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# Orthodontic curriculum in Saudi Arabia: Faculty members' perception of clinical learning outcomes

Talat Hasan Al-Gunaid<sup>1,2</sup>, Rawah Talal Eshky<sup>3</sup> and Ahmed Abdulkarem Alnazzawi<sup>4</sup>

## Abstract:

**OBJECTIVES:** This study aimed to assess the perception of orthodontic staff members around clinical learning outcomes (LOs) of the undergraduate orthodontic curriculum with a focus on dental schools in Saudi Arabia.

**MATERIALS AND METHODS:** Twenty-three LOs were formulated, all of which were associated with skills required in the undergraduate orthodontics course. Orthodontic staff members were invited to provide their opinion regarding the curriculum using a Likert scale, whereby participants could answer each question on a scale from "Strongly Agree" to "Strongly Disagree."

**RESULTS:** Sixty-one teaching staff members agreed to partake in this study. The highest level of agreement among the participants pertained to conducting systematic orthodontic intraoral and extraoral examinations (100%), followed by explaining causes for space loss (98.3%). The lowest level of agreement was regarding executing a treatment plan for non-skeletal cases (62.2%) followed by skills of fabrication and activation of removable appliances (77%). Around 67.1% of the academics refused to allow dental students to select and bond orthodontic brackets.

**CONCLUSION:** It is time to amalgamate the objectives and create a unified national list of LOs for all orthodontic curriculums across the country without any distinction of knowledge or skills required at the undergraduate level.

## Keywords:

Curriculum, Saudi Arabia, undergraduate orthodontics

## Introduction

It is well-known that education serves as the foundation for professional advancement.<sup>[1]</sup> The aim of all dental colleges around the world is almost identical: To provide the community with highly qualified and trained dentists. This target cannot be achieved without a well-constructed curriculum, good teaching methods, and outstanding teaching staff. However, variations between national, regional, and international dental colleges do exist in curriculum structures.<sup>[2]</sup> One way in which to reduce the discrepancies between these dental curriculums, and to approximate

the level of dental graduates, is to compare one college curriculum to another through a process called benchmarking.<sup>[1]</sup>

Dental education in Saudi Arabia began in 1976 with the opening of the first dental college at King Saud University, followed by the College of Dentistry at King Abdulaziz University in 1985.<sup>[3]</sup> However, in the last two decades, dental education in the Kingdom has undergone a drastic change. This is largely characterized by the establishment of many new universities across the country and its different regions resulting in 28 dental schools being opened (19 public schools and 9 private schools).

In the past 10 years, most, if not all, dental colleges in Saudi Arabia have been involved

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<sup>1</sup>Department of Pediatric Dentistry and Orthodontics, College of Dentistry, Taibah University, <sup>3</sup>Department of Pediatric Dentistry and Orthodontics, College of Dentistry, Taibah University, <sup>4</sup>Department of Substitutive Dental Sciences, Associate Professor and Dean, College of Dentistry, Taibah University, Madinah, <sup>2</sup>Department of Orthodontics, Faculty of Dentistry, Ibb University, Ibb City, Yemen, Saudi Arabia

## Address for correspondence:

Dr. Talat Hasan Al-Gunaid,  
Department of Pediatric Dentistry and Orthodontics, College of Dentistry, Taibah University, Madinah, Saudi Arabia.  
E-mail: gunaid2000@hotmail.com

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in the academic accreditation process under the supervision of the Saudi National Commission for Academic Accreditation and Assessment (NCAAA). The NCAAA was established to determine the standards and criteria for academic accreditation and assessment, as well as for accrediting higher institutions and the programs that they offer. However, little is being done to close the gap between the parameters of LOs in dental education.<sup>[1]</sup>

Some teachers believe that undergraduate dental students should only be taught the basics of orthodontic science,<sup>[4]</sup> while others place stress on providing students with a sound theoretical background and practical skills.<sup>[5]</sup> Undergraduate orthodontic education can vary widely across the globe, and even between universities in the same country. This has clear consequences for the quality and competencies of graduating dentists, such as the total course duration, as well as selection and admission to postgraduate orthodontics courses. The concept, scope, and type of clinical activities can vary between dental institutes, and there is a lack of general agreement between colleges. This results in graduates with differing skill set managing orthodontic patients when entering clinical practice, both in orthodontic technique and in treatment planning for common orthodontic malocclusions. Different forms of collaboration need to be promoted including visiting professors, external examiners, student interchange programs during summer, and research partnerships. The question, however, is whether this type of orthodontic education is appropriate for students who are being educated to practice dentistry in today's general dental service.

The objective of this study was to assess the perception of orthodontic staff members around clinical LOs of the undergraduate orthodontic curriculum at Saudi Arabian dental schools. In turn, this should help to develop a consensus among staff members regarding the optimal contents of orthodontic courses.

## Materials and Methods

A cross-sectional observational study was conducted. Ethical clearance was obtained from the ethical committee, College of Dentistry, Taibah University (N: UCDREC/20191020/THGunaid).

The questionnaire was based on that used by Bashir *et al.*<sup>[6]</sup> with adjustment in the questions to fit our aims. Using the Google Forms questionnaire template, 23 LOs were formulated, all of which were associated with skills required in the undergraduate orthodontics course. A link to the questionnaire was sent to the staff members of different Saudi dental colleges via WhatsApp messages, e-mails, or through the Dean's

Council WhatsApp group. The questionnaire consisted of three parts. The first part included demographic data such as the name of the university, education, years of teaching experience, while the second part was an evaluation of the participants' perceptions toward the orthodontic curriculum. The final part asked about the skills that undergraduate students should or should not be allowed to perform. The orthodontic staff members were invited to give their opinion about the curriculum using a Likert scale, whereby participants could answer each question on a scale from "Strongly Agree" to "Strongly Disagree." Later, "Strongly Disagree," "Disagree," and "Neutral" were combined as one set and labeled as having no consensus, while "Strongly Agree" and "Agree" were grouped as the consensus. An explanation of the purpose of the study and the research procedures were also included.

## Statistical methods

Descriptive statistics for all variables were determined. All statistical analyses were performed using the SPSS software (version 20, SPSS, IBM Corporation, USA).

## Results

### Staff members' characteristics

Eighteen out of 28 dental colleges responded (16 governmental, 2 private colleges) and 61 teaching staff members agreed to participate in the study. Most of the teaching staff held a PhD degree (40.9%), while 29.5% had a board's certificate. Approximately 59% were assistant professors and 19.6% were associate professors. At the time of the study, 47.5% of the teaching staff had less than 5 years of teaching experience, followed by 6–10 years (21.3%). Only 3.2% had an experience of more than 20 years [Table 1].

### Perception of LOs regarding treatment planning

Table 2 shows that participants agreed on all 17 LOs. The ability to conduct systematic orthodontic intra- and extraoral examination had the highest level of agreement (100%), followed by the skill of explaining causes for space loss (98.3%). In contrast, the skill of executing a treatment plan for a case with non-skeletal involvement showed the lowest level of agreement across participants (62.2%), followed by design, insertion, adjustment, and activation of simple removable appliances (77%).

### Perception of clinical skills that students should or should not perform

Table 3 outlines LOs related to skills that undergraduate students should or should not perform. In this section, five out of six skills were chosen, with the skill of managing emergencies in fixed orthodontics showing the highest consensus (80.2%). In contrast, participants

**Table 1: Demographic data of participants**

Variable	Participants (n=61)
University	
Al Jouf University	2 (3.2%)
Ibn Sina University	2 (3.2%)
Jazan University	4 (6.5%)
King Abdulaziz University	5 (8.1%)
King Khalid University	4 (6.5%)
King Saud bin Abdulaziz University for Health Sciences	2 (3.2%)
King Saud University	8 (13.1%)
Princess Nora bint Abdul Rahman University	1 (1.6%)
Riyadh Elm University	4 (6.5%)
Taibah University	6 (9.8%)
Taif University	2 (3.2%)
University of Hail	3 (4.9%)
Umm Al-Qura University	3 (4.9%)
Najran University	3 (4.9%)
Qassim University	2 (3.2%)
Prince Sattam bin Abdulaziz University	7 (11.4%)
Al Baha University	1 (1.6%)
King Faisal University	2 (3.2%)
Highest Qualification	
PhD	25 (40.9%)
Master	15 (24.5%)
Board	18 (29.5%)
Fellowship	3 (4.9%)
Academic ranking	
Professor	6 (9.8%)
Associate Professor	12 (19.6%)
Assistant Professor	36 (59%)
Lecturer	7 (11.4%)
Experience (years)	
<5 years	29 (47.5%)
6-10 years	13 (21.3%)
11-15 years	8 (13.1%)
16-20 years	9 (14.7%)
More than 20 years	2 (3.2%)

did not seem to agree to a high extent on handling cases with crowding (54%), treatment of simple orthodontic cases using removable appliances (60.6%), and academics refusing to allow dental students to select and bond brackets (67.1%).

## Discussion

According to many experts, the ultimate dental education is an integration process of knowledge, skills, and principles into clinical proficiencies. It is a dynamic process that involves aspects of the curriculum, clinical training, assessment, and evaluation. All of these require continuous follow-up and constant revision to be kept relevant.<sup>[3]</sup> This is achieved by performing comprehensive analyses, updating and developing the curriculum, and providing the community with highly qualified graduates.<sup>[7,8]</sup> Dental education not only aims to provide students with clinical training but also to

prepare them for future challenges, give them the ability to develop a full view of each patient, enhance the oral health of patients and improve teamwork skills.<sup>[9]</sup> This study has endeavored to provide readers with insights into the undergraduate orthodontic curriculum in Saudi Arabia. Across the country, orthodontic courses are almost identical and are taught in the final 2 years of the dental program (usually in the fifth and sixth years). These courses consist of preclinical work which mainly focuses on lab skills, as well as clinical orthodontics, in which students receive training on recognition, assessment, conducting a clinical examination, reaching a diagnosis, and treatment planning. However, students are not usually permitted to treat patients, even through the use of removable orthodontic appliances. This differs from schools in some other parts of the world, where dental students are allowed to treat cases with removable, and even fixed, appliances.<sup>[10]</sup>

In this study, it was found that the majority of orthodontic teaching staff members in Saudi Arabia hold a doctoral degree (40.9%), followed by a board's degree (29.5%). This could be due to the current regulations adopted by the Saudi Arabian universities, which require any new member who wishes to be appointed assistant professor to have either a doctoral degree or a master's degree plus a board certificate. With that said, more than half of the teaching staff were assistant professors (the first ranking academic degree in the Saudi higher educational system). This may be because most of these positions were occupied by non-Saudi teaching staff members for a long period of time, and now, many Saudis are returning to the country after studying abroad and becoming involved in the teaching process. In support of this, 47.5% of the teaching staff in this study had less than 5 years of teaching experience.

The questionnaire revealed that all teaching staff was in complete agreement (100%) that students should have the basic knowledge and skills involved in performing systematic orthodontic intraoral and extraoral examinations. This is similar to the findings reported by Bashir for Pakistani teaching staff.<sup>[6]</sup> In the United States of America, undergraduate dental students were surveyed to assess their ability to identify malocclusions and test their diagnostic skills. The research concluded that 4 years of undergraduate education did not enhance the orthodontic diagnostic abilities of the students.<sup>[11]</sup>

Over 98.3% of the staff members agreed that students should have the ability to explain causes for space loss. Most participants seemed to recognize that future graduates need to be equipped with this knowledge to prevent the consequences of space loss and development of malocclusion. On the other hand,

**Table 2: Perception on learning outcomes regarding treatment planning (n: 61)**

Variable	n (%)					Consensus	
	Strongly Agree	Agree	Disagree	Strongly Disagree	Neutral	Yes	No
Take a detailed and systematic orthodontic history	40 (65.5)	16 (26.2)	4 (6.5)	0	1 (1.6)	91.7	....
Perform a systematic orthodontic intra and extra oral examination	49 (80.3)	12 (19.7)	0	0	0	100	....
Perform a mixed dentition space analysis	33 (54)	24 (39.3)	3 (4.9)	0	1 (1.6)	93.3	....
Perform permanent dentition space analysis and Bolton analysis	30 (49.1)	26 (42.6)	1 (1.6)	0	4 (6.5)	91.7	....
Identify and analyze anatomic landmarks in cephalometric radiographs and assess the patients' profile and facial esthetics	34 (55.7)	22 (36)	4 (6.5)	1 (1.6)	0	91.7	....
Describe basic problems faced by an orthodontic patient in three planes of space	32 (52.4)	24 (39.3)	0	0	5 (8.1)	91.7	....
Develop a problem list and treatment plan (by using history, clinical examination, cephalographs, OPG, study casts, photographs)	32 (52.4)	21 (34.4)	3 (4.9)	3 (4.9)	2 (3.2)	86.8	....
Demonstrate basic principles of treatment planning	25 (40.9)	30 (49.1)	4 (6.5)	1 (1.6)	1 (1.6)	90	....
Execute the treatment plan for a case with non-skeletal involvement after making a detailed problem list	21 (34.4)	17 (27.8)	10 (16.3)	5 (8.1)	8 (13.1)	62.2	....
Design, insertion, adjustment, and activation of simple removable appliances	21 (34.4)	26 (42.6)	10 (16.3)	2 (3.2)	2 (3.2)	77	....
Demonstrate various space maintainers	28 (45.9)	30 (49.1)	1 (1.6)	1 (1.6)	1 (1.6)	95	....
Explain causes for space loss	42 (68.8)	18 (29.5)	0	0	1 (1.6)	98.3	....
Assess the need for space regaining and demonstrate various space regainers	23 (37.7)	29 (47.5)	2 (3.2)	2 (3.2)	5 (8.1)	85.2	....
Locate the position of impacted teeth in three planes of space	20 (32.7)	29 (47.5)	7 (11.4)	3 (4.9)	2 (3.2)	80.2	....
Describe various methods, indications, contraindications, advantages, and disadvantages of serial extraction	23 (37.7)	26 (42.6)	3 (4.9)	5 (8.1)	4 (6.5)	80.3	....
Specify the importance of retention and the required management to prevent relapse	24 (39.3)	29 (47.5)	4 (6.5)	0	4 (6.5)	86.8	....
Be able to identify which patient should be referred to the orthodontic specialist	43 (70.4)	10 (16.3)	7 (11.4)	1 (1.6)	0	86.7	....

Consensus=agreement of 60% of the participants and above

**Table 3: Perception on skills that undergraduate students should or should not perform (n: 61)**

Variable	n (%)					Consensus	
	Strongly Agree	Agree	Disagree	Strongly Disagree	Neutral	Yes	No
Treat interceptive orthodontic cases	14 (22.9)	20 (32.7)	18 (29.5)	4 (6.5)	5 (8.1)	55.6	....
Treat simple orthodontic cases using removable appliance	19 (31.1)	18 (29.5)	13 (21.3)	1 (1.6)	10 (16.3)	60.6	...
Manage emergencies in fixed orthodontics	22 (36)	27 (44.2)	8 (13.1)	1 (1.6)	3 (4.9)	80.2	...
Select and cement the bands for molar teeth	21 (34.4)	22 (36)	10 (16.3)	2 (3.2)	6 (9.8)	70.4	...
Select and bond brackets	5 (8.1)	15 (24.5)	22 (36)	19 (31.1)	0	...	67.1
Depict various ways of handling the crowding	9 (14.7)	24 (39.3)	20 (32.7)	5 (8.1)	3 (4.9)	54	...

Consensus=agreement of 60% of the participants and above

the skill of executing a treatment plan for non-skeletal cases had the lowest consensus at 62.2%, a percentage that is significantly lower than that reported by Bashir (90%).<sup>[6]</sup> This finding does, however, support the study of Rock *et al.*,<sup>[12]</sup> who reported that the University Teachers' Group in the UK finds it unreasonable to expect new graduates to have enough orthodontic experience and skills to allow them to formulate treatment plans. They also state that undergraduate orthodontic training should concentrate on diagnosis and recognition of problems, rather than providing limited exposure to treatment techniques.<sup>[12]</sup> There was also a lack of agreement regarding skills related to removable appliance design, insertion, adjustment, and activation, with the percentage sitting at 77%. Again,

this is lower than that reported by Bashir *et al.*<sup>[13]</sup> for the Pakistani teaching staff (90%). O'Brien wrote about the undergraduate orthodontic curriculum in the UK and cited that there is very little information about the efficacy of a removable orthodontic appliance.<sup>[14]</sup> He also stated that when compared to current treatment standards, it delivers a compromised result.<sup>[14]</sup> In addition, Rock *et al.*<sup>[12]</sup> reported that orthodontic staff members in the UK are attempting to shift the focus of orthodontic education away from using removable appliances to avoid these compromised outcomes. This is also reflected in the present study—participants agreed the least about treating simple orthodontic cases using a removable appliance. Moreover, other studies have suggested that newly qualified dentists



should only be undertaking correction of crossbites and space-maintaining treatments.<sup>[14,15]</sup>

In terms of the skills that undergraduate students should or should not be performing, there was a general consensus for five out of the six skills. Skills pertaining to the management of emergencies in fixed orthodontics received the highest consensus (80.2%). This indicates that these skills should be incorporated into any future revisions of the curriculum. This is, in fact, something that our institution has acted upon for the sake of ensuring the highest clinical and educational standards. We will be including the management of emergencies in orthodontics in the next revision of our curriculum. This action was taken in response to several incidents faced by our dental students in their daily practice.

Finally, orthodontic treatment provided by general dental practitioners is a debated issue between academics, dentists, and orthodontists.<sup>[16,17]</sup> There are two main stances: Either dental students should be taught basic skills, such as dealing with fixed orthodontics or handling simple interceptive orthodontic cases during their undergraduate program, or they should not. Those who hold the former viewpoint believe that the acquired skills will provide the community with well-trained dentists who can handle difficulties that they encounter in their practical life. In the UK, teaching staff is now allowing dental students to treat patients with a fixed appliance so that they can become familiar with such scenarios and manage similar cases in the future.<sup>[12]</sup> The team opposing this idea thinks that these skills should only be learned during postgraduate studies.<sup>[15]</sup>

Despite the limitation in this study of its relatively small number of participants, some clear trends and areas of agreement could be valuable to consider when planning for future curriculum.

## Conclusion

It is time to amalgamate the objectives and create a unified national list of LOs for all orthodontic curriculums across the country without any distinction of knowledge or skills required at the undergraduate level.

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## Conflicts of interest

There are no conflicts of interest.

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