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Knowledge and Awareness of the orthodontic triage and its uses among dental healthcare professionals – a cross-sectional study

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Abstract

Introduction In orthodontics, the triage system is used to assess the preadolescents to rule out interventions needed earlier and to assess the nature of orthodontic problems as complex or moderate. The objective of this study was to determine the knowledge and awareness of orthodontic triage and its uses among dental healthcare professionals (DHCP).

Materials and methods A triage awareness questionnaire (TAQ) was formulated and validated as reliable by a panel of five orthodontic specialists which was then circulated online among 400 DHCP. The questionnaire consisted of nine sections that assessed the current knowledge and usage of orthodontic triage among the dental community. Frequencies and percentages were reported for all categorical variables. Chi-square was used to assess the association among the variables.

Results The response rate was 28.2% with the majority of participants being general dentists. Regarding the knowledge and use of triage, 40% of DHCP were only familiar with the word "orthodontic triage" while being unaware of how it works and 79% denied using orthodontic triage. Regarding the management of anomalies, 42% of DHCP preferred extraction as the management of supernumerary teeth ($p=0.013$). Practitioners belonging to private setups performed visual inspection in growing patients for assessment of their facial features ($p=0.012$). Clinicians with more than one year of experience referred young patients to orthodontic specialists for the management of crossbite ($p=0.024$). Younger clinicians (25–35 years) with more than one year of experience referred adult patients to orthodontists for correction of their unesthetic smile ($p=0.013$).

Conclusions This paper provides foundational data for the development of future policies and protocols supporting structured, evidence-based approaches to patient management via use of orthodontic triage. This study underscores the importance of targeted educational interventions to enhance understanding and implementation of orthodontic triage principles in clinical practice. Further probing is necessary to discern the disparity between understanding the orthodontic triage and effective employment of its components among practicing dental healthcare professionals.

Keywords Orthodontic triage, Dental practitioners, Orthodontic referrals, Developing orthodontic problems

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Introduction

Triage comes from the French word "tier" which means "to sort" [1]. Triage has been historically used in wars and in cases of disasters where mass casualties occur, and only limited resources are available [2]. It fulfils the bifold purpose of providing help and critical care to those who need it first and those who require more complex procedures [3]. Over time, the triage approach has become an integral part of standard medical procedures, ensuring swift and life-saving assistance for individuals requiring immediate attention [4].

In orthodontics, the triage system is used to assess the preadolescents to rule out interventions needed earlier and to assess the nature of orthodontic problems as complex or moderate [5]. O'Brien et al. [6] concluded from their two-stage study that a significant portion of dentists make improper referrals. Subsequent studies were conducted to evaluate the effectiveness of triage in orthodontics to ensure appropriate patient referrals [7, 8].

Orthodontic triage is a critical tool which plays an essential role in prioritization of patient care based on the urgency and severity of orthodontic discrepancies. It helps ensure that patients receive timely and appropriate care with optimal usage of limited resources. Despite it`s importance, there is a notable gap in literature regarding the knowledge and awareness of orthodontic triage protocols among dental healthcare professionals. Furthermore, improvement in knowledge regarding triage protocols can help prevent inadequate use of triage leading to delayed treatments, increased complexity of untreated conditions and inefficient use of resources. Hence, it is essential to establish foundational data concerning the understanding, awareness, and implementation of orthodontic triage among dental healthcare professionals.

Materials and methods

After obtaining an exemption from the institutional ethical review committee (2023-8638-24518), a cross-sectional study was conducted electronically via a validated triage awareness questionnaire (TAQ) (Fig. 1). The questionnaire was circulated through email addresses and other social media platforms. Random selection of participants was allowed by circulation of the questionnaire among dental associations and registered practitioners. The sample size was calculated by Open-epi software assuming the hypothesis that at least 400 dental healthcare professionals (DHCP) are aware of the orthodontic triage while keeping $\alpha = 0.05$ and the power of study as 80%.

We included clinicians who were currently in practice, had an experience of at least more than a year, and consented to online participation. Clinicians who were currently out of practice, were unqualified, dental auxiliaries and orthodontists were excluded from our study. The questionnaire was developed and confirmed as reliable by a panel of five orthodontic specialists for its relevance and clinical applicability. Specialists were asked to rate each component of questionnaire on content validity indicators such as relevance, clarity, and accuracy using a four point Likert scale: 1 = Very unimportant, 2 = Unimportant, 3 = Important, 4 = Very unimportant which yielded a content validation index value of 0.84.

This questionnaire-based study was structured into nine sections, encompassing a total of twenty seven questions. The initial and obligatory section centered on obtaining participants' consent. Section two gathered demographic information from the respondents. Sections three and four delved into queries related to the understanding, awareness, and utilization of orthodontic triage. Section five focused on inquiries about the referral process to orthodontists. Section six was dedicated to questions about managing various moderate and complex conditions. Section seven explored adult referrals, and Section eight consisted of inquiries regarding treatment approaches. Section nine inquired about DHCP regarding their interest in integrated sessions to enhance their understanding of orthodontic problems and their management. The questionnaire was disseminated electronically via an online survey platform i.e. Google forms. Reminders were sent twice per week in order to maximize response rate. All responses were anonymized and stored securely in a digital master file with access only to authors.

Statistical analysis

Data were analyzed using SPSS (version 23.0). Frequencies and percentages were reported for all the categorical variables. A Chi-square test was applied to assess the association among different variables. A $p \leq 0.05$ was considered statistically significant.

Results

Response rate

Out of 400, 112 DHCP responded to the questionnaire which resulted in a response rate of 28.2%. Among the respondents, 72% were general dentists, 11% specialized in operative dentistry and endodontics, while 8% of participants were specialists in the fields of prosthodontics and oral & maxillofacial surgery, equally.

Demographics

In terms of age distribution, 92% fell within the 25–35 years age range. The majority of the participants i.e. 71% had more than one year of experience. Regarding their practice, 39% belonged to private clinics, while 17% worked in government setups (Table 1).

Triage Awareness Questionnaire

I consent to participate:

- Yes
- No

General Information

Serial No.: _____ **Specialty:** _____

Age: _____ years **Gender:** M / F

Years of experience: _____ years **Area of practice:**_____

Type of practice: Private clinic/Private hospital/Government hospital/Both

Knowledge of Triage

Q.1. Are you aware of the orthodontic triage?

(a) Yes

(b) No

(c) Familiar with the name but don't know how it works.

Usage of Triage

Q.2. Do you use the Index of Orthodontic treatment Needs on young children that come to your clinic for dental checkups?

(a) Yes

(b) No

Q.3. Do you use the five steps of orthodontic triage to evaluate young patients?

(a) Yes

(b) No

Referral to Orthodontists

Q.4. How many patients do you refer to an orthodontist per week?

(a) 1-5

(b) 5-10

(c) Above 10

Fig. 1 Triage Awareness Questionnaire

Table 1 Demographics

Variable	Frequency
Gender	
Male	27
Female	85
Age	
25–35 years	104
35–45 years	05
> 45 years	03
Experience	
> 1 year	80
> 5 years	25
> 10 years	07
Practice	
Private clinics	44
Private hospital	32
Government hospital	20
Both	16

N=400

Table 2 Response regarding knowledge & usage of orthodontic triage

Knowledge of triage	Response	*p* – value
Yes	41	0.753
No	26	
Only familiar with the name	46	
Usage of triage		0.312
Yes	67	
No	45	

N=400

Chi-square test, $p \leq 0.05$*

Table 3 Management of supernumerary teeth

Management of supernumerary teeth	Response	*p* – value
Extract on their own	46	0.013*
Refer to orthodontists	26	
Refer only complex ones	40	

N=400

Chi-square test, $p \leq 0.05$*

Table 4 Assessment of facial features

Type of Practice	Visual inspection			*p* – value
	Yes	No	Only when obvious/ severe	
Private clinics	32	01	11	0.012*
Private hospital	24	00	08	
Government hospital	15	04	01	
Both	12	03	01	

N=400

Chi-square test, $p \leq 0.05$*

Table 5 Management of crossbite

Experience	Management of crossbite			*p* – value
	Treat themselves	No action	Refer to orthodontists	
> 1 year	08	18	53	0.024*
> 5 years	00	02	21	
> 10 years	03	00	05	

N=400

Chi-square test, $p \leq 0.05$*

Table 6 Adult referrals

Experience	Adult referrals		*p* – value
	Yes	No	
> 1 year	73	07	0.006*
> 5 years	24	00	
> 10 years	05	03	
Age	Yes	No	0.013*
25–35 years	63	17	
35–45 years	21	03	
> 45 years	08	00	

N=400

Chi-square test, $p \leq 0.05$*

Knowlede & usage of triage

Regarding the knowledge of triage, 40% of DHCP were only familiar with the word "orthodontic triage" while being unaware of how it works (p=0.753), 79% of DHCP denied using orthodontic triage for referral of young orthodontic patients (p=0.312) (Table 2).

Referral of young population

Among the DHCP, 77% reported referral of young patients with orthodontic findings instead of impartment of treatment in their general setups (p=0.350), while 42% preferred extraction as the management of supernumerary teeth (p=0.013) (Table 3). Practitioners belonging to private setups performed visual inspection in growing children for assessment of their facial features (p=0.012) (Table 4). Clinicians with less experience referred young patients to orthodontists for the management of crossbite (p=0.024) (Table 5).

Adult referrals

Younger clinicians (25–35 years) with more than one year of experience referred adult patients, who came to them with the complaint of unesthetic smile to orthodontists (p=0.013) (Table 6).

Discussion

In our study, we aimed to evaluate the level of knowledge and awareness within the dental community concerning orthodontic triage for referral of orthodontic patients along with current practice trends regarding orthodontic problems. This online survey yielded a 28% response from DHCP. The majority of respondents were general dentists accounting for 72% of participants. Under the light of the findings of this study, a hypothesis is proposed

that DHCP are unfamiliar with the use of orthodontic triage for referral of young patients while being attentive towards developing orthodontic problems among pediatric patients. With the help of this study, we aim to disseminate information that facilitates more targeted and precise interventions in the management of evolving orthodontic issues which will ultimately assist clinicians in early diagnosis, treatment planning, and intervention, thereby enhancing patient care.

Rayner and Neal [7] assessed the use of the Index of Orthodontic Treatment Needs (IOTN) for triaging orthodontic patients in order to reduce inappropriate referrals from general practitioners. Their findings revealed that triage effectively reduced the inappropriate referral rate i.e. IOTN grade 3 and below. Similarly, Ashley et al. [8] also assessed a method of triaging orthodontic patients to adequately refer them which proved to be effective for earlier identification of severe malocclusions. Therefore, while the effective role of orthodontic triage is established, there is non-existant knowledge on its actual referral practices. Thus, we attempted to bridge this gap, providing foundational data for the development of future policies and protocols supporting structured, evidence-based approaches to patient management.

Lee et al. [9] conducted a study to assess the factors that play a role in the referral of orthodontic patients to specialists. According to them, general dentists refer complex cases and growing patients to orthodontists which is in agreement with our study in which dentists preferred referral of growing patients for assessment and treatment of their developing orthodontic problems to specialists. This finding suggests that dental professionals recognize the crucial role of timely intervention for growing individuals, thereby enhancing the effectiveness of orthodontic treatment and potentially reducing treatment duration.

However, when assessed for familiarity with orthodontic triage and usage of IOTN along with five steps of assessment for developing orthodontic problems, majority of dentists responded that they are only familiar with the term "orthodontic triage" while being unaware of how it works. Jackson et al. [10] conducted a study on the behavior of dentists in West Sussex concerning orthodontic referrals. Their research also revealed that the majority of dentists lack familiarity with the utilization of orthodontic triage. This finding underscores the necessity to enhance awareness regarding the utilization of orthodontic triage for prompt referrals. When assessed regarding the age at which dentists refer young patients to orthodontists, 32% of dentists responded that they refer young patients for evaluation at the age of 12 years and onwards. Imran et al. [11] conducted a questionnaire-based study regarding orthodontic practice among general practitioners and found that most of the dentists in their study had a limited understanding of the suitable age for evaluating orthodontic needs in the younger population. Research indicates that, based on the extent of malocclusion, early intervention can prove advantageous in reducing the severity and treatment complexity associated with many orthodontic problems [12–14].

In our study, we found a significant association between private practitioners and the performance of visual inspection for assessing the profile of the pediatric population. This shows that practitioners in private setups are more considerate of the assessment of facial features of growing patients. Visual examination of the facial profile of growing patients is an integral part of orthodontic diagnosis and treatment planning. This helps in earlier identification and intervention of malposed skeletodental relationships [15].

Regarding the management of different moderate and complex developing conditions, a significant finding was observed related to the management of supernumerary teeth as 42% of dentists responded that they extract any tooth that appears additional in young patients on their own. It showed that the majority of dentists lack the baseline knowledge regarding the management of supernumerary teeth. Studies show that supernumerary teeth can be a result of an underlying abnormality and their extraction may help intercept these developing malocclusions. Hence, an evaluation from orthodontic specialists is essential for ensuring comprehensive care in these cases [16, 17].

Jafari et al. [18] assessed the awareness of general dentists towards the use of space maintainers among the pediatric population and found that their knowledge regarding space maintenance could be improved, while in our study, we assessed the attitude of DHCP towards the use of space maintainers. Although insignificant, 70% of dentists reported that they evaluate and advise space maintainers in growing patients. This finding illustrates an enhancement in the knowledge of DHCP towards the prevention of space loss in pediatric patients ultimately reducing the arch length discrepancies. In our study, most of the general dentists claimed to be observant regarding prevalent oral habits in young children and took non-interventive measures, aligning with the results found by Rani et al. [19], where the majority of general dentists preferred counselling as the approach for managing oral habits in the pediatric population. This finding showed that the dental community remains watchful of existing oral habits among the growing population and actively takes measures within their expertise to address these problems. In this study, majority of DHCP preferred referral of young patients with crossbite to orthodontists for their evaluation and treatment. This outcome is in concurrence with the findings of Kayalara et al. [20] who found out in their survey that dentists prefer referral

of young patients for evaluation and treatment of crossbite. This finding suggested that dentists recognize that crossbites can present as a multifaceted issue associated with underlying skeletal abnormalities and therefore, necessitate an approach from specialists. Despite the primary use of orthodontic triage for evaluating the young population, our questionnaire included a section dedicated to the referral of adult patients. Younger clinicians between the age range of 25–35 years, with experience of more than a year refer adult patients with concerns of unesthetic smiles to orthodontic specialists. Similarly, Lee et al. [9] identified in their study that general practitioners especially those early in their career emphasized achieving a balance of occlusion and optimum esthetics as crucial for orthodontic treatment. Hence, based on increased complexity, they prefer referral to specialists. This indicates that younger clinicians may prioritize achieving both occlusal balance and optimal esthetics in orthodontic treatment which enhances patient outcomes by ensuring comprehensive care. This understanding helps them make informed decisions about when to refer patients to specialists for more intricate cases, ensuring that patients receive appropriate and effective care tailored to their specific needs.

Timing of treatment is an essential component of optimum orthodontic practice. Therefore, it is of prime importance that growing patients be evaluated at the right time for in-time prevention and interception of developing orthodontic problems [21]. Hence, referral of growing orthodontic patients should be made an integral part of primary healthcare practice. This study may serve as a foundation for future research, offering a hypothesis that can be investigated further. In this study, responses from all dental healthcare professionals were sought to better understand the current practice trends regarding orthodontic problems. The majority of responses were gathered from general dentists and only a handful of other dental specialists. This limited response rate is attributed to the online format of the study. However, a systematic review carried out by Fosnacht et al. [22] suggests that low response surveys are equally as valuable as high response questionnaire studies, as there is a high probability of obtaining similar responses in a population with greater participation. Additionally, the study may not account for the contextual factors such as geographical differences in practice standards and organizational policies which influence the use of orthodontic triage. Therefore, we recommend conducting an in-depth survey that includes contextual variables through an interview format, combined with a physical approach for data collection.

Conclusions

- This paper provides foundational data for the development of future policies and protocols supporting structured, evidence-based approaches to patient management via use of orthodontic triage.
- This study underscores the importance of targeted educational interventions to enhance understanding and implementation of orthodontic triage principles in clinical practice.
- Further probing is necessary to discern the disparity between understanding the orthodontic triage and effective employment of its components among practicing dental healthcare professionals.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12903-024-04593-z.

Supplementary Material 1

Author contributions

F.I contributed towards conceptualization, methodologyR.H validated and supervisedM.F supervised the project.

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Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request. All data generated or analysed during this study are included in this manuscript. The datasets generated and/or analysed during the current study are not publicly available due [due to confidentiality] but are available from the corresponding author on reasonable request.

Declarations

Ethical approval and consent to participate

This protocol was approved by ethical review committee of the institiute with the approval number (2023-8638-24518). Informed consent was obtained from all subjects as the first and compulsory segment of the questionnaire.

Consent for publication

The authors of this study provide complete consent for publication of this article in BMC Oral Health after approval from the review process.

Competing interests

The authors declare no competing interests.

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