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# Oral hygiene awareness and practice in orthodontic patients in Makkah city: A cross sectional study

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## Abstract:

**OBJECTIVES:** To evaluate the level of oral hygiene awareness and practice among orthodontic patients that have fixed appliances and investigate the differences in awareness as per age, gender, and education qualification.

**MATERIALS AND METHODS:** A cross-sectional study with 250 patients was included. A questionnaire was used to collect information regarding the patient's oral hygiene.

**RESULTS:** The level of awareness and oral hygiene practice was significantly higher among females, with a consistent stepwise increase toward older ages. Also, increased with higher education level, longer duration since getting the appliance, and receiving instructions from the orthodontist.

**CONCLUSIONS:** Oral hygiene instructions received by the orthodontist play an important role in the patient's awareness level. Also, many predictors have a significant effect on the patient's cooperation in practicing oral hygiene measures.

## Keywords:

Awareness, cross-sectional study, Makkah, oral hygiene, orthodontic patients, practice

## Introduction

Malocclusion is one of the most common oral health issue in the human globally.<sup>[1]</sup> The aim of orthodontic treatment is not only to provide good aesthetics but also a stable occlusion and a proper masticatory function.<sup>[2]</sup>

Individuals with orthodontic treatment have a significant increase in the amount of dental plaque as a consequence of the difficulty in maintaining proper Oral Hygiene (OH).<sup>[3,4]</sup> Plaque buildup around orthodontic appliances may negatively affect the gingiva, causing enlargement or recession. This can lead the orthodontic treatment to be prolonged or even discontinued.<sup>[2,5,6]</sup> Therefore, all individuals

undergoing orthodontics must practice meticulous OH measures.<sup>[7]</sup> Maintaining OH during the course of treatment with a fixed orthodontic appliance depends significantly on the patient's awareness of it.<sup>[8]</sup> Plaque buildup around orthodontic brackets and bands may lead to loss of gingival attachment, gingival recession, increased pocket depths, and gingival enlargement. This might affect the orthodontic treatment to be prolonged or even discontinued.<sup>[2,5,6]</sup> However, the patient's awareness, motivation, cooperation, and attitude toward treatment are all important elements in maintaining OH throughout the treatment period with fixed orthodontic appliance.<sup>[8]</sup> Several studies reported that orthodontic patients' knowledge and awareness of their gingival health was insufficient even with obtaining adequate instructions, many people fail to follow them properly.<sup>[9]</sup>

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This study aimed to evaluate the level of awareness of orthodontic patients regarding OH and to investigate the differences in the OH awareness and practice as per age, gender, and education qualification.

## Materials and Methods

### Ethics statement

Ethical approval has been gained from the Institutional Review Board of Makkah Healthcare Cluster, KSA (H-02-K-076-0322-693). Informed consent was obtained from all participants after explaining the details of the study and its importance of it through personal contact. Participants who do not accept to sign the informed consent were excluded from the study.

### Study design

The present investigation was a cross-sectional observational analytical design. The survey was an interviewer-administered type questionnaire and was filled by the doctors conducting this research. All participants enrolled in the study speak basic English, therefore an Arabic validated version was not required. This study used the Strengthening the Reporting of Observational Studies in Epidemiology criteria.<sup>[10]</sup>

### Participants and study groups

The population included in this study were Saudi patients, treated in governmental hospitals in Makkah city, Saudi Arabia. Patients who were included in this study are healthy, mentally stable, have current orthodontic treatment for at least 3 months, and their age between 12 and 35 years. The policy of patient's eligibility to receive orthodontic treatment adopted by orthodontists in Makkah Healthcare Cluster stated that the youngest age to receive orthodontic treatment is 12 years when all the permanent teeth erupted. Based on the latest published data by the General Authority for Statistics in 2016, the total population of the Makkah region was 8,325,304, of which 4,440,571 were Saudi. The total number of Saudi populations aged between 12 and 35 years was 1,973,411. The sample size was 250 patients, based on a 95% confidence level and confidence interval equal to 6.

### Questionnaire

The purpose and importance of this study was explained orally to all participants along with explaining the questionnaire. The information provided also stated that the findings of this survey do not influence participants' treatment plan and that no identifiable information about them was collected. We mentioned that participation is entirely voluntary.

A questionnaire adopted from a previous study done by Ilyas *et al.* in 2019<sup>[2]</sup> (Appendix A) was used in this

study. It is designed to be straightforward for all patients. The questionnaire was used to collect information regarding the patient's OH routines. It has two parts, the first part was about the patient's demographic data and the second part was used to assess the patient's oral health awareness and practice during fixed orthodontic treatment.

### Statistical analysis

Microsoft Excel spreadsheet was used to enter the data collected from participants by researchers (IBM SPSS software package version 2.5 Chicago, IL, USA). Software program was used for the statistical analysis by a blinded statistician. All variables were analyzed descriptively. Frequency distribution was used to describe categorical variable and Chi-square test was used to verify significance in the differences among subgroups. Shapiro-Wilk's test was used to verify normality of the quantitative variables, accordingly, after normality being endured, the mean and standard deviation were used for summarization, and independent sample *t*-test and analysis of variance test were used to test the significance in differences between subgroups. Linear regression analysis was used for predictors of the level of awareness; *P* value <.05 was considered as an indication of significance.

## Results

As per the study design, 250 patients who had been subjected to orthodontic appliance were enrolled in the study, where they responded to a predesigned questionnaire reflecting their awareness about OH following orthodontic application. The results section is comprised of two main compartments, first part describes characteristics of the study group and the second part presents summarization of the awareness and OH practice score and the different factors that may affect the patient's awareness and adherence to practicing OH measures.

### Characteristics of study group

All the participants were able to complete the questionnaires making a total response rate of 100%. Table 1 shows that there was preponderance of females (64%) and almost two-thirds were in the age group (aged 19 to <25 years). Most of the respondents had either high school level of education (56.4%) or university qualifications (20%). More than one-half had the orthodontic appliance for an average of 1-2 years (53.6%) in addition to 19% who had the appliance for more than two years.

### Awareness of the respondents about oral hygiene

Table 2 demonstrates that only 4.4% of the respondents who used to brush their teeth once daily and 10% who

brush it irregularly, while the rest were brushing it twice or more, the most identified used brush is the soft brush (51.2%). The great majority (88.6%) indicated that they use interdental brush as dental hygiene, in addition to 20.5% who are using dental floss. Less than one-half of

**Table 1: Characteristics of the study group (n=250)**

Characteristics	#	%
Gender:		
Male	90	36.0
Female	160	64.0
Age:		
<18 years	66	26.4
19-25 years	166	66.4
>25 years	18	7.2
Education level:		
Elementary	8	3.2
Intermediate	51	20.4
High school	141	56.4
University	50	20.0
Duration of wearing orthodontic appliance:		
3 months to <1 year	67	26.8
1-2 years	134	53.6
>2 years	49	19.6

**Table 2: Clinical characteristics of the study group (n=250)**

Characteristics	#	%
Frequency of using toothbrush daily:		
Once	11	4.4
Twice	166	66.4
Three times	48	19.2
Irregular	25	10.0
Type of brush:		
Soft	128	51.2
Medium	40	16.0
Hard	10	4.0
Any type	72	28.8
Using dental hygiene aids (n=185, 74%):		
Inter-dental brush	164	88.6
Dental floss	38	20.5
Tooth pick	32	17.3
Miswak	5	2.7
Using mouth wash (n=118; 47.2%):		
Once daily	58	49.6
Twice daily	26	22.2
When dentist prescribe it	24	20.5
Before going to dentist	9	7.7
Type of mouth wash (n=118; 47.2%):		
Fluoridated	16	13.7
Nonfluoridated	4	3.4
Any type	25	21.4
Have no idea	72	61.5
Scaling during orthodontic treatment (n=194; 77.6%):		
Once at the start of orthodontic treatment	139	71.6
Irregular, to maintain good health of the gum	17	8.8
Irregular, when the dentist suggest it	38	19.6

the respondents 118 (47.2%) used to do mouth wash, of them a total of 71.8% who used it on regular base, either once daily (49.6%) or twice (22.2%); and almost two-thirds of them (61.5%) had no idea about the type of mouth wash they were using. Most of the respondents (77.6%) expressed that they undergone scaling; of them, there were 71.6% who had scaling only once at the start of the orthodontic treatment and the rest were on irregular base.

Regarding consumption of sticky food, Table 3 shows that while more than one-half of the respondents (59.7%) who claimed that they received instructions from the dentist never consumed sticky food; only 1 participant (5.9%) of those who had no such instructions were not consuming it. This difference is statistically significant  $P < .05$ .

To facilitate determining the factors associated with changes in the awareness of the patients about OH, the identified practices were weighed by scores, giving highest scores for the optimum practices. The overall sum scores were 17, accordingly, the total score was transferred to percentages.

The results showed that the overall awareness score percentage was 54.9%, which is below average. Table 4 shows that the awareness score percentage was significantly higher among females (Mean  $\pm$  SD; 47.4%  $\pm$  15.2%,  $P = 0.000$ ); with a consistent stepwise increase toward older ages till reaching (Mean  $\pm$  SD; 66.7%  $\pm$  14.6%) in those aging 25 years or more ( $P = 0.000$ ). Also, it was noticed that the level of awareness increases significantly with higher education level where it increased from (Mean  $\pm$  SD; 37.5%  $\pm$  15.7%) in those with elementary education up to (Mean  $\pm$  SD; 63.9%  $\pm$  18.5%) in respondents with university qualification ( $P = 0.000$ ). Moreover, it was found that the level of awareness increases significantly with longer duration since applying the orthodontic appliance ( $P = .027$ ). Finally, it was evident that receiving instructions from the dentist significantly increased the level of awareness among the respondents up to (Mean  $\pm$  SD; 54.9%  $\pm$  17.2%)  $P = 0.000$  [Figure 1].

The final regression model displayed in Table 5 demonstrates that the age, gender, and education level are significant predictors for the level of awareness, with  $R^2 = 0.191$ , which means that these variables are collectively responsible for 19.1% of the changes in the level of awareness ( $P < .05$ ). The standardized coefficients indicate that being a female, old age and having high education level increases the likelihood of getting higher awareness level about OH.

## Discussion

This study aimed to evaluate the oral health awareness and practice among patients who received fixed orthodontic

appliances. For patients who received orthodontic appliances, it is important to know that OH awareness and practice are critical to prevent caries and periodontal problems during and after orthodontic treatment.

In the present study, the preponderance of females was 64% with males comprising 46% of the study sample. These findings are similar to many previous studies globally<sup>[11-14]</sup> and many other studies conducted in Saudi Arabia.<sup>[3,8,15,16]</sup> This might be explained by that females concern more about esthetics and good occlusion compared to males and having an increased demand for orthodontic treatment.<sup>[17,18]</sup>

**Table 3: Eating sticky food during orthodontic treatment according to getting instructions from the dentist to hold it**

Characteristics	Got instructions from the orthodontist				χ <sup>2</sup>	P
	Yes		No			
	#	%	#	%		
Not at all	139	59.7%	1	5.9%	22.10	<0.00
Yes, frequently	19	8.2%	1	5.9%		
Yes, sometimes	75	32.2%	15	88.2%		

**Table 4: Comparing overall awareness score percentage about oral hygiene according to characteristics of the study group**

Characteristic	Awareness score percentage		P
	Mean	SD	
Gender			<0.001*
Male	47.4	15.21	
Female	56.7	18.14	
Age categories			<0.001**
<18 years	44.6	16.61	
19 to <25 years	55.4	16.98	
≥25 years	66.7	14.55	
Education level			<0.001**
Elementary	37.5	15.70	
Intermediate	45.4	16.30	
High school	53.4	15.92	
Bachelor	63.9	18.45	
Duration of wearing the orthodontic appliance			0.027**
3 months to <1 year	48.7	17.43	
1-2 years	53.1	17.00	
>2 years	55.8	17.72	

\*Based on independent sample t-test \*\*Based on analysis of variance test

OH knowledge and practice were significantly higher among female participants (Mean ± SD; 56.7% ± 18.14%). As per a previous study,<sup>[19]</sup> females were taking care of their teeth and periodontal health as they pay more attention to their oral health. The older age group (aged >25 years) showed a significant increase in their OH knowledge and practice compared to younger age group (Mean ± SD; 56.7% ± 14.6%). Participants who acquired university qualifications showed more adherence to dental health practice. These findings are similar to Al-harbi *et al.*<sup>[8]</sup> study that reported a high positive correlation between the educational level of the subjects and their periodontal health knowledge. As per the findings of present study, older females with higher education were more aware of OH methods and had good OH practice.

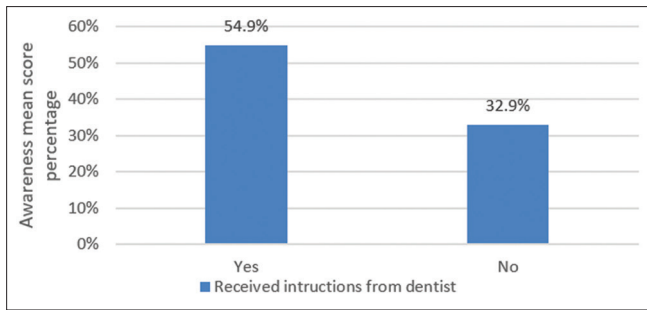
Tooth brushing is the most important method in the mechanical removal of dental plaque and maintain good OH during orthodontic treatment.<sup>[20]</sup> This study found that most participants were using toothbrushes and brushed their teeth at least twice daily. The current findings of this study were similar to many studies observed a high percentage (>90%) of orthodontic patients brushing their teeth at least twice per day.<sup>[2,3,8,15,21-23]</sup> Soft bristles tooth brushes were used by almost half of the patients in present study; this is similar to many previous studies.<sup>[23,24]</sup> However, other studies reported that medium toothbrushes used by majority of the participants to clean their teeth.<sup>[9,21]</sup> Medium toothbrushes tend to remove more plaque; however, they may cause more gingival abrasion than soft toothbrush.<sup>[25]</sup> If a patient complained from soft-tissue damage—such in patients receiving orthodontic brackets—a soft toothbrush may be recommended to prevent further injury.<sup>[26]</sup>

Toothbrush alone was found not able to remove plaque under arch wires, so the need for auxiliary aids such as floss and interdental brushes and mouth washes were recommended.<sup>[27]</sup> Using dental floss is associated with better gingival health for patients having fixed orthodontic appliances.<sup>[28]</sup> However, only 20% of the participants in the present study reported the use of dental floss. This is similar to findings of previous studies that reported a low percentage of using dental floss

**Table 5: Regression model for the factors predicting awareness about oral hygiene according to characteristics of the study group**

	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.	95.0% CI for B	
	B	Std. Error				Lower Bound	Upper Bound
(Constant)	15.015	5.192		2.892	0.004	4.788	25.242
Age	5.424	2.935	0.168	1.848	0.046	-0.356	11.205
Gender	8.209	2.139	0.223	3.838	0.000	3.996	12.422
Education level	5.143	2.227	0.212	2.31	0.022	0.757	9.53

R<sup>2</sup>=0.191. Variables excluded from the final model: Duration of wearing the orthodontic appliance and instructions from the dentist.



**Figure 1:** Awareness of the respondents about oral hygiene according to previously receiving instructions from the dentist

among Saudi orthodontics patients.<sup>[15,29]</sup> These findings can be explained that dental floss is difficult to use in the presence of fixed orthodontic appliances. Thus, patients might be unwilling to use it while undergoing orthodontic treatment.<sup>[15]</sup> Surprisingly, the findings of current studies showed that most of participants were using interdental toothbrushes (88%). These findings were higher than the percentages in many previous studies that reported the daily use of interdental brushes by the patients (23.3%- 68%).<sup>[15,22,23,30]</sup>

The use of mouthwash was common among participants in the present study (47%). Lee *et al.*<sup>[22]</sup> and Ilyas *et al.*<sup>[2]</sup> reported that a higher percentage of their participants 64% and 66% continuously were using mouthwashes during orthodontic treatment. In contrast, many other studies found lesser percentage ranged between 25.9% and 31.3% of their participants were using mouthwashes.<sup>[21,23]</sup>

In this study, 70% of the patients did scaling before the start of treatment and only 6% of them do scaling on irregular bases. These results are similar to a previous study that reported 52% of the participants had scaling once before at the start of orthodontic treatment, whereas 26% had to scale two or more times.<sup>[2]</sup> Patients with fixed orthodontic appliances complain from difficulties when practicing OH measures. Patients with orthodontic appliances have an increased risk of gingivitis, enamel demineralization, and plaque accumulation. After receiving fixed orthodontic appliances, OH changes and it is more difficult to remove plaque and avoid complications.<sup>[31]</sup>

In this study, 63% of the patients included in the study claimed that they received instructions from the dentist regarding the consumption of sticky food. About 60% of the participants were able to follow them. Similarly, another study reported that 52% of those surveyed did not eat any sticky food during their course of orthodontic treatment.<sup>[32]</sup> An opposite finding was found in another study that mentioned that only 9% of the participants did not consume any sticky food.<sup>[33]</sup>

## Conclusions

Patients undergone orthodontic treatment showed acceptable level of awareness about OH that was influenced by many factors such as the patient's gender and level of education. Improvement in OH during orthodontic treatment can be endorsed by continuous monitoring and reinforcement of the OH instructions given by their orthodontist during the follow-up visits.

Scaling and professional tooth cleaning by dental hygienist can lead to efficient control of plaque accumulation and improvement in the gingival health in patients with fixed orthodontic appliances.

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## Conflicts of interest

There are no conflicts of interest.

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## Appendix A: Questionnaire used for data collection<sup>[2]</sup>

### Part 1: Demographic Data

1. Age Range:
  - 12-18 Years
  - 19-25 Years
  - 26-35 Years
2. Gender:
  - Female
  - Male
3. Level of Education:
  - Elementary
  - Intermediate
  - High School
  - Bachelor or more
4. How Long have you been wearing an Orthodontic appliance?
  - 3 months to 1 year
  - 1 to 2 years
  - More than 2 years

### Part 2: Questions About Oral Hygiene Awareness in Orthodontic Patients

1. Do you use a Toothbrush?
  - Yes
  - No

If yes, how many times do you use it daily?

- 1 Time
- 2 Times
- 3 Times
- Irregularly

Which type of Toothbrush do you use?

- Soft
- Medium
- Hard
- Any type available

2. Other than brushing, do you take extra measures to improve your oral health?
  - Yes
  - No

If yes, which of the following oral hygiene aids do you employ?

- Dental floss
- Miswak
- Toothpick
- Interdental brush

3. Have you used mouthwash since your orthodontic treatment?
  - Yes
  - No

If yes, how frequently do you use it?

- Once Daily
- Twice Daily

- Before going to your dentist
- When your dentist prescribes it to treat your swollen gums

Which type of Mouthwash do you use?

- Fluoridated
- Nonfluoridated
- Any type available
- Have no idea

4. Have your dentist told you not to eat Sticky Foods?

- Yes
- No
- I do not remember

Do you eat Sticky Food during orthodontic treatment?

- Yes, frequently
- Yes, sometimes
- Not at all

5. Have you visited Periodontal Department for scaling during orthodontic treatment?

- Yes
- No

If yes, how many times have you visited?

- One at the start of orthodontic treatment
- At regular intervals to maintain good health of gums
- Off and on when the dentist suggests you