




Awareness to Orthodontics among a Sample of Final Year Dental Students

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Abstract

Objective Because of esthetic demand, awareness about orthodontic treatment has increased nowadays, especially among young people and adolescents, in addition to the fact that knowledge of orthodontics and various details of it is more significant among dental students according to what they learned in their curricula and their examination and observation of many cases of malocclusion. The objective of the present study was to evaluate the awareness of the final year of undergraduate dental students toward orthodontics.

Materials and Methods About 532 (320 females and 212 males) students in the fifth year of six Iraqi universities were invited to participate in this questionnaire distributed via the Google classroom. This questionnaire included 20 questions about orthodontics. Pearson’s chi-square test evaluated the gender and universities differences.

Results In general, the awareness responses were very high in most of the questions answered except in three questions in which the percentage of positive answers varies from 49 to 76%. Also, there were no significant gender differences in 17 question answers, and only 3 showed significant gender differences. Females expressed a high level of awareness than males.

Conclusion The high and close level of awareness expressed by students’ responses in this study revealed the integrated education in orthodontic sciences in Iraqi dental colleges in different universities, except in some questions that deal with topics about the acceleration of tooth movement and the relation between vitamin D3 and teeth movement.

Keywords

- ▶ awareness
- ▶ orthodontic treatment
- ▶ dental students
- ▶ orthodontics

Introduction

Oral health can influence childhood well-being, which also affects general health through development. Malocclusion is the arrangement alteration of teeth and the form of the face, cranium, and jaws.¹ It refers to any anomalies in tooth position, not within the normal or incorrect relation between the upper and lower arches in any of the three planes. The malocclusion may be caused by genetic or environmental factors and a combination of local factors such as tooth anomalies, oral habits, etc. The orthodontic treatments prevent the damage of the tissue and make the esthetics and physical function better.²

In the past years, orthodontic treatment has been increased in the most developed countries in the world.^{3,4} The demand for orthodontic therapy affects the self-awareness of dental appearance and the desire to look attractive.² Preadolescents and youth adulthood would be benefited from getting orthodontic treatment because the sooner the treatment is started, the more we can control the prevention of the complications of malocclusion. Moreover, the interest in knowing the patients' ages can help guide the orthodontist to educate them and their parents by providing advice.⁵

Awareness, availability of the experts, ethnic trends and values, and socioeconomic factors all affect the demand and desire for orthodontic treatment. Awareness is the state of feeling, perceiving, or being conscious. It planned oral health basically, which was considered an inherent part of general health. The information on malocclusion and the development treatment needs is now being at hand worldwide in addition to the development indices of malocclusion.¹

The main categories that request orthodontic therapy are children and adolescents. They are motivated by parents and guardians who influenced the orthodontic treatment needs among them; also, they are widely affected by the school teachers who relate closely with those children and adolescent students.⁵

The patient's awareness, behavior, and complaints are the orthodontic treatment success factors. Furthermore, oral hygiene during orthodontic treatment should be intense to avoid further periodontal disease.⁶

Medical practitioners have an essential role to play for patients who are mostly suffered from health-related complaints, and they provide the care firstly in the investigation, detection, and referral of patients who have different oral health problems such as malocclusion where most of the functions had been done by those practitioners, so that may be very useful to prevent and manage the oral diseases and efficient delivery of oral health care.⁷

During the coronavirus disease 2019 pandemic, education and learning transformed into technology based instead of face-to-face contact depending on different means such as Zoom, Google Meet, and others. Al-Taweel et al⁸ evaluated various features of technology-based learning in an online survey performed on undergraduate dental students from different Iraqi universities. The students showed a low-moderate degree of satisfaction with a positive attitude

toward this type of learning and the quality of presentation of the scientific materials.

Many studies assessed medical^{7,9,10} and dental students^{11,12} awareness about orthodontics. These studies showed marked awareness toward orthodontics.

The objective of the present study was to evaluate the level of awareness of final year undergraduate dental students from different universities toward orthodontics concentrating on etiology, diagnosis, planning treatment, and the types of orthodontic retainers, using auxiliaries and accelerative orthodontics.

Materials and Methods

Approval of the scientific committee in the Department of Orthodontics, College of Dentistry, University of Baghdad was gained to conduct this cross-sectional online survey among a sample of final year dental students in different Iraqi universities (ID: 21 in 1-2-2021). Informed consent was obtained from all subjects before filling the questionnaire.

The sample size was calculated using SurveyMonkey online sample size calculator based on the number of final year students which was 3,143, at 95% confident level and 5% marginal error; hence, the calculated sample size was 343. To circumvent the probable dropout, further 15% (52 subjects) was added to the sample; hence, the required calculated sample size was 395 participants.

A questionnaire on Google Forms was prepared according to previous studies^{11,12} with addition of new questions. These questions were reviewed by two specialist orthodontists and validated by a pilot study on 20 students. It consisted of general questions about orthodontics. The students in the fifth year of six universities (Baghdad, Iraqi, Mustansiriyah, Babylon, Basra, and Al-Rafidain) were invited to participate in this questionnaire distributed via the Google classroom. The final number of participants was 532.

This questionnaire included 20 questions as follows:

1. Do you notice improper positioning of your teeth? Yes, no.
2. Have you ever noticed people with improperly positioned teeth? Yes, no.
3. Do you think improperly positioned teeth might affect the subject's facial appearance and self-confidence? Yes, no.
4. Do you think that improperly positioned teeth might affect oral functions? Yes, no.
5. Do you think improperly positioned teeth might cause side effects such as caries, periodontal, and growth problems? Yes, no.
6. Do you aware that regular visits to the orthodontist may reduce the severity of improperly positioned teeth and jaws? Yes, no.
7. Do you think there is a direct relation between bad oral habits and malocclusion? Yes, no.
8. Do you think the genetic factor plays an essential role in developing certain malocclusion? Yes, no.
9. Do you think that orthodontic treatment started at an earlier age is better? Yes, no.

10. Do you know that the orthodontic treatment may take between 1 and 3 years of treatment followed by a retention period? Yes, no.
11. Do you know that orthodontic treatment needs regular monthly visits over the treatment period? Yes, no.
12. Are you aware of the need for extraction during braces treatment? Yes, no.
13. Do you know that bad oral hygiene during treatment may cause side effects such as white spot lesions, caries, and gingival inflammation? Yes, no.
14. Do you know that treatment with a fixed brace might be associated with variable levels of pains and soft tissue soreness? Yes, no.
15. Do you hear about some methods or devices that accelerate tooth movement? Yes, no.
16. Do you think that there is a relation between vitamin D3 and orthodontics? Yes, no.
17. Do you know the types of orthodontic retainers, namely, the fixed and removable? Yes, no.
18. Do you know that some types of skeletal malrelations can be treated at an early age with growth modification appliances? Yes, no.
19. Do you know that some types of skeletal malrelations cannot be treated with fixed orthodontic appliances alone without surgery? Yes, no.
20. Do you know that some types of elastics might be used throughout the treatment? Yes, no.

Statistical Analyses

Confidentiality was kept during data collection and analysis, and responses were collected and analyzed by the SPSS program (version 25). The frequency and percentage of responses according to the different genders and universities were tabulated; then, Pearson's chi-square test was applied to detect gender and university differences as the data were nominal. The probability level was set at 5%.

Results

The distribution of the participants from different universities according to the genders is demonstrated in ►Table 1. The female to male ratio was 3/2. Generally, the highest number of responses was performed by the students of Baghdad University, and the lowest response was from the

students of Al-Rafidain University College, with a total response rate reaching up to 60%.

Twenty questions have been answered by the final year dental students in different Iraqi dental faculties. Generally, the positive responses by the participants (those who answered yes) exceeded 85% in 17 questions. The percentage of positive responses in the three questions ranged between 58 and 74%. Regarding the gender differences, ►Table 2 revealed no significant gender differences in 17 question answers, and only 3 showed significant gender differences ($p \leq 0.05$).

►Table 3 revealed significant differences in responses to one question only regarding responses among the students from different universities. The positive responses by the participants (those who answered yes) exceeded 80% in 17 questions. In the other three questions (Q1, 15, and 16), the positive response was ranged from 53 to 76%.

Discussion

Facial and dental appearance plays a central part in all stages of human life and considerably affects person's life before and during adolescence.¹³ The behavior of people and their knowledge of the appearance of the teeth may vary.¹⁴ Self-awareness is not a stable phenomenon; it is dynamic.¹⁵

This is the first Iraqi study investigating the awareness of final year undergraduate students toward orthodontics, including many comprehensive and most specialized questions in orthodontics and at the level of more than one university of Iraq. In addition to that, there are only two Indian studies^{11,12} close to the present study in their subject, but the nature of the questions is different except for some elementary questions.

Most of the students in this study were aware of esthetics, and this appeared in their positive responses in the first three questions except in Q1, where the positive response was 57 to 76%, and this agreed with the findings of other studies.^{11,12} The logical explanation for the lower positive response for Q1 can be attributed to the high prevalence of class I occlusion among the population, so mild spacing, crowding, or rotation of the teeth is considered normal for those students. Moreover, treating patients in the teaching hospitals in different branches and accomplishing the practical requirements make students more concentrated on patients' occlusion. Nowadays, people worldwide seek medical, dental, and

Table 1 The distribution of the participants according to genders and universities

Genders		Baghdad	Iraqi	Rafidain	Mustansiria	Babylon	Basrah	Total
Males	N	81	31	22	36	20	22	212
	%	39	46	58	47	34	27	40
Females	N	129	36	16	41	39	59	320
	%	61	54	42	53	66	73	60
Total	N	210	67	38	77	59	81	532
	%	100	100	100	100	100	100	100

Table 2 Frequency distribution, percentage, and gender differences regarding the answers for the questions

Question	Answer		Genders			Gender difference	
			Males	Females	Total	Chi-square test	p-Value
1	No	N	76	119	195	0.098	0.754
		%	36	37	37		
	Yes	N	136	201	337		
		%	64	63	63		
	Total	N	212	320	532		
		%	100	100	100		
2	No	N	12	13	25	0.727	0.394
		%	6	4	5		
	Yes	N	200	307	507		
		%	94	96	95		
	Total	N	212	320	532		
		%	100	100	100		
3	No	N	14	11	25	2.855	0.091
		%	7	3	5		
	Yes	N	198	309	507		
		%	93	97	95		
	Total	N	212	320	532		
		%	100	100	100		
4	No	N	10	17	27	0.094	0.759
		%	5	5	5		
	Yes	N	202	303	505		
		%	95	95	95		
	Total	N	212	320	532		
		%	100	100	100		
5	No	N	7	14	21	0.387	0.534
		%	3	4	4		
	Yes	N	205	306	511		
		%	97	96	96		
	Total	N	212	320	532		
		%	100	100	100		
6	No	N	16	13	29	3.004	0.083
		%	8	4	5		
	Yes	N	196	307	503		
		%	92	96	95		
	Total	N	212	320	532		
		%	100	100	100		
7	No	N	23	19	42	4.230	0.040
		%	11	6	8		
	Yes	N	189	301	490		
		%	89	94	92		
	Total	N	212	320	532		
		%	100	100	100		

(Continued)

Table 2 (Continued)

Question	Answer		Genders			Gender difference	
			Males	Females	Total	Chi-square test	p-Value
8	No	N	22	28	50	0.397	0.529
		%	10	9	9		
	Yes	N	190	292	482		
		%	90	91	91		
	Total	N	212	320	532		
		%	100	100	100		
9	No	N	13	12	25	1.616	0.204
		%	6	4	5		
	Yes	N	199	308	507		
		%	94	96	95		
	Total	N	212	320	532		
		%	100	100	100		
10	No	N	22	33	55	0.001	0.981
		%	10	10	10		
	Yes	N	190	287	477		
		%	90	90	90		
	Total	N	212	320	532		
		%	100	100	100		
11	No	N	15	23	38	0.002	0.961
		%	7	7	7		
	Yes	N	197	297	494		
		%	93	93	93		
	Total	N	212	320	532		
		%	100	100	100		
12	No	N	28	27	55	3.130	0.077
		%	13	8	10		
	Yes	N	184	293	477		
		%	87	92	90		
	Total	N	212	320	532		
		%	100	100	100		
13	No	N	6	8	14	0.054	0.816
		%	3	3	3		
	Yes	N	206	312	518		
		%	97	98	97		
	Total	N	212	320	532		
		%	100	100	100		
14	No	N	20	16	36	3.974	0.046
		%	9	5	7		
	Yes	N	192	304	496		
		%	91	95	93		
	Total	N	212	320	532		
		%	100	100	100		

Table 2 (Continued)

Question	Answer		Genders			Gender difference	
			Males	Females	Total	Chi-square test	p-Value
15	No	N	76	135	211	2.141	0.143
		%	36	42	40		
	Yes	N	136	185	321		
		%	64	58	60		
	Total	N	212	320	532		
		%	100	100	100		
16	No	N	56	94	150	0.552	0.458
		%	26	29	28		
	Yes	N	156	226	382		
		%	74	71	72		
	Total	N	212	320	532		
		%	100	100	100		
17	No	N	25	26	51	1.979	0.160
		%	12	8	10		
	Yes	N	187	294	481		
		%	88	92	90		
	Total	N	212	320	532		
		%	100	100	100		
18	No	N	17	19	36	0.876	0.349
		%	8	6	7		
	Yes	N	195	301	496		
		%	92	94	93		
	Total	N	212	320	532		
		%	100	100	100		
19	No	N	31	28	59	4.460	0.035
		%	15	9	11		
	Yes	N	181	292	473		
		%	85	91	89		
	Total	N	212	320	532		
		%	100	100	100		
20	No	N	18	32	50	0.341	0.559
		%	8	10	9		
	Yes	N	194	288	482		
		%	92	90	91		
	Total	N	212	320	532		
		%	100	100	100		

beauty centers to improve their appearances and self-confidence, such as doing plastic surgeries for the nose, injecting filler and Botox, or performing veneers and Hollywood smiles. This is apparent in the high-positive response of the students in all universities and genders.

Regarding the effect of malocclusion on the oral health and functions (Q4 and Q5), the positive responses were high

among the students indicated that they had high level of information regarding the effect of malaligned teeth in causing caries and periodontal diseases due to food stagnation and difficulty to use the cleaning aids such as tooth brush, dental floss, and tooth picks¹⁶ as they are so hard to enter in the interdental spaces and this came in agreement with Agrawal's findings.¹¹ Additionally, the presence of

Table 3 Frequency distribution, percentage, and university differences regarding the answers for the questions

Question	Answer		Universities							Universities difference	
			Baghdad	Iraqi	Rafidain	Mustansiria	Babylon	Basrah	Total	Chi-square test	p-value
1	No	N	77	29	14	33	14	28	195	6.942	0.225
		%	37	43	37	43	24	35	37		
	Yes	N	133	38	24	44	45	53	337		
		%	63	57	63	57	76	65	63		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
2	No	N	9	2	2	4	4	4	25	1.166	0.948
		%	4	3	5	5	7	5	5		
	Yes	N	201	65	36	73	55	77	507		
		%	96	97	95	95	93	95	95		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
3	No	N	10	2	2	2	3	6	25	2.587	0.763
		%	5	3	5	3	5	7	5		
	Yes	N	200	65	36	75	56	75	507		
		%	95	97	95	97	95	93	95		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
4	No	N	9	4	1	2	7	4	27	6.319	0.276
		%	4	6	3	3	12	5	5		
	Yes	N	201	63	37	75	52	77	505		
		%	96	94	97	97	88	95	95		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
5	No	N	7	4	1	5	4	0	21	9.712	0.084
		%	3	6	3	6	7	0	4		
	Yes	N	203	63	37	72	55	81	511		
		%	97	94	97	94	93	100	96		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
6	No	N	9	6	4	5	3	2	29	5.365	0.373
		%	4	9	11	6	5	2	5		
	Yes	N	201	61	34	72	56	79	503		
		%	96	91	89	94	95	98	95		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
7	No	N	13	12	3	2	6	6	42	12.254	0.031
		%	6	18	8	3	10	7	8		
	Yes	N	197	55	35	75	53	75	490		
		%	94	82	92	97	90	93	92		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		

Table 3 (Continued)

Question	Answer		Universities							Universities difference	
			Baghdad	Iraqi	Rafidain	Mustansiria	Babylon	Basrah	Total	Chi-square test	p-value
8	No	N	18	5	4	5	9	9	50	3.692	0.595
		%	9	7	11	6	15	11	9		
	Yes	N	192	62	34	72	50	72	482		
		%	91	93	89	94	85	89	91		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
9	No	N	12	5	2	1	2	3	25	4.655	0.459
		%	6	7	5	1	3	4	5		
	Yes	N	198	62	36	76	57	78	507		
		%	94	93	95	99	97	96	95		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
10	No	N	24	6	7	5	6	7	55	4.297	0.507
		%	11	9	18	6	10	9	10		
	Yes	N	186	61	31	72	53	74	477		
		%	89	91	82	94	90	91	90		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
11	No	N	16	1	2	3	8	8	38	10.181	0.070
		%	8	1	5	4	14	10	7		
	Yes	N	194	66	36	74	51	73	494		
		%	92	99	95	96	86	90	93		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
12	No	N	22	9	3	10	6	5	55	3.198	0.669
		%	10	13	8	13	10	6	10		
	Yes	N	188	58	35	67	53	76	477		
		%	90	87	92	87	90	94	90		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
13	No	N	9	1	0	1	2	1	14	5.860	0.320
		%	4	1	0	1	3	1	3		
	Yes	N	201	66	38	76	57	80	518		
		%	96	99	100	99	97	99	97		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
14	No	N	17	3	3	6	3	4	36	2.137	0.830
		%	8	4	8	8	5	5	7		
	Yes	N	193	64	35	71	56	77	496		
		%	92	96	92	92	95	95	93		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		

(Continued)

Table 3 (Continued)

Question	Answer		Universities							Universities difference	
			Baghdad	Iraqi	Rafidain	Mustansiria	Babylon	Basrah	Total	Chi-square test	p-value
15	No	N	74	20	18	31	27	41	211	10.347	0.066
		%	35	30	47	40	46	51	40		
	Yes	N	136	47	20	46	32	40	321		
		%	65	70	53	60	54	49	60		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
16	No	N	47	26	9	23	22	23	150	10.132	0.072
		%	22	39	24	30	37	28	28		
	Yes	N	163	41	29	54	37	58	382		
		%	78	61	76	70	63	72	72		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
17	No	N	21	5	3	5	7	10	51	2.485	0.779
		%	10	7	8	6	12	12	10		
	Yes	N	189	62	35	72	52	71	481		
		%	90	93	92	94	88	88	90		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
18	No	N	16	6	3	3	3	5	36	2.281	0.809
		%	8	9	8	4	5	6	7		
	Yes	N	194	61	35	74	56	76	496		
		%	92	91	92	96	95	94	93		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
19	No	N	25	6	9	7	4	8	59	6.992	0.221
		%	12	9	24	9	7	10	11		
	Yes	N	185	61	29	70	55	73	473		
		%	88	91	76	91	93	90	89		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		
20	No	N	15	5	5	6	9	10	50	5.282	0.382
		%	7	7	13	8	15	12	9		
	Yes	N	195	62	33	71	50	71	482		
		%	93	93	87	92	85	88	91		
	Total	N	210	67	38	77	59	81	532		
		%	100	100	100	100	100	100	100		

anterior or posterior crossbite may cause serious growth problems such as asymmetry or anterior functional mandibular displacement that leads to class III, so regular visits to orthodontists at different stages such as primary and mixed dentition to manage the cases of crossbite, jaws' growth excess or deficiency, space regaining or maintaining is required (Q6).

One of the main factors causing malocclusion is genetics, especially in class III, class II division 2, and hypodontia. Students' positive response toward this question is high, just like the bad oral habits that cause proclination of upper anterior teeth, open bite, posterior crossbite,^{17,18} so managing such habits is mandatory (Q7 and Q8). Here, the role of the orthodontists and dental students in educating the

parents and even the teaching staff in the schools is important so as clarification for the etiology of different types of malocclusion and the risks of deferring the treatment that may lead to deleterious effects which may require surgical intervention in addition to the psychological trauma representing by bullying and teasing.^{19–21}

There are many arguments regarding early intervention to some types of malocclusions. Class III or instanding incisors can cause a functional shift asymmetrical growth, so early treatment is mandatory (Q9). On the other hand, class II division 1 can be postponed until the patients reach the maximum growth spurt to get a shorter treatment time and effective intervention.

In the present study, about 82 to 94% of the students were aware that the fixed orthodontic appliance might take a longer time in treatment and retention (Q10), in addition to the regular monthly visits throughout treatment (Q11), and this came in accordance with another Iraqi study,²² as Al-Attar et al confirmed that many orthodontists considered that the time of active orthodontic treatment is critical and long as they ratified that the orthodontic tooth movement is a biological process and its occurrence required time.

Generally, fixed orthodontic treatment takes about 1 year in simple nonextraction cases and may reach up to 3 years for complex and surgical cases. Students should be aware of this information as there are many myths of shorter treatment duration such as 6 months or more. Patients should visit their orthodontists regularly each 4 to 6 weeks to change the archwire, elastomeric chain, or activate closing loops. With the availability of self-ligating bracket systems and CuNiTi archwires, the intervals may reach 8 weeks.

Historically, orthodontics began with a nonextraction approach during the Edward Angle period. After detecting relapses in many cases, Tweed advocated the extraction of premolars to treat cases of class II or bimaxillary proclination. During the last couple of decades, the nonextraction approach was reintroduced by Damon and associates, so the cases were treated by expansion and arch development. Although there is a controversy about the second approach, dental extractions are still a significant decision in treating many cases. Dental students responded positively to the need for dental extraction in about 90% (Q12).

Fixed orthodontic appliance is considered a plaque retentive factor, so with poor oral hygiene, many problems may arise such as caries, white spot lesions, and gingivitis. Awareness of these problems is vital to educate the patients about those risks, this is apparent in the high-positive response of the students for Q13.

Placement of elastic separators, placement of initial archwire, activation of the closing loop, or changing the elastic chains may cause pain. This differs from patient to patient depending on the pain threshold. Patients should be aware that painkillers can be prescribed to reduce the pain.^{23,24} Protruding the archwire from the molar tubes can cause soft tissue irritation, so wax or flowable composite can relieve that problem—more than 90% of the students are aware of that problem (Q14).

During the past years, some arguments have been aroused to use some materials or methods to accelerate the orthodontic tooth movement. Vitamin D3, plasma-rich protein (PRP), and other materials have been tested to accelerate the movement and lessen the shorter treatment time. About 60% of the responses were positive toward the awareness about the methods of teeth movement acceleration (Q15 and Q16). About 61 to 78% of the students were aware of vitamin D3 and orthodontics. Vitamin D stimulates the alveolar bone remodeling to accelerate orthodontic tooth movement,²⁵ so vitamin D deficiency may slow down the rate of the movement of teeth under the effect of the orthodontic force.^{26,27} Moreover, Khamees et al²⁸ concluded that vitamin D deficiency would enhance both bone and cementum resorption and decrease their deposition after orthodontic treatment leading to replace after retention.

Teeth must be retained after active treatment; otherwise, relapse is inevitable. Retainers can be classified into removable and fixed types. Students had good knowledge of the types of these retainers (Q17).

Many cases of class III malocclusion with maxillary deficiency must be treated as early as maxillary central incisors get erupt. Awareness about such cases was good, with a high-positive response among students (Q18).

Fixed orthodontic appliances can treat not all cases. Some cases with severe skeletal malrelations in three planes of spaces need orthognathic surgery in addition to the conventional treatment. Students' awareness was also high in determining the complicated cases requiring orthognathic surgeries (Q19).

The students' awareness was positive toward the uses and advantages of elastics in orthodontics (Q20). In the majority of the cases, patients should wear elastics to correct some situations to get maximum intercuspation, close anterior open bite, etc. With the self-ligating bracket system, early light short elastics can be used in day 1 to get maximum effect during treatment. Nowadays with the accessibility for different smartphone applications, elastics, removable appliance, and retainer wearing remainders in the form of apps can help the patients to wear them regularly.^{29,30}

This study revealed no significant gender differences in all six universities shared in this questionnaire for 17 question answers only, but the remaining 3 questions showed significant gender differences (Q7, Q14, and Q19), which agree with Agrawal's study.¹¹ Furthermore, females have a higher level of awareness in most of the questions, and this agrees with Baswaraj et al's study¹²; this may be attributed to nature of females who want to be more attractive, so they tend to have a higher level of awareness about orthodontic therapy,⁹ in addition to the significant female sample size in the present study.

This subject is so important as it evaluated the academic integrity of education with regard to orthodontics. Dar and Khan³¹ evaluated the prevalence of academic lapses among medical students and found that it is a critical issue as wrong behavior or knowledge in the academic setting will result in an individual who pron to future indulgence.

The findings of the present study are interesting and may be used as standard for the national curriculum preparation and development committee to review the curriculum and information given to the students every year and adding the evidence-based information with regard to the treatment options and efficiency and using the videos that explain the subjects in addition to testing the information by national examination designed specifically for all students in different universities. Utilization the new technologies and adding subjects related to the digital orthodontics^{32,33} is mandatory in addition to achieving online examination in the lectures and clinics in order to test the understanding of the information given will improve the quality of the graduated students.

The limitation of this study was that not all Iraqi dental colleges participated in this study, although the number of the participants was above the calculated limit; so, to overcome this limitation in the future, a study that includes all Iraqi dental final year students is required. However, in future, including dental students in different years in such a survey is important to test their knowledge and awareness to orthodontics as many information in the social media platform and YouTube are not reliable.

Conclusion

The high and close level of awareness expressed by students' responses revealed the integrated education in basic orthodontic sciences in Iraqi dental colleges at different universities and applying the standard items of the curriculum by all senior lecturers. Both males and females had high awareness; however, females had higher with regard to pain and esthetics. Some questions that deal with topics about the acceleration of tooth movement and the relation between vitamin D3 and teeth movement showed variable awareness; hence, need more attention in the future years.

Data Availability

The manuscript provides a detailed and extensive explanation of all the gathered data. The corresponding author can provide this analysis' datasets upon reasonable request.

Authors' Contribution

Z.M.K., A.F.A.H., and M.N. designed the study. Z.M.K. and H.I.K. performed the research. Z.M.K. and M.N. analyzed the data. Z.M.K, H.I.K., and M.M.M wrote the manuscript. G.M., D.R., and M.C. contributed to editorial changes in the manuscript. All authors have read and approved the final manuscript.

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Conflict of Interest

None declared.

References

- 1 Harish A, Jakati SV, Khetal N, et al. Survey on awareness about orthodontic treatment in general population of Nagpur District. *Int J Adv Res* 2017;5(03):500–504
- 2 Bhullar MK, Nirola A. Malocclusion pattern in orthodontic patients. *Indian J Dent Sci* 2012;4(04):20–22
- 3 Bos A, Hoogstraten J, Prah-Andersen B. Expectations of treatment and satisfaction with dentofacial appearance in orthodontic patients. *Am J Orthod Dentofacial Orthop* 2003;123(02):127–132
- 4 Shaw WC. Factors influencing the desire for orthodontic treatment. *Eur J Orthod* 1981;3(03):151–162
- 5 Rafiqi A, Foroughi Moghaddam S, Alizadeh M, Sharifzadeh H. Awareness of orthodontic treatment among schoolteachers of two cities in Iran. *J Dent Res Dent Clin Dent Prospect* 2012;6(01): 25–28
- 6 Zotti F, Dalessandri D, Salgarello S, et al. Usefulness of an app in improving oral hygiene compliance in adolescent orthodontic patients. *Angle Orthod* 2016;86(01):101–107
- 7 Al Shahrani I, Kandyala R. Medical students' awareness of orthodontics: a cross sectional study in King Khalid University, Abha, Saudi Arabia. *Arch Orofac Sci* 2014;9(01):17–24
- 8 Al-Taweel FB, Abdulkareem AA, Gul SS, Alshami ML. Evaluation of technology-based learning by dental students during the pandemic outbreak of coronavirus disease 2019. *Eur J Dent Educ* 2021;25(01):183–190
- 9 Essamet M, Darout IA. Awareness and behavior related to orthodontic treatment among Jazan University students, Kingdom of Saudi Arabia. *J Dent Oral Hyg* 2016;8(03):12–17
- 10 Manikandan S, Sivakumar S, Prasanth KB. Knowledge and awareness of medical students on orthodontics: a cross sectional study. *Med-Leg Update* 2020;20(02):107–111
- 11 Agrawal R. Knowledge, attitude and perception of orthodontic treatment among dental students. *Inter J Dent Res* 2018;6(01):3–5
- 12 Baswaraj JK, Kumarswamy KM, Padmini MN, Chandralekha B, Shruthi DP. Dental students' perception of orthodontic treatment. *J Indian Assoc Public Health Dent* 2015;13(01):79–82
- 13 Siddegowda R, Rani MS. An epidemiological survey on awareness towards orthodontic treatment in south Indian school children. *Open J Dent Oral Med* 2013;1(01):5–8
- 14 Vallittu PK, Vallittu AS, Lassila VP. Dental aesthetics—a survey of attitudes in different groups of patients. *J Dent* 1996;24(05): 335–338
- 15 Rochat P. Five levels of self-awareness as they unfold early in life. *Conscious Cogn* 2003;12(04):717–731
- 16 Lanzetti J, Michienzi PD, Collura J, Sabatini S, Vilardi S, Deregibus A. Comparison of two electric toothbrushes: evaluation on orthodontic patients. *Minerva Dent Oral Sc* 2023;72(03):125–130
- 17 Rosa M, Quinzi V, Marzo G. Paediatric orthodontics part 1: anterior open bite in the mixed dentition. *Eur J Paediatr Dent* 2019;20(01):80–82
- 18 Al-kinane SM, Al-Dahan ZA. The effects of thumb sucking habit on the development of malocclusions in preschool age children in Hilla city. *J Bagh Coll Dent* 2019;31(03):44–49
- 19 Minervini G, Franco R, Marrapodi MM, Fiorillo L, Cervino G, Ciccù M. The association between parent education level, oral health, and oral-related sleep disturbance. An observational cross sectional study. *Eur J Paediatr Dent* 2023;24(03):218–223
- 20 Minervini G, Franco R, Marrapodi MM, Di Blasio M, Ronsivalle V, Ciccù M. Children oral health and parents education status: a cross sectional study. *BMC Oral Health* 2023;23(01):787
- 21 Morales-Salazar SA, Montegudo-Sangama JM, Arriola-Guillén LE. Influence of dentofacial characteristics on the appearance of self-reported bullying: a review. *Dent Med Probl* 2022;59(04): 657–661

- 22 Al-Attar AM, Al-Shaham S, Abid M. Perception of Iraqi orthodontists and patients toward accelerated orthodontics. *Inter J Dent* 2021;2021(12):1–7
- 23 Rafeeq RA, Saleem AI, Hassan AF, Nahidh M. Orthodontic pain (causes and current management) a review article. *Int Med J* 2020;25(03):1071–1080
- 24 Abdaljawwad AA, Al-Groosh DH. Effects of various analgesics on pain perception and rate of tooth movement: a randomized controlled clinical study. *J Bagh Coll Dentistry* 2022;34(02):37–51
- 25 Narmada IB, Husodo KR, Ardani IGAW, Rahmawati D. Effect of Vitamin D during orthodontic tooth movement on receptor activator of nuclear factor kappa- β ligand expression and osteoclast number in pregnant Wistar rat (*Rattus norvegicus*). *J Krishna Inst Med Sci Univ* 2019;8(01):37–42
- 26 McLaughlin L, Clarke L, Khalilidehkordi E, Butzkueven H, Taylor B, Broadley SA. Vitamin D for the treatment of multiple sclerosis: a meta-analysis. *J Neurol* 2018;265(12):2893–2905
- 27 Tehranchi A, Sadighnia A, Younessian F, Abdi AH, Shirvani A. Correlation of Vitamin D status and orthodontic-induced external apical root resorption. *Dent Res J (Isfahan)* 2017;14(06):403–411
- 28 Khamees AM, Al Groosh DH, Al-Rawi NH. Effects of vitamin D deficiency on bone and root resorption post-orthodontic retention in rats. *J Bagh Coll Dent* 2022;35(02):54–64
- 29 Vaid NR, Hansa I, Bichu Y. Smartphone applications used in orthodontics: a scoping review of scholarly literature. *J World Fed Orthod* 2020;9(3S):S67–S73
- 30 Ahmed HMA, Obaid DH, Kadhum HI, Nahidh M, Russo D, Herford AS, Ciccù M, Minervini G. Awareness of orthodontic patients towards smartphone orthodontic apps. *Minerva Dent Oral Sci* 2024;73(03):134–141
- 31 Dar UF, Khan YS. Self-reported academic misconduct among medical students: perception and prevalence. *ScientificWorld-Journal* 2021;2021:5580797
- 32 Romeo E, Scaringi R, Lops D, Palazzolo A. Single crown restorations supported by one-piece zirconia dental implants: case series with a mean follow-up of 58 months. *Prosthesis* 2023;5(04):1060–1074
- 33 D'Ambrosio F, Giordano F, Sangiovanni G, Di Palo MP, Amato M. Conventional versus digital dental impression techniques: what is the future? An umbrella review. *Prosthesis* 2023;5(03):851–875