



Investigating the desire of last year dental students towards conducting orthodontic treatments in their future profession

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ABSTRACT

Introduction: Orthodontics is a significant part of general dentistry education. Yet, many general dentistry graduates seldom practice orthodontics. This study assesses the desire of last-year dental students at Shahid Beheshti Dental School towards orthodontic treatments in their future career.

Materials and Methods: A questionnaire was validated by ten dental specialists. For reliability, it was re-administered to ten students after ten days. Descriptive statistics were used for results presentation. The Mann-Whitney test compared ranked responses, and the Kruskal-Wallis test compared grade point average (GPA) variations. The comparison of mean opinions based on age, gender, and academic term was conducted with the t-test independent samples and based on GPA status with a one-way ANOVA. Analyses were done using SPSS 25, with a significance level of 0.05.

Results: In this study, 58 last-year students were questioned in line with the research objectives. More than half of the students believe that the hours dedicated to teaching orthodontic courses at university are insufficient (65%), the quality of theoretical teaching is low (55%), practical teaching hours and presence in the department are inadequate (48%). Only 15 percent of students declared they have the necessary confidence to diagnose and conduct orthodontic treatments after graduation. About half of the students express an interest in attending supplementary orthodontics courses after graduation (39%).

Conclusion: According to approximately half of the students' opinions, the quality of teaching theoretical and conceptual orthodontics courses is low. Additionally, students lack the necessary confidence and desire to diagnose, plan, and perform treatments after graduation.

Keywords: Dental education; General dentistry; Orthodontics; Orthodontics education.

Introduction

Orthodontics is a specialized branch of dentistry, a portion of which is taught to general dental students during their undergraduate studies [1]. The instruction of orthodontics to general dentistry students is one of the most challenging parts of dental education, as it requires not only extensive theoretical teaching in limited class hours but also adequate practical training [2]. Orthodontic education in many general dentistry courses

is limited [3]. General dentists and specialists in fields other than orthodontics must have adequate knowledge about orthodontic treatments in order to diagnose patients' problems and make appropriate referrals [4]. Only a small percentage of general dentists regularly perform orthodontic treatments after graduation, and only about 60 percent of general dentistry graduates are comfortable with handling orthodontic emergencies [5].

Other studies have shown that most general dentists spend less than 10 percent of their time on orthodontic treatments. This figure has remained unchanged compared to previous studies, and it is predicted to remain stable in the future [6]. Despite this, some papers have stated that general dentistry students are satisfied with the university's orthodontic education and the materials taught, as well as clinical training [7]. On the other hand, some studies have shown that the level of knowledge of general dentists for preliminary diagnosis and treatment is not sufficient, and there is a need for a more organized and improved training program for general dentists [8].

In some countries, the national health system expects dentists to manage orthodontic emergencies regardless of their desire to perform orthodontic treatments. Orthodontic emergencies refer to unscheduled appointments made to address problems related to orthodontic appliances. According to studies conducted in the United States, the United Kingdom, and Poland, all graduates are capable of performing this task [9]. The purpose of this study is to investigate the desire of final-year dental students at Shahid Beheshti Dental School to perform orthodontic treatments in their future profession.

Materials and Methods

The present research was conducted in a cross-sectional and descriptive manner. The target population consisted of all 11th and 12th-semester students in the 2022-2023 academic year who have completed all orthodontics practical units and filled out the questionnaire.

Implementation Method

For validity, a specific form was designed and given to ten experts for evaluation. For reliability, the questionnaire was administered twice to ten students at a ten-day interval and was reviewed. All 11th and 12th-semester students who participated in the study and completed the questionnaire, descriptive reports of the questionnaire questions were performed in the form of frequency reports and percentages or mean and standard deviation.

Statistical Analysis

In terms of descriptive statistics, categorical data were presented as counts and percentages (%). While continuous variables were described using the mean, standard deviation (SD), and standard error (SE). Due to

the ranking nature of the questionnaire responses, the Mann-Whitney nonparametric test was used to compare their distribution at different levels and the Kruskal-Wallis test was used to compare the variable status of GPA. Therefore, the mean comparison of opinions based on gender, age, and academic semester levels was performed using the independent samples t-test, and based on GPA status using the one-way ANOVA test. The analyses were performed using SPSS 25 software, and a significance level of 0.05 was considered.

Ethical Considerations

Before enrollment in the study, written informed consent was obtained from all participants. The purpose of the study was explained to all research units and their written consent was obtained. The information of all patients will remain confidential with the project executor. All Helsinki research ethics statements and university medical sciences ethics committees are considered at all stages of research. The project was implemented after approval in the medical faculty's research council and obtaining the ethics code number and receiving the introduction letter.

Results

In this study, 58 students were questioned in line with the research objectives, and considering the rank of the answers to questions 1 to 27 of the questionnaire, the Mann-Whitney and Kruskal-Wallis tests were used to examine the relationship between the answers and the aforementioned independent variables. The Table 1 summarizes the findings from all questions in the orthodontic education feedback questionnaire. Regarding question 1 of the questionnaire about whether the theoretical teaching hours of orthodontics are sufficient or not, question 2 about whether the quality and method of teaching theoretical orthodontics at Shahid Beheshti University are desirable or not, and question 3 about whether the theoretical topics taught in orthodontics classes have provided me with the necessary knowledge and sufficient information to perform practical work or not, based on the results presented, none of these had any correlation to the variables (Table 2).

Also, concerning question 4 about whether I gained enough knowledge to guide and advise patients after attending theoretical orthodontics classes or not, question 5 about whether the practical teaching hours and presence in the orthodontics department are sufficient or not, question 6 about whether the quality and method of practical orthodontics teaching at Shahid Beheshti University are desirable or not, and question

7 about whether the number of orthodontic patients that I treated or followed up (follow-up) during my studies is sufficient for learning or not, based on the results presented, none of these had any correlation to the variables ($P\text{-value}>0.05$). Also, regarding question 8 about whether the practical teaching performed has created orthodontic treatment ability in me or not, based on the results presented, the distribution of participants' opinions on question 8 was only related to their academic term with a $P\text{-value}=0.006$, but had no correlation to other variables including age, gender, and GPA with a $P\text{-value}>0.05$.

Concerning question 9 about whether the practical and theoretical teaching of orthodontics has created the necessary belief and conviction for treating orthodontic patients in me or not, question 10 about whether performing and learning laboratory stages in the orthodontics department at the university is necessary or not, and question 11 about whether performing laboratory stages in the orthodontics department has been sufficient and has caused sufficient learning in me or not, based on the results presented, none of these had any correlation to the variables and the $P\text{-value}$ was >0.05 in all cases. Regarding question 12 of the questionnaire about the usefulness of following the usual tracing and case analysis steps in the orthodontics section for learning, the results showed a significant relation to the gender of the respondents ($P\text{-value}=0.039$), but it was independent of the other variables ($P\text{-value}>0.05$). The "strongly agree" and "agree" choices were more popular among females, while "strongly disagree" answer was more popular among males (Table 1 and Table 3).

Regarding question 13 about whether a general dentist should be able to treat orthodontic patients with phase one problems (phase one problems: preventive / removable / functional treatments performed by a general dentist) and problems with removable orthodontic appliances, the responses showed no significant relationship with any of the variables ($P\text{-value}>0.05$) in all cases (Table 4). In question 14, regarding whether the equipment and facilities at the university's orthodontics department are sufficient, no significant relationship with any of the variables was found ($P\text{-value}>0.05$) in all cases. Similarly, in question 15 about whether or not the respondents are generally interested in performing orthodontic treatments, no significant relationship with any of the variables was found ($P\text{-value}>0.05$) in all cases (Table 5). Regarding question 16 about whether or not they like treating children and teenagers and question 17 about whether a general dentist should be able to diagnose initial orthodontic

problems and manage preventive treatments effectively, no significant relationship with any of the variables was found ($P\text{-value}>0.05$) in all cases. In question 18, about whether performing orthodontic treatments as a general dentist (with general fees) has economic attractiveness, the responses were related to their age but not to the other three variables. Based on these results, older students were more likely to choose "disagree" and "strongly disagree" as their responses. In question 19, about whether orthodontic treatments are difficult due to the need for numerous visits with each patient, and question 20, about whether orthodontic treatments are difficult due to the challenging diagnosis and treatment plans, no significant relationship with any of the variables was found ($P\text{-value}>0.05$) in all cases.

In question 21, about whether or not the respondents are interested in performing orthodontic treatments due to their lengthy duration, the responses were significantly related to age and term, but not to gender and average grade. According to the results, younger respondents and those in term 11 were less interested in performing orthodontic treatments due to their lengthy duration, but in older respondents and those in term 12, the length of orthodontic treatments was not a deterrent from their interest in performing these treatments.

In question 22, about whether the respondents will perform orthodontic treatments for their patients after graduation, no significant relationship with any of the variables was found ($P\text{-value}>0.05$) in all cases (Table 6). Regarding question 23, about whether or not I perform emergency orthodontic treatments for my patients after graduation, and also about question 24 about whether or not I have complete confidence in the final result of orthodontic treatment. Also, question 25 about whether I have the necessary self-confidence to diagnose orthodontic treatment after graduation, and question 26 about whether I would like to participate in additional orthodontic courses after graduation, the results indicated no significant relation to any of the variables for these questions and the $P\text{-value}$ was >0.05 in all cases. Regarding question 27, about whether or not I would like to perform these treatments after graduation if there is a professor or system to support me during the treatment process of orthodontic patients, according to the results presented in the distribution of participants' opinions, this was only related to their age but was independent of other variables. Based on the results, older students were more likely to choose "disagree" and "strongly disagree" as their responses.

In order to determine the total score of the questionnaire regarding the students' willingness to perform orthodontic treatment, the scores of different questions were added together and the scale of scores was converted to a 0 to 100 scale. The mean total score was 55.22 with a standard deviation of 10.06. The minimum score was 28.70 and the maximum observed was 87.04. Considering the normal distribution of data by different levels of age groups, gender, term, and GPA, using the Shapiro-Wilk test ($P > 0.05$) in all nine cases

including two age groups, two gender groups, two term groups, and three GPA groups, parametric tests such as T-test and one-way ANOVA were used to examine the relationship between the total questionnaire score and these variables. Table 7 shows the statistical indicators of the questionnaire scores according to these variables. Based on the results, the total questionnaire score was not related to any of the independent variables of age group, gender, term (using an independent T-test), and GPA (using one-way ANOVA).

Table 1. Summary of orthodontic education feedback questionnaire findings.

Question Number	Question Topic	Answers				
		Strongly agree	Agree	No opinion	Disagree	Strongly disagree
1	Adequacy of Orthodontic Theory Teaching Hours	0	9 (15.5%)	11 (19%)	26 (44.8%)	12 (20.7%)
2	Adequate Quality of Orthodontic Theory Teaching	3 (5.2%)	11 (19%)	12 (20.7%)	27 (46.6%)	5 (8.6%)
3	Adequate Relevance of Theoretical Topics	16 (27.6%)	17 (29.3%)	11 (19%)	13 (22.4%)	1 (1.7%)
4	Adequate Confidence Post Theoretical Classes	9 (15.5%)	19 (32.8%)	11 (19%)	18 (31%)	1 (1.7%)
5	Adequacy of Practical Teaching Hours	3 (5.2%)	15 (25.9%)	12 (20.7%)	23 (39.7%)	5 (8.6%)
6	Adequacy of Practical Orthodontic Teaching	2 (3.4%)	17 (29.3%)	13 (22.4%)	22 (37.9%)	4 (6.9%)
7	Adequate Patient Exposure	16 (27.6%)	21 (36.2%)	10 (17.2%)	9 (15.5%)	2 (3.4%)
8	Adequate Practical Teaching Efficacy	16 (27.6%)	24 (41.4%)	11 (19%)	6 (10.3%)	1 (1.7%)
9	Adequate Confidence from Orthodontic Teaching	9 (15.5%)	20 (34.5%)	15 (25.9%)	11 (19%)	3 (5.2%)
10	Adequacy of Laboratory Learning	13 (22.4%)	15 (25.9%)	15 (25.9%)	13 (22.4%)	2 (3.4%)
11	Adequate Efficacy of Laboratory Learning	7 (12.1%)	16 (27.6%)	15 (25.9%)	17 (29.3%)	3 (5.2%)
12	Benefit of Tracing and Analysis	1 (1.7%)	6 (10.3%)	12 (20.7%)	27 (46.6%)	12 (20.7%)
13	Adequate General Dentist's Role	0	4 (6.9%)	6 (10.3%)	25 (43.1%)	23 (39.7%)
14	Adequacy of University Equipment	5 (8.6%)	6 (10.3%)	13 (22.4%)	26 (44.8%)	8 (13.8%)
15	Adequate Interest in Orthodontic Treatments	6 (10.3%)	6 (10.3%)	11 (19%)	22 (37.9%)	13 (22.4%)
16	Adequate Treating Young Patients	5 (8.6%)	11 (19%)	7 (12.1%)	24 (41.4%)	11 (19%)
17	Adequate General Dentist's Diagnostic Role	0	1 (1.7%)	4 (6.9%)	29 (50%)	24 (41.4%)
18	Adequate Economic Attractiveness	4 (6.9%)	15 (25.9%)	21 (36.2%)	12 (20.7%)	6 (10.3%)
19	Adequate Complexity Due to Multiple Sessions	3 (5.2%)	14 (24.1%)	5 (8.6%)	27 (46.6%)	9 (15.5%)
20	Adequate Complexity Due to Diagnosis and Planning	3 (5.2%)	16 (27.6%)	6 (10.3%)	23 (39.7%)	10 (17.2%)
21	Disinterest Due to Treatment Length	10 (17.2%)	16 (27.6%)	12 (20.7%)	15 (25.9%)	5 (8.6%)
22	Adequate Post-Graduation Treatment Intent	10 (17.2%)	15 (25.9%)	17 (29.3%)	12 (20.7%)	4 (6.9%)

Question Number	Question Topic	Answers				
		Strongly agree	Agree	No opinion	Disagree	Strongly disagree
23	Adequate Emergency Orthodontic Treatments Post-Graduation	8 (13.8%)	16 (27.6%)	13 (22.4%)	16 (27.6%)	5 (8.6%)
24	Adequate Confidence in Treatment Outcome	1 (1.7%)	6 (10.3%)	12 (20.7%)	29 (50%)	10 (17.2%)
25	Adequate Confidence in Diagnosis Post-Graduation	2 (3.4%)	9 (15.5%)	8 (13.8%)	25 (43.1%)	14 (24.1%)
26	Adequate Interest in Post-Graduate Courses	6 (10.3%)	13 (22.4%)	16 (27.6%)	14 (24.1%)	9 (15.5%)
27	Adequate Support System for Treatments	0	6 (10.3%)	4 (6.9%)	24 (41.4%)	24 (41.4%)

Table 2. Distribution of scores for Question 3 based on different levels of age groups, gender, term, and GPA.

Question 3	Age Group	Age Group	Gender	Gender	Term 11	Term 12	GPA	GPA	GPA
	22-24	25-27	Male	Female			14-16	16-17	17-20
Strongly agree	12 (24%)	4 (50%)	6 (22.2%)	10 (32.3%)	6 (18.8%)	10 (38.5%)	1 (10%)	6 (27.3%)	9 (34.6%)
Agree	17 (34%)	0 (0%)	7 (25.9%)	10 (32.3%)	12 (37.5%)	5 (19.2%)	6 (60%)	5 (22.7%)	6 (23.1%)
No opinion	8 (16%)	3 (37.5%)	6 (22.2%)	5 (16.1%)	4 (12.5%)	7 (26.9%)	2 (20%)	4 (18.2%)	5 (19.2%)
Disagree	12 (24%)	1 (12.5%)	7 (25.9%)	6 (19.4%)	9 (28.1%)	4 (15.4%)	1 (10%)	7 (31.8%)	5 (19.2%)
Strongly disagree	1 (2%)	0 (0%)	1 (3.7%)	0 (0%)	1 (3.1%)	0 (0%)	0 (0%)	0 (0%)	1 (3.8%)
P-value	0.457		0.206		0.196		0.8		

Table 3. Distribution of Question 12 scores according to different levels of age groups, gender, term, and GPA.

Question 12	Age Group	Age Group	Gender	Gender	Term 11	Term 12	GPA	GPA	GPA
	22-24	25-27	Male	Female			14-16	16-17	17-20
Strongly agree	1 (2%)	0 (0%)	0 (0%)	1 (3.2%)	1 (3.1%)	0 (0%)	0 (0%)	0 (0%)	1 (1.7%)
Agree	6 (12%)	0 (0%)	1 (3.7%)	5 (16.1%)	4 (12.5%)	2 (7.7%)	1 (10%)	1 (4.5%)	4 (15.4%)
No opinion	9 (18%)	3 (37.5%)	6 (22.2%)	6 (19.4%)	7 (21.9%)	5 (19.2%)	3 (30%)	6 (27.3%)	3 (11.5%)
Disagree	24 (48%)	3 (25%)	11 (40.7%)	16 (51.6%)	15 (46.9%)	12 (46.2%)	5 (50%)	8 (36.4%)	14 (53.8%)
Strongly disagree	10 (20%)	2 (25%)	9 (33.3%)	3 (9.7%)	5 (15.6%)	7 (26.9%)	1 (10%)	7 (31.8%)	4 (15.4%)
P-value	0.851		0.039		0.224		0.484		

Table 4. Distribution of Question 13 scores according to different levels of age groups, gender, term, and GPA.

Question 13	Age Group	Age Group	Gender	Gender	Term 11	Term 12	GPA	GPA	GPA
	22-24	25-27	Male	Female			14-16	16-17	17-20
Strongly agree	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Agree	3 (6%)	1 (12.2%)	2 (7.4%)	2 (6.5%)	2 (6.3%)	2 (7.7%)	0 (0%)	2 (9.1%)	2 (7.7%)
No opinion	6 (12%)	0 (0%)	5 (18.5%)	1 (3.2%)	6 (18.8%)	0 (0%)	2 (20%)	3 (13.6%)	1 (3.8%)
Disagree	24 (48%)	1 (12.5%)	7 (25.9%)	18 (58.1%)	14 (43.8%)	11 (42.3%)	7 (70%)	9 (40.9%)	9 (34.6%)
Strongly disagree	17 (34%)	6 (75%)	13 (48.1%)	10 (32.3%)	10 (31.3%)	13 (50%)	1 (10%)	8 (36.4%)	14 (53.8%)
P-value	0.108		0.762		0.085		0.115		

Table 5. Distribution of Question 15 scores according to different levels of age groups, gender, term, and GPA.

Question	Age Group	Age Group	Gender	Gender	Term 11	Term 12	GPA	GPA	GPA
15	22-24	25-27	Male	Female			14-16	16-17	17-20
Strongly agree	5 (10%)	1 (12.5%)	2 (7.4%)	4 (12.9%)	3 (9.4%)	3 (11.5%)	0 (0%)	3 (13.6%)	3 (11.5%)
Agree	6 (12%)	0 (0%)	2 (7.4%)	4 (12.9%)	4 (1.5%)	2 (7.7%)	2 (20%)	3 (13.6%)	1 (3.8%)
No opinion	11 (22%)	0 (0%)	7 (25.9%)	4 (12.9%)	10 (31.3%)	1 (3.8%)	3 (30%)	4 (18.2%)	4 (15.4%)
Disagree	17 (34%)	5 (62.5%)	6 (22.2%)	16 (51.6%)	7 (21.9%)	15 (57.7%)	5 (50%)	6 (27.3%)	11 (42.3%)
Strongly disagree	11 (22%)	2 (25%)	10 (37%)	3 (9.7%)	8 (25%)	5 (19.2%)	0 (0%)	6 (27.3%)	7 (26.9%)
P-value	0.333		0.181		0.346		0.433		

Table 6. Distribution of Question 22 scores according to different levels of age groups, gender, term, and GPA.

Question	Age Group	Age Group	Gender	Gender	Term 11	Term 12	GPA	GPA	GPA
22	22-24	25-27	Male	Female			14-16	16-17	17-20
Strongly agree	8 (16%)	2 (25%)	5 (18.5%)	5 (16.1%)	4 (12.5%)	6 (23.1%)	0 (0%)	6 (27.3%)	4 (15.4%)
Agree	14 (28%)	1 (12.5%)	5 (18.5%)	10 (32.3%)	10 (31.3%)	5 (19.2%)	5 (50%)	6 (27.3%)	4 (15.4%)
No opinion	16 (32%)	1 (12.5%)	10 (37%)	7 (22.6%)	10 (31.3%)	7 (26.9%)	4 (40%)	6 (27.3%)	7 (26.9%)
Disagree	8 (16%)	4 (50%)	3 (11.1%)	9 (29%)	5 (15.6%)	7 (26.9%)	0 (0%)	3 (13.6%)	9 (34.6%)
Strongly disagree	4 (8%)	0 (0%)	4 (14.8%)	0 (0%)	3 (9.4%)	1 (3.8%)	1 (10%)	1 (4.5%)	2 (7.7%)
P-value	0.650		0.602		0.872		0.158		

Table 7. Statistical indices of the total score variable of the questionnaire based on different levels of age group, gender, term, and GPA.

Variable	Levels	Number	Mean	SD	SE	P-value
Gender	Male	27	56.99	11.43	2.20	0.213
	Female	31	53.67	8.58	1.54	
Term	11th	32	55.81	11.56	2.04	0.621
	12th	26	54.48	8.01	1.57	
Grade point average (GPA)	14-16	10	52.50	8.25	2.61	0.617
	16-17	22	55.26	8.32	1.77	
	17-20	26	56.23	12.00	2.35	

Discussion

This study's findings reveal that a majority of last-year students are critical of the orthodontic curriculum at the university. Specifically, they feel that the teaching hours for orthodontic courses are inadequate, the quality of theoretical instruction is subpar, and practical teaching hours, along with departmental engagement, are lacking. While they acknowledge sufficient patient exposure, they believe the current teaching methods don't adequately prepare them for orthodontic procedures or instill the necessary confidence. The perceived

non-beneficial nature of laboratory stages and related analyses, combined with a belief that general dentists shouldn't necessarily provide orthodontic treatments, further underscores their reservations. Additionally, many students highlighted the insufficiency of the faculty's equipment and facilities. There's a prevalent disinterest in performing orthodontic treatments, especially for younger patients, and a sentiment that general dentists shouldn't be tasked with diagnosing primary orthodontic issues. The complexity and extended duration of orthodontic treatments further deter many

from considering this specialty. Over a third expressed they wouldn't undertake any orthodontic procedures post-graduation, including emergencies. Only 15% felt confident in their post-graduate orthodontic capabilities. Interestingly, about half are open to further orthodontic courses post-graduation, and less than 10% would consider practicing orthodontics with adequate faculty support. In a study that Al-Nosairi conducted on 1716 participants in Saudi Arabia, similar results showed a difference in knowledge and attitudes among general practitioners and dental specialists [10]. This in turn intensifies the need to provide precise basic principles of orthodontics in the general dental course compared to other precise training on making some devices. These graduates need to understand the system of initial diagnosis and referral with more details for the overall welfare of the patient. Based on similar studies that have been conducted, many of these studies support this reality that dental graduates lack sufficient knowledge of the basic concept of malocclusion. Even with non-orthodontic specialties, although better than general dentists, it can be improved more by organizing seminars and multidisciplinary associations while they are studying in their postgraduate faculties.

According to another study conducted in Ireland in which a survey was conducted among dentists about orthodontic education at the general level and the extent of its use in their practice. The results showed a contradiction with the present study as the knowledge showed that understanding similar orthodontic concepts, 54 percent positively responded to academic knowledge. About 60 percent of them said they could handle orthodontic emergencies. And 70 percent wished to study in this field [11-14]. In another study, twenty-nine orthodontic program directors completed a survey. In some dental schools, orthodontics is offered to students in the first year. However, most schools provide the bulk of orthodontic instruction in the third year. The number of curriculum hours devoted to orthodontic education in the years preceding the doctorate varies greatly between schools. Less than half (31.25 percent) of the responsive programs require patient orthodontic treatment by students. These results suggest that there is, in fact, a great deal of variation in teaching methods, curriculum content, and evaluation methods in pre-doctoral orthodontic programs [15]. In comparison to our findings, they have highlighted a significant variation in teaching methods, curriculum content, and evaluation approaches across orthodontic programs. While their study emphasized the varied timing and curriculum hours devoted to

orthodontic education, our research particularly underscored the last-year students' perspectives on the sufficiency and quality of both theoretical and practical orthodontic teachings at the university. Additionally, our study delved deeper into the correlation of various independent variables with the students' feedback, an aspect not prominently covered in the aforementioned study. In another study examining students' confidence and desire to perform orthodontic treatments, it was found that only one-third of the 69 participating students had the ability, confidence, and desire to perform these treatments [16]. Also, according to another survey conducted in British dental schools, it was found that the focus of orthodontic teaching in these schools was more diagnosis-oriented and emphasized on diagnosing and finding malocclusions, with general students having very little participation in patient treatment [17]. In comparison to our findings, these studies have similarly highlighted students' hesitancy and lack of confidence in performing orthodontic treatments. While one study reported that only a third of the participants felt equipped and confident to undertake these procedures, our results indicated varying levels of confidence among students, especially in relation to specific orthodontic tasks. Furthermore, the emphasis on diagnosis-oriented teaching in British dental schools, contrasts with the broader curriculum at Shahid Beheshti University, where both theoretical and practical aspects of orthodontics are covered, albeit with some students expressing concerns about the sufficiency of practical exposure.

The current study is just the first step towards a larger question. The ultimate goal is to ensure that dental graduates have enough knowledge to timely refer these cases to an orthodontic specialist. However, the limitation of this research was its geographic coverage and sample as a suitable sample. More studies done on this matter would strengthen the findings and help in better evidence-based conclusion drawing. Orthodontics holds a unique place in dentistry, as although it is taught theoretically and practically throughout the general course, after graduation, a significant portion of dentists refer all malocclusions for care to a specialist, including the simplest orthodontic problems that could be corrected by simple mobile devices. The free displacement of dentists implies that ideally, knowledge and skills in general programs should be equal. Harzer and Oliver [7] have shown diversity in format and time available for orthodontic education in the general curriculum at 44 schools in 23 countries across Europe. The number of curriculum hours devoted to clinical

orthodontics ranges from 20 to 1540 hours with an average of 173.4 hours and a standard deviation of 269.5 hours. However, removing unrelated cases and integrated orthodontic and pediatric dentistry programs brings these figures to a minimum of 20 hours and a maximum of 360 hours with an average of 112 hours. The time of entry into clinics varies. Some schools also allocate several hours of curriculum time to learning to make orthodontic appliances in the laboratory and cephalometric analysis [7,15,18].

Orthodontics is one of several disciplines designed in a busy curriculum, with limited opportunities for general students to understand the theoretical and practical principles of orthodontics. Achieving a balance between theoretical, laboratory, and clinical time for comprehensive understanding of orthodontics is important. However, the value of spending several hours in the lab to make orthodontic appliances should be questioned. Although this activity might aid in eye-hand coordination, it is unlikely that a dentist will again utilize these skills after graduation unless he/she chooses to specialize in orthodontics. The time might be better spent on quality control (identifying well- and poorly-made orthodontic appliances or how to write appropriate referral letters). Similarly, teaching cephalometric analysis skills to general students has little value, as it's not an activity they'll perform in practice. This time could be better spent on understanding cephalometric values concepts. Moreover, in the future, computer packages may automatically generate cephalometric analyses without the need to identify landmarks [19-21].

A written curriculum is valuable for both staff and students to map out the topics covered during the program. This usually includes the theoretical and lab parts of the program and is predictable in terms of content and time. The clinical aspects of the program usually have a high level of unpredictability, unless the clinical experience of general students is highly structured. Allowing students to see an unscreened sample of patients, while providing an opportunity to encounter any orthodontic problem, limits their opportunity for practical involvement in orthodontic management. Orthodontics, unlike other fields where interventions such as restorations or extractions are completed in one or few visits, requires a long period of time [22-24]. The answer to whether students need more or less clinical experience can only be found if the purpose of such experience is initially clarified, and the faculty can ensure its fairness for all students. Therefore, it's possible that reviewing relevant cases may provide

more knowledge to the student than spending time on clinical treatment. Assisting students in learning can be achieved in various ways [15,18,25-27]. Professors need to understand the different learning approaches that may be adopted by students. Professors might also influence the learning environment by managing the structure of the curriculum, using different teaching methods, and modifying their teaching approach. By providing written objectives and learning outcomes, they can ensure that students clearly understand what is expected of them [28-30].

Conclusion

Based on the results of this research and according to approximately half of the students' opinions, the quality of teaching theoretical and conceptual courses of orthodontics at Shahid Beheshti Dental School is low. Furthermore, students do not have the necessary desire and self-confidence for diagnosis, treatment planning, and performing treatments after graduation. Additionally, students' age, GPA, and gender have no correlation with their level of desire.

Conflict of Interest

There is no conflict of interest to declare.

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