Knowledge of orthodontic treatment among various dental specialties: a systematic review

Majed Abdullah Alharbi1, Razan Musaad Al-Salamah1

ABSTRACT
Orthodontics is a subspecialty in dentistry that has seen significant advances in the past few years. Patients who require orthodontic treatment could have a significant benefit from their treatment in addition to an improved quality of life. Accordingly, the knowledge of non-orthodontic dental specialists about this field could help in the early referral of patients to receive proper treatment. This review aimed to assess the knowledge of non-orthodontic specialists toward orthodontic treatment over the past 10 years. The literature was searched through Embase, Medline, Ovid, and PubMed databases from 2010 to October 2020. The search terms included were a combination of knowledge or awareness, orthodontic treatment or management, medical, general, or dental specialists. After this, articles were chosen to include only original studies examining the knowledge and awareness of medical and general dental specialists toward orthodontic treatment. Selected trials mentioned the professional status of the included medical specialists under investigation. After the exclusion of review studies and including only original investigations, 12 articles appeared. Eight articles were defined as eligible, covering a total of 1,397 non-orthodontic specialists from different countries. All eight studies had a cross-sectional questionnaire design. The level of the specialists included varied from students to dental experts. General dentists were included in six studies, undergraduate dental students were included in two studies, dental surgeons were included in one study, and pediatric dentists were included in another study. Knowledge and awareness of non-orthodontics specialists are variable among studies. However, further improvements are required through educational programs.

Keywords: Orthodontic treatment, knowledge, awareness.

Introduction
Orthodontics is a branch of dentistry that is concerned with the diagnosis and management of dental malocclusions [1]. These conditions are primarily due to irregular teeth or jaws, either one or both. Malocclusions are described as an irregularity between the arches or an anomaly in teeth position, away from standard estimates [2].

Nevertheless, malocclusions have been shown to arise from multiple factors; the outcomes of malocclusions are almost similar [3]. These outcomes include an irregular appearance, periodontal and gingival complaints, speech problems, chewing difficulties, as well as patient dissatisfaction [4]. Furthermore, malocclusions have been associated with an increased incidence of tooth decay and temporomandibular disorder.

Patients with malocclusion usually require the collaboration of a dental multidisciplinary team who is all aware of the diagnosis and management of malocclusions [5]. The primary goal of orthodontic treatment for many patients is to have good aesthetics, which significantly influences patients’ self-esteem and confidence [6]. The prevalence of malocclusions varies from 20% in the United States to 87.7% in Africa. In Saudi Arabia, the incidence of malocclusions is about 60% [7].

In developed countries, the knowledge and awareness toward orthodontic treatment among the dental and non-dental specialties are improving; similar figures are even described in the general public [8]. This improved awareness can result in better detection and treatment of malocclusions at an early age to reduce complications [9].

Despite this finding, the knowledge and awareness of non-orthodontics specialists about orthodontics in other countries, particularly developing and underdeveloped countries, are still underestimated [10]. Therefore, this
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A systematic review aimed to evaluate the literature on the knowledge and awareness of non-orthodontic specialists toward orthodontics over the past 10 years.

**Methodology**

The present systematic review was carried out using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist recommendations for systematic review and meta-analysis [11]. This systematic review was carried out by searching electronic databases to include eligible trials from 2010 till October 2020 in four databases, including Medline, Embase, Ovid, and PubMed.

The search terms included knowledge or awareness, orthodontic treatment or management, medical, general, or dental specialists. All the titles and abstracts that resulted from this initial search were revised thoroughly to avoid missing any possible studies. The outcomes were then refined to include only original research articles investigating knowledge and awareness of medical and general dental specialists toward orthodontic treatment. Selected trials mentioned the professional status of the included medical specialists under investigation. Additionally, all studies from different countries were eligible. Only studies published in English were included, which can be further evaluated in the second step.

The inclusion criteria were having information on the knowledge and awareness of medical and general dental specialists toward the orthodontic treatment. Moreover, the references of selected studies were examined to find any relevant studies. Finally, the predefined data sets were gathered from the final record of eligible articles and summarized. Articles were excluded in case of review studies, overlapped or incomplete data, and unavailability of full-text articles or case of inappropriate study design. The full description of the search strategy is shown in Figure 1.

![Figure 1. Four databases, including Medline, Embase, Ovid, and PubMed.](image-url)
The first step included a preliminary review, where a specially designed excel sheet was used for data extraction. Selected data from eligible studies were then revised through the excel sheet. Articles published by one research group investigating similar variables were reviewed for any possible duplication.

**Results**

After searching the abstracts and checking the eligibility criteria in identified potential abstracts, eight articles were included in the present systematic review, published between 2010 and October 2020, covering 1,397 non-orthodontic specialists from different countries.

All eight studies [12-19] had a cross-sectional questionnaire design. The level of the included specialists varied from students to dental experts. General dentists were included in six studies [12-16,18], undergraduate dental students were included in two studies [17,19], and pediatric dentists were included in one study [12], and pediatric surgeons were included in another study [13].

The knowledge level toward orthodontic treatment did not differ significantly among specialists with different years of experience. However, general dental practitioners had better knowledge about orthodontic treatment than other non-orthodontic specialists in most studies. Also, dental students had better knowledge and attitude toward orthodontic treatment than medical students, as described in Table 1.

**Discussion**

Patients who have malocclusions or other dental problems that require orthodontic treatment usually visit a general dentist at the beginning of their complaint [8]. Consequently, the awareness of general dental practitioners and other non-orthodontic specialists about

<table>
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<tr>
<th>Author(s)</th>
<th>Year</th>
<th>Study design</th>
<th>Sample size</th>
<th>Professional level</th>
<th>Objective</th>
<th>Results</th>
</tr>
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<tbody>
<tr>
<td>Bajaj et al. [12]</td>
<td>2020</td>
<td>Cross-sectional questionnaire study</td>
<td>500</td>
<td>General dentist, and oral surgeons</td>
<td>To evaluate the awareness and knowledge among oral surgeons and general dentists on orthodontic extraction patterns.</td>
<td>Most general dentists and oral surgeons agree with the cordial concept of extracting teeth simultaneously on the same side per jaw and following it accordingly.</td>
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<td>Barzilay et al. [13]</td>
<td>2020</td>
<td>Cross-sectional questionnaire study</td>
<td>117</td>
<td>Pediatric specialists and general dental practitioners</td>
<td>To evaluate the knowledge and approach of pediatric specialists and general dental practitioners in the management of children about the timing of referral and early orthodontic intervention.</td>
<td>The average total accuracy score in a 27-knowledge questionnaire was 68.6%, resulting in a statistically significant difference between the Progressive systemic sclerosis (PSS) and the General Dental Practitioner (gdp). This difference arose from confusion regarding the prevention of maxillary permanent canine impaction and the need for a leeway space maintainer. GDPs and the PSSs had an excellent knowledge of orthodontics and a good referral pattern, although the knowledge of PSSs was significantly higher than that of the GDPs.</td>
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<td>Mahmood et al. [14]</td>
<td>2019</td>
<td>Cross-sectional questionnaire study</td>
<td>100</td>
<td>General dentists</td>
<td>To evaluate the awareness among general dentists for referral of patients needing orthodontic treatment.</td>
<td>Among the participants, 31% had 2 years or less experience, 40% had 2-6 years, and 29% had more than 6 years of experience. The information scores were looked at between general dental expert (8.89) and non-orthodontic specialists (10.25), which demonstrated that the scores were critically low among both experts and non-experts.</td>
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<td>Acharya et al. [15]</td>
<td>2019</td>
<td>Cross-sectional questionnaire study</td>
<td>185</td>
<td>General dentists and non-orthodontic specialists</td>
<td>To assess the knowledge of orthodontic treatment among general dentists and non-orthodontic specialists</td>
<td>Almost 60.5% think that the first orthodontic evaluation of a child should be carried out within 7-8 years of age, and 44.3% think orthodontic treatment can even be started after 40 years of age. Around 66% of the participants think that orthodontic treatment cannot be performed in periodontally compromised cases. No significant difference was found between the mean scores of knowledge among general dentists and non-orthodontic specialists (p = 0.891) or dentists with different years of experience (p = 0.644).</td>
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(Continued)
orthodontic conditions and their treatment is crucial for the early referral of patients who need orthodontic treatment [5].

The present review examined the medical literature to explore the awareness and knowledge of non-orthodontic specialists about orthodontic treatment during the past decade. The study demonstrated a non-significant difference in the knowledge level toward orthodontic treatment based on professional experience. Also, general dental practitioners seemed to have a better knowledge about orthodontic treatment compared to other non-orthodontic specialists. Finally, dental students seemed to have a better knowledge and attitude toward orthodontic treatment compared to medical students.

General dental practitioners were the most represented in the included studies. Most recently, Bajaj et al. [12] examined the knowledge of general dentists and oral surgeons toward orthodontic extractions by including 500 participants to respond a survey. Bajaj et al. [12] demonstrated that most responders agreed on extracting teeth on the same side of the jaw [12].

Also, Barzilay et al. [13] evaluated general dentists’ and pediatric dentists’ knowledge and practices toward treating and referring children to orthodontic specialists. Barzilay et al. [13] demonstrated that pediatric specialists have a significantly higher level of knowledge toward orthodontic treatment in children than general dentists, which can be attributed to the confusion related to the impaction of permanent maxillary canines and requiring a leeway space maintainer [13]. Furthermore, Mahmood et al. [14] and Acharya et al. [15] examined the knowledge of general dentists and non-

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<th>Results</th>
</tr>
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<tr>
<td>Kapoor et al.</td>
<td>2018</td>
<td>Cross-sectional questionnaire study</td>
<td>32</td>
<td>Non-orthodontics specialists and general practitioner dentists</td>
<td>To assess the general practitioner dentists and non-orthodontic specialists’ attitudes and knowledge toward orthodontics’ basic principles and practices.</td>
<td>The knowledge level of dentists and the non-orthodontic dental specialists were 13.92 and 16.69, respectively. There were statistically significant knowledge and attitude differences between Group A and Group B ($p &lt; 0.001$).</td>
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<td>Agrawal et al.</td>
<td>2018</td>
<td>Cross-sectional questionnaire study</td>
<td>300</td>
<td>Undergraduate dental students</td>
<td>To establish knowledge, attitude, and perception of orthodontics treatment among dental students.</td>
<td>The dental students showed adequate knowledge about the orthodontic treatment and had a positive attitude toward it. Females had very good knowledge, satisfaction, and a positive attitude compared to the males regarding dental esthetics and treatment. House surgeons were much more aware, very much satisfied, and had a more positive attitude than first-year students.</td>
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<td>Sastri et al.</td>
<td>2015</td>
<td>Cross-sectional questionnaire study</td>
<td>78</td>
<td>General dental practitioners and non-orthodontic specialties.</td>
<td>To identify knowledge and attitude toward orthodontic treatment</td>
<td>There was a significant difference in knowledge and attitude scores between general dental practitioners and non-orthodontic specialties ($p &lt; 0.001$). The study showed more scores in the case of male practitioners, but the difference was not statistically significant ($p &gt; 0.01$).</td>
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<td>Adegbite et al.</td>
<td>2012</td>
<td>Cross-sectional questionnaire study</td>
<td>85</td>
<td>Medical students</td>
<td>To evaluate the level of knowledge about orthodontics and the awareness of the effects of malocclusion on the general well-being, among medical students.</td>
<td>The majority (75.3%) were in their clinical years. However, only 45.9% of the students heard the term “orthodontics,” and only 20% correctly answered that orthodontics involves malocclusion treatment. Regarding the management procedures used in orthodontic clinics, 54.1% of them selected the rearrangement of teeth. As for knowledge about appliances used in orthodontics, about half of the students (49.4%) chose dentures, 40% chose removable appliances, and 57.7% chose braces. Most of the students (81.2%) agreed that they would refer patients to orthodontic specialists in the future, while 3.5% were undecided, and 15.3% disagreed. The medical students had limited knowledge of orthodontics as a specialty and knew very little about the impact of malocclusion on the individual’s well-being.</td>
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orthodontic specialists in different settings. Mahmood et al. [14] studied this level of knowledge based on the specialists’ level of experience, revealing a significantly low level of knowledge about orthodontic treatment among both expert and non-expert general dentists.

However, Acharya et al. [15] examined orthodontic treatment knowledge, particularly in children, demonstrating that more than half of the general dentists believed that orthodontic evaluation should be carried out at the age of 7-8 years old. Acharya et al. [15] also showed a non-significant difference in the knowledge of general dentists and other non-orthodontic specialists or those with different years of experience.

On the contrary, Kapoor et al. [16] compared general dentists’ and non-orthodontic specialists’ knowledge toward orthodontic treatment. Kapoor et al. [16] showed a significantly higher level of knowledge among general dentists than non-orthodontic specialists. These findings were also supported by Sastri et al. [18]. However, it should be noted that Kapoor et al. [16] and Sastri et al. [18] included a few number of participants in their surveys, which reduced the reliability of these findings.

The knowledge about orthodontic treatment was also examined among dental and medical students. Agrawal et al. [17] examined dental students’ knowledge and showed that they have a relatively good level of knowledge and a positive attitude toward orthodontic treatment.

On the other hand, Adegbite et al. [19] examined medical students’ knowledge about orthodontic treatment, of which about three-quarters of the responders were in their clinical years. Adegbite et al. [19] demonstrated that medical students had limited information about orthodontic specialty and orthodontic treatment, particularly malocclusions [19].

However, the included studies suffered from some limitations. All the included studies used a cross-sectional questionnaire study design, which could affect the reliability of the outcomes produced from these studies, as the responses to the survey questions depend on the honesty and subjective opinion of the responders. Further studies with a more robust design are highly recommended.

**Conclusion**

The awareness and knowledge of orthodontic treatment were highly varied among non-orthodontic specialists, with some studies reporting adequate knowledge and others reporting insufficient knowledge about orthodontic treatment. Accordingly, an improvement in the knowledge about orthodontic treatment is needed, which can be in the form of continuous medical educations sessions or academic courses in medical and dental schools. Furthermore, future studies should focus on using objective scores rather than subjective questions to evaluate orthodontic treatment knowledge to improve the reliability of the findings.

**Conflict of interest**

The authors declare that there is no conflict of interest regarding the publication of this article.

**Funding**

None

**Consent to participate**

Not applicable.

**Ethical approval**

Not applicable.

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