.55) | 126 (62.38; 4.55) | 1.61 | 1.07–2.42 |
| Daily use of Miswak | | | | |
| Never | 2787 (54.80; 1.00) | 2405 (45.20; 1.00) | REF | |
| Less than once | 841 (51.53; 1.74) | 872 (48.47; 1.74) | 1.17 | 0.99–1.38 |
| Once | 662 (43.20; 1.76) | 920 (56.80; 1.76) | 1.63 | 1.38–1.93 |
| Twice or more | 913 (48.02; 1.53) | 1097 (51.98; 1.53) | 1.44 | 1.23–1.68 |

AOR, adjusted odds ratio; CI, confidence interval; REF, reference.

Despite the free access to health care in the KSA, only 12% of Saudi Arabian people ≥ 15 years of age underwent a routine dental check-up during the last year, and almost half needed to visit a dental clinic because of a complaint. Our findings call for increased efforts to promote oral health through regular examinations to detect dental problems at early stages and prevent their progress. Increased regular examinations would result in preventing and delaying the progress of dental diseases. Contact with the health care system may influence practices around oral hygiene, which are the main preventive strategy. If appropriate instructions on brushing and flossing are given, patients would be more likely to adhere to these practices[13]. Relying on patients' motivation alone is not sufficient to maintain adequate oral hygiene practices. Patients should be informed about the positive and negative outcomes of their oral hygiene practices, as well as the control they can have over their oral health through their behaviour[14].

Our findings confirmed that individuals who brush or floss more frequently are more likely to have visited

 

a dental clinic for a routine examination within the last year. However, they were also more likely to have visited a dental clinic because of a complaint. Clearly, contact with a dental provider, for check-ups and for signs of problems, raises awareness of oral health through an increased number of visits. A similar finding was also noted in Jordan, where the oral hygiene habits of school children were positively influenced by parental visits to dental clinics[15]. This is encouraging. Programmes to educate the public about the importance of regular dental check-ups will result in more attention to oral health and repeat visits for care.

There is a pressing need for oral health promotion as part of an integral general health preventive programme. Messages around oral health practices, including oral hygiene, and routine dental check-ups should be reinforced through many platforms in the KSA. A major finding of our study was the high prevalence of use of Miswak among Saudi Arabian people, even among those who did not brush or floss their teeth. Miswak is used traditionally in the KSA. This has been a practice in the past and has been continued by many as part of their culture. In fact, Miswak has been cited as one of the practices of Prophet Mohammed[16], which is predominantly the reason behind its widespread use in the Muslim world and in the KSA. However, its benefit is still controversial and not actually proven. Hence, it would be better if future dental programmes were to ensure the transition from Miswak to proper dental hygiene. Therefore, religious support is deemed essential for health promotion. Indeed, the use of Miswak is not the only hygiene practice promoted in Islam[17]. Hence, the channels through which Saudi Arabian people have learned about the use of Miswak and other hygiene practices can be leveraged to include brushing, flossing and benefiting from the free dental clinics. Such promotion can be integrated under the umbrella of general health promotion.

Our study has some limitations. First, our data are cross-sectional and hence we cannot assess causality. Second, many of our behavioural data, such as brushing and flossing, are self-reported and thus are subject to recall and social desirability biases. On the other hand, our study is based on a large sample size, used a standardised methodology for all its measures, is nationally representative and provides accurate data as a result of our near-real-time data-quality monitoring throughout the whole survey period. Also, our study did not collect any data on diagnosed/treated oral health issues or on self-assessment of oral health. Such questions would be relevant for a future study to assess the burden of oral disease in the KSA.

This study calls for increased efforts to improve oral health practices in the KSA. The KSA provides free medical care in over 2,000 primary health care facilities throughout the country[17]. These health facilities offer immunisation and free medication to Saudi Arabian people. The majority of these facilities have a dental clinic and a referral mechanism for dental care at regional centres. It is crucial to increase the use of these facilities in a prevention programme. The KSA Ministry of Health should develop and implement programmes to increase the awareness of oral health. These programmes should be included in ongoing outreach activities throughout all of the primary health clinics. Moreover, campaigns to increase the general public's awareness of the importance of oral health are necessary to reduce the future financial and human burden of oral disease.

In conclusion, oral hygiene practices are not common in the KSA, and prevention of oral disease, whether through hygiene practices or health care, is very limited. With the absence of data on the burden of oral disease, we expect this burden to be high considering the findings reported in this study.

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## Conflict of Interest

The authors declare that there are no conflicts of interest.

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