# ORIGINAL ARTICLE

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# Use of miswak versus toothbrushes: oral health beliefs and behaviours among a sample of Jordanian adults

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Abstract: Objective: This descriptive survey aimed at determining the perceived relationship among miswak, the toothbrush, and toothbrush-plus-miswak usage on oral health beliefs and behaviours of Jordanian adults, 18-60 years old, seeking dental care in the city of Irbid, northern Jordan. Methods: Patients (n = 138) voluntarily completed a selfdesigned questionnaire prior to their dental appointments at public and private clinics. Results: Overall, the level of oral health knowledge was low; of 71 people who attempted to define dental plaque, only 26% knew the meaning of dental plaque. While 12% have never been to a dentist, and 12% visit the dentist on a regular basis, the majority (63.2%) of the respondents reported that they visit the dentist only when they have pain. The majority (72%) use the toothbrush, 20.5% use the toothbrush-plus-miswak and only 3% use miswak alone. Toothbrush users believe that using the toothbrushplus-miswak is most effective in reducing mouth debris  $(\chi^2 = 32.069, d.f. = 16, P = 0.01)$ ; and level of education is significantly associated with the type of oral cleaning device used ( $\chi^2 = 25.817$ , d.f. = 12, P = 0.05). There was no significant difference between toothbrush users and toothbrush-plus-miswak users in terms of how they perceive their oral health status. About 19% of the study participants use dental floss, 60.9% use mouth rinses and 8.3% use inter-dental brushes. Educated people (baccalaureate or associate degrees) tended to use toothbrushes and toothbrush-plus-miswak. The toothbrush-plus-miswak users are most likely to spend 1-2 min each day cleaning their teeth ( $\chi^2 = 34.9$ , d.f. = 20, P = 0.02) than those using other devices. Respondents who use the toothbrush are most likely to visit the dentist when they have pain ( $\gamma^2 = 34.02$ , d.f. = 12, P = 0.00) than those using other

devices. *Conclusion:* The oral health awareness level among Jordanian adults is poor and needs to be improved. Evidence-based and community-based dental health education and a philosophical change from disease-oriented and pain management care to primary preventive care are highly recommended for the Jordanian population.

**Key words:** Jordan, miswak, oral health behaviours, oral health beliefs, toothbrush

# Introduction

Chewing sticks have been used as oral hygiene tools for centuries in the Middle East and North Africa, and the most common type still used today is the miswak chewing stick. People in Jordan may use both the traditional toothbrush and miswak, or a toothbrush without miswak. However, using miswak among younger generations in Jordan is dependent on religious beliefs of the person. Among older generations, miswak use is perceived as both traditional practice and religious ritual. Few studies have measured people's perceptions of miswak. This survey focused on the oral health beliefs and behaviours of adults in Irbid, Jordan to determine how people seeking dental care perceive the effectiveness of miswak and the toothbrush on their oral health. Three attribute independent variables were used to divide the participants into three groups: miswak use, toothbrush use and toothbrush-plus-miswak use. Several items on a self-designed questionnaire measured oral health beliefs and oral health behaviour as perceived by Jordanian adults in the three groups. Jordan is a small Muslim country situated in the Middle East, south of Syria, to the north-east by Iraq. As of July 2004, Jordan's total population was approximately 5.6 million, with 35% in the 0-14-yearold range and 61% in the 15-64-year range. Only 4% was over 65 years of age (http://www.cia.gov/cia/publications/factbook/ geos/jo.html) (1).

# Review of the literature

#### History of miswak

In most Muslim countries, a popular form of oral self-care is the use of tree twigs such as miswak. Miswak is obtained from a plant called *Salvadora Persica* that grows in the Middle East, and used as a toothbrush to clean the teeth and surrounding gingival structures (2–6). However, the use of miswak is a pre-Islamic custom; it was used by the ancient Arab, Babylonian, Greek and Roman societies. Miswak also was used as a form of ritual cleansing and religious practice by Prophet Mohammed (Peace Be Upon Him) around 600 AD.

#### Miswak use in oral hygiene

Miswak roots, branches and bark grow in many diameters and lengths; however, 12–15 cm lengths are recommended for easy grasp and manipulation. Thick sticks are difficult to chew and fray; a 1 cm diameter frays well and allows the stick to transmit the pressure of cleaning without breaking or tissue injury. Dry miswak may damage the gums; therefore, it should be soaked for 24 h in fresh water prior to usage. Once used, it is rinsed and allowed to air dry, just like a toothbrush.

#### Properties of miswak

Chemical analysis revealed that miswak contains natural substances assumed to be beneficial to oral health icluding: trimethylamine, salvadorine, chloride, fluoride, silica, sulphur, vitamin C, saponins and sterols (see Table 1).

#### Dental knowledge and awareness

Taani (7) conducted a study in Jordan comparing periodontal awareness and knowledge with patterns of dental attendance. Adults of 20–60 years old were asked to complete a questionnaire about their personal information, periodontal awareness, health knowledge and self-reported dental attendance. About 25% of the respondents reported gum bleeding on brushing, 40.4% believed that they had periodontal disease, 25% had bad breath, 81.4% were irregular seekers of dental care and the majority incorrectly defined dental plaque. Taani concluded that knowledge and awareness of periodontal disease is still poor in Jordan.

Douglas *et al.* (8) studied the opinions of the Jordanian people regarding their oral hygiene and dental care. A questionnaire about demographics, dentition, frequency of brushing

Chemical components	Oral health benefits/effects
Fluoride	Remineralization of tooth structure from the repeated use of miswak, which releases fluoride-containing sap
Silica	An abrasive material to remove tooth stain
Tannins	A phenolic compound that has an astringent effect and promotes saliva production
Resins	Amorphous products that form a protective layer over the enamel to prevent caries
Alkaloids	Nitrogenous organic compounds found in plants, which have a bactericidal effects and stimulatory action on the gingiva, e.g. salvadorine
Essential oils	Benzyl nitrile, eugenol, thymol, isothymol, eucalyptol, isoterpinolene and g-caryophyllene that have antibacterial effects; characteristic aroma; carminative action; mild bitter taste stimulates flow of saliva
Sulphur compounds	Compounds have a pungent taste and smell and bactericidal effects
Vitamin C	Ascorbic acid promotes healing and tissue repair
Sodium bicarbonate	A compound used as a dentifrice, because of its mild abrasive properties
Calcium	A mineral that inhibits enamel demineralization and promotes remineralization
Chloride	An element that inhibits calculus formation and helps in removing extrinsic tooth stains
Benzyl isothiocyanate	A chemotherapeutic agent with anti-carcinogenic properties

#### Table 1. Chemical components of miswak and their proposed oral health benefits (2, 5, 9, 11-20)

and attitude towards dental health was distributed to about 2000 people. Results revealed that 52.7% of the sample was male, 24% had a college education, 14% had no education, 10.6% regularly experienced gingival bleeding and 75% used miswak. The researchers concluded that dental problems would increase in the future.

#### Effects of miswak on oral bacteria

Al lafi and Ababneh (5) conducted a study to determine the antibacterial effects of miswak in vitro. A sample of fresh miswak was collected 1 month prior to the experiment. Samples of plaque microorganisms were obtained from 70 patients visiting Queen Alia Military Hospital for dental treatment. The samples were cultured and analysed in the laboratory for aerobic and anaerobic bacteria. Three laboratory methods: the streaked-plate method, ditch-plate method and tube dilution test for MIC were used for measuring the antibacterial activity. Findings revealed that miswak inhibits the growth of some microorganisms in the laboratory. The researchers concluded that miswak has strong antibacterial effects in the laboratory against some oral bacteria such as Staphylococcus aureus, Streptococcus mutans, Streptococcus mitis and anaerobic Streptococcus. Almas and Al-Bagieh (9) studied the antimicrobial effects of miswak. Samples of miswak were cut 2 days prior to the experiment and miswak extracts were soaked for 48 h before preparing the extracts at 5, 10 and 50% concentrations. The ditch plate method was used to test the antimicrobial activity. Results showed considerable in vitro antimicrobial effects of these extracts at higher concentrations against Streptococcus mutans. The researchers concluded that outcomes need to be verified in randomized clinical trials at multiple testing sites before specific client recommendations could be made.

#### Study purpose and research questions

The purpose of this descriptive study was to determine the perceived relationship among miswak, the toothbrush and toothbrush-plus-miswak usage on oral health beliefs and behaviours of Jordanians. No previous study has been performed on the use of miswak in patients who seek dental treatment in Jordan. Therefore, the following research questions were addressed:

1 What is the relationship between Jordanian adults' perception of miswak and/or toothbrush use and their perceived oral health?

- 1a What oral cleaning devices do Jordanian adults use?
- 1b Do the people use supplemental oral cleaning devices?
- **1c** Is there a relationship between people's level of education, age, income, and gender, and type of oral cleaning device used?

2 Is there a difference in the self-reported oral health behaviours of people who are miswak users, toothbrush users and toothbrush-plus-miswak users?

**3** Is there a difference in the self-reported oral health beliefs of people who are miswak users, toothbrush users and toothbrush-plus-miswak users?

# Methodology

The researchers targeted adults who sought dental care at a public health dental clinic (the Health Center) and at two private clinics (Obeidat and Qublan) in the city of Irbid, Jordan. These specific settings were chosen because their clinical managers agreed to have the questionnaires distributed to their patients. A student from Jordan University of Science and Technology volunteered to distribute the questionnaires. From 1 March to 15 April 2004 during the normal operating hours, patients were approached and asked to read the questionnaire and cover letter explaining the purpose of the survey. If the person voluntarily agreed to participate, the questionnaire administrator waited and collected the questionnaire after it had been placed in a sealed envelope by the respondent to preserve anonymity and confidentiality. For inclusion, subjects had to be adults, 18–60 years of age, seeking professional care at a public health or private dental clinic, with at least one of their own teeth and voluntarily willing to complete the questionnaire. All patients who appeared to meet these requirements for the study were invited to participate. Once 150 questionnaires were collected, the questionnaires were returned by the questionnaire administrator in their sealed envelopes to the principal investigator at Old Dominion University in the US (see Fig. 1 for questionnaire).

#### Research design, procedures and materials

As the questionnaire was self-designed, content validity was established by a panel of health science faculty at Old Dominion University. Test-retest reliability was also documented by administering the questionnaire twice to the same Old Dominion University Arab-speaking students (n = 10) from Jordan within 1 week. Once the questionnaire and cover letter were finalized, they were sent to Jordan for translation into Arabic. The 'Oral Health Beliefs and Behaviors of Jordanian People Questionnaire' was voluntarily completed by each participant to determine his or her oral health perceptions, behaviours and self-reported oral health status. Given the closed-ended questionnaire, participants were asked to select one and sometimes more than one response regarding their perceived oral health status and oral care behaviours. Based on their responses to question 3 in section 2, each participant was placed into one of three groups: the toothbrush-only group, the toothbrush-plusmiswak group and the miswak-only group.

#### Data analysis

Collected data were coded and entered into a database programme prior to the final analysis using the SPSS-PC package. Analysis of data included simple descriptive statistics in the form of percentages, frequency distributions and bar graphs; statistical significance was determined by the chi-square test and cross tabulation, and the level of significance was set at  $P \leq 0.05$ .

## Results

Given that a non-probability, convenience sample was used, results are limited to the population of Jordanian patients,

18–60 years old, who seek dental care at private or public dental clinics and who are similar to those represented in this study. People who do not seek dental care are most likely very different from those who participated in the survey.

#### Demographic characteristics of the study population

This survey was conducted in Irbid, northern Jordan, on 150 Jordanian people, 18–60 years old. However, of the 150 questionnaire distributed, 138 were returned for a 92% response rate. From the 138 participants, three respondents were younger than 18 years, and one above 60 years; therefore, they were excluded from the study, resulting in a final response rate of 89.3%. The results are discussed in relation to the original research questions. As only four people identified themselves as miswak users, valid statistical comparisons could not be made for this group.

As Table 2 shows, the majority (64.7%) of the study participants were between the ages of 18–30; 26.3% were between 31 and 40 years. More than half (56%) of the respondents were female and 44% were male. The majority (61.8) was single and 31.3% were married. In terms of monthly income, 40.9% of the respondents earned between >\$100–\$200, 21.7% earned <\$100 and 12.6 earned >\$400.

Regarding level of education, the majority (59%) holds baccalaureate or associate degrees, and 26.1% had a high school education; only 6% had graduate degrees.

#### **Research question 1**

What is the relationship between Jordanian adults' perceptions of miswak and/or toothbrush use and their perceived oral health?

About 13% of the respondents perceived having excellent oral health; 48.1% perceived having good oral health. About 41% reported having slight stain on their teeth, and 24% felt that they were stain free; 69% reported having bleeding gums and 25% never experienced bleeding gums when brushing their teeth. There was no significant difference between toothbrush users and toothbrush-plus-miswak users in terms of how they perceive their oral health status.

#### **Research question 1a**

#### What oral cleaning devices do Jordanian adults use?

The majority (72%; n = 95) of the respondents use the toothbrush, 20.5% (n = 27) use toothbrush-plus-miswak and 3% (n = 4) use miswak (see Fig. 2).

#### Oral Health Beliefs and Behaviors of Jordanian People

**Directions:** Please answer each question by checking  $(\sqrt{)}$  the answer that BEST reflects your own beliefs and practices or by writing in a short response. After completing the questionnaire, please place it in and seal the envelope. This will insure that your responses are anonymous and held in strict confidence. Please return the completed questionnaire in the sealed envelope to the person who distributed it to you. The questionnaire takes about 10 minutes to complete. Thank you.

SECTION 1: <u>Demographics</u> What is your birthday? \_\_\_\_\_

Gender: □ Male □ Female

Marital Status: 
☐ Married 
☐ Unmarried 
Separate/ Divorced

Monthly Income: □ <\$100 □ \$100-\$200 □ >\$200-\$300 □ >\$300-\$400 □>\$400

Education Level (check your highest): 
□ Less than high school 
□ High school
□College/University Degree
□ Master's/Doctorate

#### SECTION 2: Oral Hygiene Behaviors

1. Regardless of the devices or products used, how much time do you spend each day cleaning your teeth? (check only one)

- Less than 1 minute
- $\circ \quad \mbox{More than 1 minute but less than 2 minutes}$
- More than 2 minutes but less than 3 minutes
- More than 3 minutes but less than 4 minutes
- More than 4 minutes but less than 5 minutes
- More than 5 minutes

2. On average, how often do you clean your teeth?

- Once daily
- Twice daily
- Three or more times a day
- Weekly, but not daily

3. What type of oral cleaning device do you use (check all that apply)?

- Toothbrush
- o Miswak
- Both toothbrush and miswak
- None
- Other\_\_\_\_(specify)

4.Do you think that the tooth-cleaning technique that you use is effective? (choose only one response)

- Yes, 100% effective
- Maybe
- o I'm not sure
- No, I don't think so

5. How often do you visit the dentist?

- Every six month
- Every year
- When I have pain
- I have never been to a dentist
- 6. What other dental hygiene devices do you use to clean your mouth? (check all that apply)
  - Dental floss
  - Mouth rinses
  - Interdental brushes
  - Other \_\_\_\_\_(specify)
- 7. Please select the one answer that BEST describes the quality of your breath.
  - Always have bad breath (halitosis)
  - Never have bad breath
  - $\circ$  Sometimes have bad breath

#### Fig 1. Oral health beliefs and behaviours of Jordanian people questionnaire.

8. Do you use miswak before prayer?

- Always
- Sometimes
- Never

Answer questions 9-10 only if you use miswak as your only method of cleaning your teeth.

9. How long have you been using miswak?

- Less than a year
- One to two years
- More than two years
- $\circ \quad \text{All of my life} \\$

10. How often do you use miswak?

- Less than once a day
- Once a day
- Twice a day
- Three or more times a day
- o Weekly but not daily

#### SECTION 3: Oral Health Beliefs

- Please rank the following oral cleaning device from MOST effective to LEAST effective (1 most effective, 2 effective, 3 least effective) write in the corresponding number in the line provided.
  - Traditional toothbrush\_\_\_\_
  - o Miswak
  - Both toothbrush and miswak

2. How would you rate your overall oral hygiene status?

- Excellent
- o Good
- Fair (average)
- o Poor
- Very poor

3. How would you rate the stains on your teeth?

- Severe
- Moderate
- Slight
- No stains

4. Do your gums bleed when you clean your teeth?

- o Always
- Sometimes
- Never (if you chose *Never*, skip to question #7 and continue)
- 5.If your gums bleed, how would you rate the amount of bleeding?
  - Slight bleeding
  - o Moderate bleeding
  - Heavy bleeding
- 6. Why do you think that your gums bleed? (choose only one response)
  - o I don't know
  - Accumulation of bacteria
  - Accumulation of food
  - Poor brushing technique
  - Poor flossing technique
  - Brushing too hard
  - Its normal for gums to bleed
  - Because I use miswak
  - o Because I don't use miswak
  - Not applicable

7. How would you rate the level of tooth decay in your mouth?

- Severe
- o Moderate
- Slight
- No tooth decay in my mouth

8. How would you rate the level of gum disease in your mouth?

- o Severe
- Moderate
- Slight
- $\circ$  No gum disease in my mouth

#### 9. Did you ever hear of **dental plaque**?

- Yes
- o No

If yes, what does dental plaque mean to you? (write in your answer below)

#### 10. How would you rate your overall oral health?

- Excellent
- Good
- Fair (average)Poor
- Very poor

#### 11. Do you notice any redness in your gums?

- Always
- Sometimes
- Never

#### 12. Do you notice any swelling in your gums?

- o Always
- Sometimes
- o Never

#### 13. Do you experience pain in your mouth?

- o Always
- Sometimes
- o Never

# 14. What do you think is BEST to use to clean your teeth if you want to have optimal oral health?

- o Miswak
- o Toothbrush
- Both miswak and toothbrush
- Other \_\_\_\_\_(specify)

#### 15. In your opinion, which of the following is MOST effective in reducing mouth debris?

- o Toothbrush
- o Miswak
- Both toothbrush and miswak
- Neither is effective
- Other \_\_\_\_\_ (specify)

#### 16. In your opinion, what do you think is MOST effective in reducing gum disease?

- Toothbrush
- o Miswak
- $\circ \quad \text{Both toothbrush and miswak} \\$
- Neither is effective

## 17. In your opinion, what is MOST effective in reducing tooth decay?

- $\circ \quad \text{The toothbrush} \\$
- The miswak
- Both toothbrush and miswak
- Neither is effective
- Other \_\_\_\_\_ (specify)
- 18. How many natural teeth do you have in your mouth?\_\_\_\_\_(write in number)

Thank you for your participation in this survey. Please place your questionnaire in the envelope, seal it, and return it to the person who gave it to you.

Fig 1. Continued.

# Table 2. Demographic characteristics of the Jordanian adults surveyed

Demographics	Frequency	Percentages	
Age			
18–30	86	64.7	
31–40	35	26.3	
41–60	12	9	
Gender			
Male	56	44	
Female	72	56	
Marital status			
Married	41	31.3	
Unmarried	81	61.8	
Divorced/separated	9	6.9	
Monthly income (\$)			
<100	27	21.7	
>100–200	52	40.9	
>200–300	15	11.8	
>300-400	17	13.4	
>400	16	12.6	
Level of education			
< High school	12	9	
High school	35	26	
University/college	79	59	
Graduate degrees	8	6	

#### Research question 1b

#### Do the people use supplemental oral cleaning devices?

About 19% of the study participants use dental floss, 60.9% use mouth rinses and 8.3% use interdental brushes.

#### Research question 1c

Is there a relationship between people's level of education, age, income and gender and type of oral cleaning device used?

Analysis revealed no statistically significant relationship between gender, age, marital status and monthly income, and the type of oral cleaning device used (see Table 3). However, chi-square analysis revealed that level of education is significantly associated with the type of oral cleaning device used  $(\chi^2 = 25.817, \text{ d.f.} = 12, P = 0.05)$ , that is people who used toothbrushes and toothbrush-plus-miswak were educated holding baccalaureate or associate degrees.



*Fig 2.* Types of oral cleaning devices used by the Jordanian adults surveyed (n = 132).

Table 3. Cross-tabulation between the types of oral cleaning devices used and demographic characteristics of Jordanians surveyed (n = 133)

	Toothbrush use		Toothbrush- plus-miswak use	
Demographics	n	%	n	%
Age (years)				
18–30	62	66	16	59.3
31–40	23	24.5	8	29.6
41–60	9	9.6	3	11.1
Gender				
Male	38	41.8	12	46.2
Female	53	58.2	14	53.8
Marital status				
Married	32	34.4	7	25.9
Unmarried	54	58.1	19	70.4
Single/divorced	7	7.5	1	3.7
Monthly income (\$)				
<100	22	24.7	5	18.5
100–200	36	40.4	11	40.7
>200–300	10	11.2	4	14.8
>300-400	9	10.1	5	18.5
>400	12	13.5	2	7.4
Level of education				
Less than high school	12	12.6	0	0
High school	26	27.4	7	25.9
University/college degree	52	54.7	19	70.4
Master's/doctorate degree	5	5.3	1	3.7

Values in bold have significant association with the type of oral cleaning device used.

# Oral health behaviours

Table 4 illustrates the self-reported dental care practices among the study participants. Chi-square analysis revealed a statistically significant association between the type of oral cleaning device used and the time spent each day cleaning teeth, frequency of brushing and frequency of dental visits. The toothbrush-plus-miswak users are most likely to spend 1–2 min each day cleaning their teeth ( $\chi^2 = 34.9$ , d.f. = 20, P = 0.02) than those using other devices. Also, they are more likely to brush their teeth twice a day ( $\chi^2 = 20.9$ , d.f. = 12, P = 0.05) than those using other devices. Respondents who use the toothbrush are most likely to visit the dentist when they have pain ( $\chi^2 = 34.02$ , d.f. = 12, P = 0.00) than those using other devices.

### Oral health beliefs

There was no statistically significant relationship between the type of oral cleaning device used and oral hygiene beliefs except with question number 15 in the questionnaire, 'What do you think is most effective in reducing mouth debris?' Chi-square analysis revealed that 51% of the toothbrush users per-

ceive that using the toothbrush-plus-miswak is most effective in reducing mouth debris ( $\chi^2 = 32.069$ , d.f. = 16, P = 0.01) (see Table 5).

# Table 4. Cross-tabulation comparing type of oral cleaningdevice used with the oral hygiene behaviours reported by theJordanian adults surveyed

Question         n         %         n         %           How much time spent cleaning your teeth?		Toothbrush use		Toothbrush- plus-miswak use	
How much time spent cleaning your teeth?         Less than 1 min       19       20       2       7.4         1-2 min       39       41       16       59.2         2-3 min       21       22.1       4       14.8         3-4 min       8       8.4       2       7.4         4-5 min       5       5.2       3       11.1         More than 5 min       3       3.1       0       0         How often do you clean your teeth?       0       0       0         Once daily       35       36.8       7       25.9         Twice daily       31       32.6       12       44.4         >3 times a day       19       20       7       25.9         Weekly not daily       10       10.5       1       3.7         How often do you visit the dentist?       Every 6 months       6       6.3       9       34.6         Every year       13       13.6       4       15.3       3.7         How often do you visit the dentist?       2       7.6       0       0         Uhave never been to a dentist       10       10.5       2       7.6         Other dental hygiene devices used? <th>Question</th> <th>n</th> <th>%</th> <th>n</th> <th>%</th>	Question	n	%	n	%
Less than 1 min       19       20       2       7.4         1-2 min       39       41       16       59.2         2-3 min       21       22.1       4       14.8         3-4 min       8       8.4       2       7.4         4-5 min       5       5.2       3       11.1         More than 5 min       3       3.1       0       0         How often do you clean your teeth?       0       0       0         Once daily       35       36.8       7       25.9         Twice daily       31       32.6       12       44.4         >3 times a day       19       20       7       25.9         Weekly not daily       10       10.5       1       3.7         How often do you visit the dentist?       13       13.6       4       15.3         Weekly not daily       10       10.5       2       7.6         Other dental hygiene devices used?       13       13.6       4       15.3         When I have pain       66       69.4       11       42.3         I have never been to a dentist       10       10.5       2       7.6         Other dental hygiene d	How much time spent cleaning you	ur teeth?	?		
1-2 min       39       41       16       59.2         2-3 min       21       22.1       4       14.8         3-4 min       8       8.4       2       7.4         4-5 min       5       5.2       3       11.1         More than 5 min       3       3.1       0       0         How often do you clean your teeth?       0       0       0         Once daily       35       36.8       7       25.9         Twice daily       31       32.6       12       44.4         >3 times a day       19       20       7       25.9         Weekly not daily       10       10.5       1       3.7         How often do you visit the dentist?       Every 6 months       6       6.3       9       34.6         Every year       13       13.6       4       15.3       3.6       4       15.3         When I have pain       66       69.4       11       42.3       1       have never been to a dentist       10       10.5       2       7.6         Other dental hygiene devices used?       Dental floss       16       16.8       8       29.6       55.6       10.0       15       55	Less than 1 min	19	20	2	7.4
2-3 min       21       22.1       4       14.8         3-4 min       8       8.4       2       7.4         4-5 min       5       5.2       3       11.1         More than 5 min       3       3.1       0       0         How often do you clean your teeth?       0       0       0         Once daily       35       36.8       7       25.9         Twice daily       31       32.6       12       44.4         >3 times a day       19       20       7       25.9         Weekly not daily       10       10.5       1       3.7         How often do you visit the dentist?       2       2       7.6         Every 6 months       6       6.3       9       34.6         Every year       13       13.6       4       15.3         When I have pain       66       69.4       11       42.3         I have never been to a dentist       10       10.5       2       7.6         Other dental hygiene devices used?       2       7.4       3       5.5       5.5         I have never been to a dentist       10       10.5       5.5       5.5       5.5       5.5	1–2 min	39	41	16	59.2
3-4 min       8       8.4       2       7.4         4-5 min       5       5.2       3       11.1         More than 5 min       3       3.1       0       0         How often do you clean your teeth?       0       0       0         Once daily       35       36.8       7       25.9         Twice daily       31       32.6       12       44.4         >3 times a day       19       20       7       25.9         Weekly not daily       10       10.5       1       3.7         How often do you visit the dentist?       5       5       4       4.5         Every 6 months       6       6.3       9       34.6         Every year       13       13.6       4       15.3         When I have pain       66       69.4       11       42.3         I have never been to a dentist       10       10.5       2       7.6         Other dental hygiene devices used?       2       7.6       11       42.3         I have never been to a dentist       10       10.5       2       7.6         Other dental hygiene devices used?       2       5       6       15       5.5	2–3 min	21	22.1	4	14.8
4–5 min       5       5.2       3       11.1         More than 5 min       3       3.1       0       0         How often do you clean your teeth?       0       0       0         Once daily       35       36.8       7       25.9         Twice daily       31       32.6       12       44.4         >3 times a day       19       20       7       25.9         Weekly not daily       10       10.5       1       3.7         How often do you visit the dentist?       Every 6 months       6       6.3       9       34.6         Every year       13       13.6       4       15.3         When I have pain       66       69.4       11       42.3         I have never been to a dentist       10       10.5       2       7.6         Other dental hygiene devices used?       Dental floss       16       16.8       8       29.6         Mouth rinses       58       61.0       15       55.5       1       15       55.5         Interdental brushes       8       5       2       7.4	3–4 min	8	8.4	2	7.4
More than 5 min         3         3.1         0         0           How often do you clean your teeth?         0         35         36.8         7         25.9           Twice daily         31         32.6         12         44.4           >3 times a day         19         20         7         25.9           Weekly not daily         10         10.5         1         3.7           How often do you visit the dentist?         2         2         3         36.6         3         9         34.6           Every 6 months         6         6.3         9         34.6         33.6         4         15.3           When I have pain         66         69.4         11         42.3         1         142.3         1         10.5         2         7.6           Other dental hygiene devices used?         0         10.5         2         7.6         11         42.3           I have never been to a dentist         10         10.5         2         7.6           Other dental hygiene devices used?         0         16         16.8         8         29.6           Mouth rinses         58         61.0         15         55.5         15         5.5 </td <td>4–5 min</td> <td>5</td> <td>5.2</td> <td>3</td> <td>11.1</td>	4–5 min	5	5.2	3	11.1
How often do you clean your teeth?         Once daily       35       36.8       7       25.9         Twice daily       31       32.6       12       44.4         >3 times a day       19       20       7       25.9         Weekly not daily       10       10.5       1       3.7         How often do you visit the dentist?       Every 6 months       6       6.3       9       34.6         Every 9 months       6       6.3       9       34.6         Every year       13       13.6       4       15.3         When I have pain       66       69.4       11       42.3         I have never been to a dentist       10       10.5       2       7.6         Other dental hygiene devices used?       Dental floss       16       16.8       8       29.6         Mouth rinses       58       61.0       15       55.5       1         Interdental brushes       8       5       2       7.4	More than 5 min	3	3.1	0	0
Once daily         35         36.8         7         25.9           Twice daily         31         32.6         12         44.4           >3 times a day         19         20         7         25.9           Weekly not daily         10         10.5         1         3.7           How often do you visit the dentist?         Every 6 months         6         6.3         9         34.6           Every 9 months         6         6.3         9         34.6         15.3           When I have pain         66         69.4         11         42.3           I have never been to a dentist         10         10.5         2         7.6           Other dental hygiene devices used?         Dental floss         16         16.8         8         29.6           Mouth rinses         58         61.0         15         55.5         1         57.4           Othere         12         8.4         2         7.4	How often do you clean your teeth'	?			
Twice daily       31       32.6       12       44.4         >3 times a day       19       20       7       25.9         Weekly not daily       10       10.5       1       3.7         How often do you visit the dentist?       Every 6 months       6       6.3       9       34.6         Every 6 months       6       6.3       9       34.6       15.3         When I have pain       66       69.4       11       42.3         I have never been to a dentist       10       10.5       2       7.6         Other dental hygiene devices used?       Dental floss       16       16.8       8       29.6         Mouth rinses       58       61.0       15       55.5       1         Interdental brushes       8       5       2       7.4	Once daily	35	36.8	7	25.9
>3 times a day       19       20       7       25.9         Weekly not daily       10       10.5       1       3.7         How often do you visit the dentist?       Every 6 months       6       6.3       9       34.6         Every 6 months       6       6.3       9       34.6         Every year       13       13.6       4       15.3         When I have pain       66       69.4       11       42.3         I have never been to a dentist       10       10.5       2       7.6         Other dental hygiene devices used?       Dental floss       16       16.8       8       29.6         Mouth rinses       58       61.0       15       55.5       1         Interdental brushes       8       5       2       7.4	Twice daily	31	32.6	12	44.4
Weekly not daily       10       10.5       1       3.7         How often do you visit the dentist?       Every 6 months       6       6.3       9       34.6         Every 6 months       6       6.3       9       34.6         Every year       13       13.6       4       15.3         When I have pain       66       69.4       11       42.3         I have never been to a dentist       10       10.5       2       7.6         Other dental hygiene devices used?       0       0       15       55.5         Interdental brushes       8       5       2       7.4         Othere       12       8.4       2       7.4	>3 times a day	19	20	7	25.9
How often do you visit the dentist?         Every 6 months       6       6.3       9       34.6         Every 9 months       13       13.6       4       15.3         When I have pain       66       69.4       11       42.3         I have never been to a dentist       10       10.5       2       7.6         Other dental hygiene devices used?       7       6       61.0       15       55.5         Interdental brushes       8       5       2       7.4	Weekly not daily	10	10.5	1	3.7
Every 6 months         6         6.3         9         34.6           Every year         13         13.6         4         15.3           When I have pain         66         69.4         11         42.3           I have never been to a dentist         10         10.5         2         7.6           Other dental hygiene devices used?	How often do you visit the dentist?				
Every year         13         13.6         4         15.3           When I have pain         66         69.4         11         42.3           I have never been to a dentist         10         10.5         2         7.6           Other dental hygiene devices used?	Every 6 months	6	6.3	9	34.6
When I have pain6669.41142.3I have never been to a dentist1010.527.6Other dental hygiene devices used? </td <td>Every year</td> <td>13</td> <td>13.6</td> <td>4</td> <td>15.3</td>	Every year	13	13.6	4	15.3
I have never been to a dentist1010.527.6Other dental hygiene devices used?Dental floss1616.8829.6Mouth rinses5861.01555.5Interdental brushes8527.4Others128.427.4	When I have pain	66	69.4	11	42.3
Other dental hygiene devices used?Dental floss1616.8829.6Mouth rinses5861.01555.5Interdental brushes8527.4Others128.427.4	I have never been to a dentist	10	10.5	2	7.6
Dental floss         16         16.8         8         29.6           Mouth rinses         58         61.0         15         55.5           Interdental brushes         8         5         2         7.4           Otherse         12         8.4         2         7.4	Other dental hygiene devices used	1?			
Mouth rinses         58         61.0         15         55.5           Interdental brushes         8         5         2         7.4           Otherse         12         8.4         2         7.4	Dental floss	16	16.8	8	29.6
Interdental brushes 8 5 2 7.4 Others 12 8.4 2 7.4	Mouth rinses	58	61.0	15	55.5
Others 12 94 0 74	Interdental brushes	8	5	2	7.4
Utilets 13 0.4 2 7.4	Others	13	8.4	2	7.4
Quality of your breath?	Quality of your breath?				
Always have bad breath 1 1.06 0 0	Always have bad breath	1	1.06	0	0
Never had bad breath 45 47.8 20 76.9	Never had bad breath	45	47.8	20	76.9
Sometimes have bad breath 48 51.06 6 23	Sometimes have bad breath	48	51.06	6	23

Values in bold have significant association with the type of oral cleaning device used.

Table 5. Results for chi-square analysis comparing type of oral cleaning device used with the oral hygiene beliefs reported by respondents

Question	$\chi^2$	d.f.	<i>P</i> -value (two-sided)
Rating overall oral hygiene?	15.099	16	0.517
Rating the stain in the teeth?	6.079	8	0.638
Do your gums bleed?	2.865	4	0.581
Why do you think your gums bleed?	28.739	36	0.800
Rating the level of tooth decay?	6.348	12	0.898
Rating the level of gum disease?	19.442	12	0.078
Do you experience pain in your mouth?	7.215	8	0.514
The best to have optimal oral health?	16.968	12	0.151
The most effective in reducing mouth debris?	32.069	16	0.01
The most effective in reducing gum disease?	16.665	12	0.163
The most effective in reducing decay?	17.152	16	0.376

Values in bold have significant association between the type of oral cleaning device used and oral hygiene beliefs.

# Oral health knowledge

Respondent's knowledge about dental plaque was measured by a specific question in the questionnaire. Results revealed that 54.6% of the respondents know something about dental plaque; 67 of the 71 responses to this question attempted to define dental plaque. Only 26% accurately defined dental plaque as a bacterial layer that accumulates on tooth surface; 31% of the respondents' erroneously defined dental plaque as a calculus layer.

# Discussion

Regarding the demographic characteristics of the respondents, the majority (64.7%) were between 18-30 years old, suggesting that the young Jordanian population are more likely to seek professional dental care than older adults. Based upon gender of participants, more than half (56.3%) were female; therefore, women may be more likely to volunteer as a study participants and/or seek dental care than men. Perhaps young women are more concerned about their appearance and health than men. Findings regarding age parallel the study by Taani (7) in which the Jordanian people surveyed were 20-60 years old. The level of education in this sample was high, e.g. 59% hold university/college degrees. The sample used by Douglas et al. (8) suggests that the level of education between the Jordanian people surveyed may have risen over the past decade. The majority (70%) reported having bleeding gums at times and 36% reported tooth decay. Perhaps those people fail to view bleeding as a sign of gingival or periodontal disease. Jordanian people may be getting inconsistent, inaccurate or no dental health information based on the fact that respondents attributed gingival bleeding to poor brushing technique (26.2%), brushing too hard (22.3%), don't know (21.4%), accumulation of bacteria (12.6%) and as normal (6%). These findings are different from Douglas et al. (8) who found that 10.6% of the respondents experienced gingival bleeding. The majority of the respondents (72%) use the toothbrush, and 20.5% use toothbrush-plus-miswak. These findings differ from those of Douglas et al. (8) who found that 75% of the Jordanian people use miswak. Jordanian people's beliefs about miswak and toothbrush use appear to have undergone significant changes over the past 10 years. Improvement in global communications and western influences may lead some Jordanian people to view miswak as old fashion, i.e. using miswak is an ancient practice and using it to clean one's teeth is associated with old traditions. In terms of demographics and type of oral cleaning devices used, and focusing on the specific educational levels of the sample enable the researcher to determine how persons from various backgrounds perceive their oral health beliefs and behaviours. Al-Oaderi and Taani (10) recently reported that 56% of school children visit the dentist when there is a serious dental or oral problem. Some Jordanian people probably have their own remedies, i.e. use of herbs and/or rinsing their mouths with salt and water. Interestingly, although dental care is almost free in Jordan, barriers such as fear, lack of transportation and lack of knowledge regarding preventive dental care keep people from receiving regular professional oral care. In this study, only 8% of the respondents visit the dentist regularly, and 63.2% visit the dentist only when they have pain. Most Jordanians believe that using the toothbrush-plus-miswak is most effective for optimal oral health, yet, they only use the toothbrush. Again this dichotomy might suggest that miswak is viewed as an ancient rather than modern practice by young Jordanian adults.

# Conclusions

Jordanian people need accurate, evidence-based dental health education, individual and community-based preventive measures, and a philosophical change from disease-oriented and pain management care to primary preventive care. A media campaign about the value and cost-effectiveness of dental hygienists in prevention and early detection of most dental and oral diseases should be planned, implemented and evaluated. Jordanian people's definition of gum disease and its signs and symptoms needs to be verified and if necessary clarified for the public. Considering the results of this study, future studies should focus on the clinical effectiveness of miswak as compared with the toothbrush on clinical periodontal parameters such as gingival bleeding, clinical attachment level, or periodontal probing depths and the prevalence of oral disease in various segments of the population. Other important future research areas include Jordanian people's values about oral hygiene instructions when compared with scaling and root planning; the short-term and long-term effects of formal dental hygiene education programmes on the Jordanian people's oral health and hygiene awareness; efficacy of community-based dental education programmes for various target population within Jordanian society; and the percentage of dental practice time in Jordan spending on oral disease prevention and patient education. This study represents the first known attempt to document the use of miswak and toothbrushes and the oral health beliefs and behaviours of contemporary Jordanian adults who seek dental care. This study should also be replicated using a probability sample of Jordanians and in people who use miswak alone. To promote oral health, patients must

feel comfortable with and value the professional dental environment, staff and mission. Availability of dental hygienists in Jordan is likely to increase the awareness of Jordanian people about the importance of oral health care. Inadequate numbers of dental hygienists, limited community or school-based oral health care programmes, insufficient oral hygiene instructions and lack of awareness of dental problems are obstacles that prevent Jordanian people from seeking dental care and from enjoying the quality of life that comes from optimal oral and systemic health. Ongoing studies are needed to determine the benefits derived from applying contemporary knowledge of health promotion and disease prevention for quality oral health in all Jordanian citizens. Evidence-based programmes are needed to provide basic health care services to the population especially pregnant women and children. Results provide a foundation for the development of oral health prevention and intervention strategies to educate people about oral health.

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