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Comparison of Orthodontic Treatment Need Assessment in 9–12-Years-Old Children Evaluated by Pedodontists, Orthodontists, General Dentists and Laypeople

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Abstract

Purpose: This study investigates the differences in perception of orthodontic treatment need among pedodontists, orthodontists, general dentists and laypeople evaluated in 9–12-years-old children using standardized intraoral photographs and Dental Aesthetic Index (DAI). ***Methods:*** A survey was conducted among four groups: pedodontists, orthodontists, general dentists and laypeople. A total of 255 participants completed the survey, consisting of 63 pedodontists, 57 orthodontists, 57 general dentists and 78 laypeople. The survey included intraoral frontal photographs of 12 different cases presenting various types of malocclusions before any orthodontic intervention. All participants were asked to evaluate the orthodontic treatment need of each case by assigning a score on a 100-mm Visual Analog Scale (VAS) placed below each photograph. Group comparisons were conducted using the Independent Samples t-test and One-Way Analysis of Variance (ANOVA), as appropriate. ***Result:*** Significant differences ($p<0.05$) were found between the groups, as orthodontists perceived higher treatment need scores, while general dentists showed a tendency to underestimate the necessity for treatment. Laypeople predominantly focused on aesthetic aspects, often overlooking functional aspects of malocclusions. Additionally, age and gender influenced perception, with older participants and females perceiving treatment need higher ($p<0.05$). ***Conclusion:*** Significant differences are observed in the perception of orthodontic treatment need in accordance with the evaluator's age, gender and profession. Hence, orthodontic treatment decision should be made intently considering these differences to fulfill the divergent expectations of each patient.

Keywords: malocclusion, orthodontic treatment need, dental aesthetic index, mixed dentition.

INTRODUCTION

Orthodontic treatment is generally not considered necessary by laypeople unless there is noticeable crowding, spacing of teeth, a significant overjet, or symptoms indicative of temporomandibular disorders. It is essential that adults around children recognize the need for orthodontic treatment and refer them to orthodontists. Likewise, it is crucial for non-orthodontic dental specialists and general practitioners to identify malocclusions and initiate timely referrals to orthodontists [8,26].

Recent dental literature emphasizes the importance of both orthodontic treatment and its timing. In orthodontics, determining the appropriate treatment time, implementing early interventions and carefully assessing the potential risks of malocclusions are of great importance [21]. Since children are unable to recognize their own need for early orthodontic care, the role of adults in making such referrals becomes even more vital [11,12,14]. Understanding the relationship between the criteria that adults use when evaluating a child's orthodontic treatment need and the objective clinical needs is essential to provide the accuracy and effectiveness of these referrals [2,4,6,27].

The demand for orthodontic treatment is primarily driven by concerns related to facial and dental aesthetics. However, evaluation of dental aesthetics is highly subjective and may vary significantly among

individuals [4,11,19,29]. To address this variability, several objective indices for assessing orthodontic treatment need have been developed and are continually being refined [5,15]. These indices help in prioritizing individuals with the most urgent treatment requirements, especially when resources orthodontic treatment are limited. They also help protect patients with minimal needs from unnecessary procedures and their potential risks [3,7]. Some indices focus solely on dental, occlusal, and functional criteria, while others incorporate aesthetic perception as well [5].

The primary aim of this study is to compare the orthodontic treatment need assessments made by pedodontists, orthodontists, general dentists and laypeople using standardized frontal intraoral photographs of children. The secondary aim is to examine the variability of these assessments based on the participants' age and gender.

MATERIAL AND METHOD

This study was approved by University Research and Ethics Committee (Project No: D-KA23/12) and was supported by University Research Fund. A survey was conducted among four groups: pedodontists, orthodontists, general dentists, and laypeople. All participants provided informed consent prior to inclusion in the study. Based on power analysis, a minimum of 53 participants was required per group. Accordingly, a total of 255 participants completed the survey, consisting of 63 pedodontists, 57 orthodontists, 57 general dentists and 78 laypeople (Table 1). The inclusion criteria for participants were as follows:

1. Pedodontists and orthodontists were at least in the third year of their specialty training
2. General dentists must have at least 2 years since graduation
3. Laypeople must not have undergone any previous orthodontic treatment

The survey included intraoral frontal photographs of 12 different cases (Fig 1) presenting various types of malocclusions before any orthodontic intervention. Informed consent was obtained for intraoral photographs of cases from parents or legal guardians for children included in the study. All survey participants were asked to evaluate the orthodontic treatment need of each case by assigning a score on a 100 mm Visual Analog Scale (VAS) placed below each photograph. The interpretation of the VAS scoring is shown in Fig 2. The assigned VAS scores were measured using a standard metric ruler with a precision of 0.5 mm by a single examiner.

Additionally, two orthodontists in their fourth year of postgraduate orthodontic education performed both VAS scoring on the 12 intraoral photographs and also conducted Dental Aesthetic Index (DAI) measurements on dental cast models of the same 12 cases twice, with a one-month interval between the sessions to assess intra-observer reliability. All DAI parameters were measured directly on the models using a digital caliper, following the standardized DAI protocol (Fig 3) [25].

The treatment needs categories derived from the DAI scores were also standardized to a common scale similar with the VAS scores (Fig 4). Accordingly, the orthodontic treatment needs identified by the 255 survey participants were interpreted and compared with the DAI-based treatment need categories.

Statistical Analysis

Statistical analyses were performed using SPSS software version 24.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including mean, standard deviation, median, minimum, maximum values and percentages were used to summarize the study data. Group comparisons were conducted using the Independent Samples t-test and One-Way Analysis of Variance (ANOVA). Inter-rater reliability was evaluated by calculating the Intraclass Correlation Coefficient (ICC). P value less than 0.05 was considered statistically significant.

RESULTS

According to the DAI measurements made on the dental cast models by the two orthodontic students in their fourth year of education, all the 12 cases examined received over 36 points and the need for treatment was necessary. Additionally in the examination of the photographs by the same two students, it was determined that the VAS scores of all 12 cases were higher than 75 and that treatment was mandatory. No statistically significant differences were found between the two fourth grade postgraduate orthodontic students' repeated assessments ($p>0.05$) or within their first and second measurements according to ICC scores since they were very close to 1 indicating excellent reliability.

The distribution of the descriptive characteristic of the participants according to profession, age and gender is presented in Table 1. It was observed that the distribution of the participants in terms of profession was balanced, the majority of the evaluators were between the ages of 20-30, and the number of female participants was approximately twice as much as male participants.

The VAS scores of the intraoral photographs of the 12 cases evaluated by the participants is presented in Table 2. Accordingly, out of the 12 cases whose photographs were examined, it was evaluated that treatment was mandatory in 6 cases, strongly recommended in 5 cases, and indicated in 1 case.

Comparison of the VAS scores of the 12 cases according to the participants' gender is presented in Table 3. Female and male participants gave equal scores when assessing treatment need in 2 of the 12 cases examined. In 10 cases, women found the treatment need

higher than men. In 4 of these 10 cases, women's scores for treatment need were found to be significantly higher ($p < 0.05$) than men's.

Comparison of the VAS scores of the 12 cases according to the participants' age is presented in Table 4. In all 12 cases examined, the need for treatment was perceived as lower by participants between the ages of 20-30. This difference between the 20-30 age group and the older age groups was found to be significant ($p<0.05$) in four cases.

Comparison of the mean VAS scores of the 12 cases according to the participants' profession is presented in Table 5. Statistically significant differences were observed in the evaluation of treatment need by different profession groups in 8 of 12 cases whose intraoral photographs were examined. The reason for these differences was that dentists evaluated the need for treatment as lower in 4 cases, lay people in 2 cases, and pedodontists in 1 case, and orthodontists evaluated the need for treatment as higher in 2 cases.

DISCUSSION

The primary aim of this study was to investigate the differences in perception of orthodontic treatment need between 9-12 years old children among pedodontists, orthodontists, general dentists and laypeople as it was not extensively examined with comparisons between multiple groups, despite being examined within some professions in the literature [2,4,6,8,11,12,26]. The intraoral photographs of 9–12-years-old children were chosen for examination as children are in late mixed dentition stage during these period and parents generally ask for orthodontic intervention during this stage [12]. Pedodontists, orthodontists, general dentists and laypeople were included in the survey study as all these professions are expected to detect the orthodontic malocclusions and refer the children for treatment at this stage. Evaluation of standardized intraoral photographs by the participants was preferred as they simulate the intraoral examination of a malocclusion which can be easily realized by any dentist and laypeople. Dental Aesthetic Index (DAI) was also included in the study as it provides a valid and standardized assessment of orthodontic treatment need from an aesthetic standpoint [3,9,15,23].

According to the findings of our research, female participants assessed the need for orthodontic treatment as higher. This situation can be explained by the fact that women have a higher perception of dentofacial aesthetics. This finding is similar to many studies in the literature [12,13,24,28].

Orthodontic treatment need was perceived as lower by participants between the ages of 20-30 in all 12 cases examined. The fact that participants between 31-40 years and above 40 years of age perceived higher treatment need in comparison with the 20-30 years of age can be explained with their increased life experience and possible parental sensitivity which may cause increased concern with the dentofacial health and esthetics of children. Consequently, participants above 30 years of age may have exhibited a more meticulous approach and greater demand for early orthodontic treatment compared to younger participants. This finding is compatible with the literature [13,17,24], although there are differences between these studies, such as the age and number of participants and the different evaluation methods.

The findings of this study indicated that perception of treatment need by different profession groups revealed substantial differences between the groups. It was observed that dentists mostly perceived the need for treatment as low, whereas laypeople and pedodontists were less likely to perceive the need for treatment as low. This finding is consistent with some studies [6,11] and differs from some studies in the literature [16,20]. The reason for the difference from some studies in the literature is thought to be the evaluated anatomical zone, the malocclusion type, the evaluation method, and the demographic distribution of the participant groups.

This study confirmed that pedodontists showed a high level of agreement with other groups in assessing orthodontic treatment need, and this finding is consistent with the literature [2,4]. Similarly, lay people were generally found to agree with other groups in assessing orthodontic treatment need. However, examination of the specific problems of each 12 case revealed that unlike pedodontists, lay people were found to care more about aesthetic problems in the anterior region, but to consider malocclusions that would cause functional problems less important. This finding is compatible with the literature [1,4,6,26].

One of the most important findings of our study was that general dentists perceived the need for orthodontic treatment lower than the other groups. When the malocclusion characteristics of the 12 cases were examined in detail, it was seen that the main problems of the cases that dentists perceived to have lower treatment needs compared to the other groups were crowding, delayed tooth eruption, single-tooth crossbite, and unilateral posterior crossbite without mandibular shift. Based on these data, this situation can be interpreted as general dentists may not have considered these problems as issues that require urgent intervention in the mixed dentition period and thought that treatments could be performed in the permanent dentition stage. This finding is consistent with some studies [11,16] and differs from some studies [6,20] in the literature. The differences between the findings of these studies may be due to the assessment methods used, the type of dentition evaluated, and the demographic distribution of the participant groups.

On the other hand, orthodontists mostly perceived treatment need as higher compared to the other groups. Orthodontists' higher perception of treatment need may be due to their more advanced knowledge of the developmental processes of malocclusions, the functional anomalies they may create, and the dentoskeletal problems that may arise in case of delay in treatment [10,18,21,22,24]. The increased sensitivity of orthodontists to the functional and pathological consequences of malocclusion observed in our study is compatible with the literature [2,4,6,11,20,26].

An important limitation of our study that should be acknowledged is the exclusive use of intraoral frontal photographs for evaluation. Performing the study solely on frontal intraoral photographs may have caused some confusion among participants when making decisions, particularly because extraoral evaluations were not possible, functional assessments could not be performed, sagittal occlusal relationships were not visible, and the presence or absence of missing or impacted teeth could not be determined in detail. Moreover, participants did not have access to panoramic and lateral cephalometric radiographs, which are routinely used in orthodontic examination. The decision to exclude such additional clinical information was made to avoid introducing complexity that could not be properly interpreted by laypeople, thereby ensuring balance and comparability among the different participant groups.

CONCLUSION

1. Orthodontists mostly perceived orthodontic treatment need as higher compared to the other groups.
2. General dentists frequently perceived the orthodontic treatment need as low, possibly due to preferring intervention during the permanent dentition rather than the mixed dentition stage.
3. Pedodontists and lay people rarely perceived the orthodontic treatment need as low. Whereas lay people care about aesthetic problems more than functional problems.
4. Female participants assessed the orthodontic treatment need as higher compared to male participants.
5. Orthodontic treatment need was perceived as lower by participants between the ages of 20-30 years in comparison with the participants above 30 years of age.

Conflict of Interests: The authors declare no competing interests.

Human Ethics and Consent to Participate

This study was approved by University Institutional Review Board and Ethics Committee (Project No:D-KA23/12) and supported by University Research Fund. All procedures performed in the study involving human participiants were accordance with ethical standards of the institutional research committee.

Informed consent was obtained from all survey participants and for intraoral photographs of cases from parents or legal guardians for children included in the study.

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