Parental perceptions of early interceptive orthodontic intervention in children and adolescents: a cross-sectional study

E. García, L. Santos, C. Borrell, J. I. Aura, L. Marqués

Universidad Católica de Valencia, Spain

DOI 10.23804/ejpd.2025.2258

email: juan.aura@uv.es

Abstract

Objective This paper aims to evaluate parental awareness regarding early orthodontic consultation and treatment. Additionally, it seeks to explore the correlation between this awareness and factors such as the number of children per family, their ages, and parental perception of dental issues including overjet, overbite, and malocclusions.

Methods A cross-sectional questionnaire-based approach was conducted. The questionnaire, adapted from a previous study, underwent pilot testing before distribution among parents at the Universidad Católica de Valencia, Spain. A sample size of 216 participants was determined. Criteria included children aged 6–17 attending UCV clinics, with exclusion of those with craniofacial anomalies. Primary variables included parental perception of early orthodontics, with secondary variables such as gender, age, and perceived dental misalignment. Analysis involved Microsoft Excel and Pearson's chi-squared test.

Results After analysing the questionnaire, 81.84% of these parents thought that their children's teeth would have a significant impact on their personality. Moreover, 70.83% parents thought that their children had a problem with their teeth; 107 of these parents consulted a dentist and 87 consulted an orthodontist (27 of these parents initiated orthodontic treatment). The number of children visiting an orthodontist was found to rise with increasing age. Moreover, a perceived overjet was associated with a higher number of orthodontic consultations.

Conclusions Although parent's awareness regarding their children's orthodontic treatment is important, other factors, such as age of the child, the severity of the malocclusion, the perceived overjet and overbite and the consulted dentist, play a role in initiating orthodontic treatment.

KEYWORDS Parent's perception, orthodontic treatment, interceptive treatment, early diagnosis.

Introduction

Early orthodontic interventions aim to identify and guide developmental pathways, focusing on how jaw development influences tooth position. Such proactive measures can reduce the duration and complexity of future treatments and minimise damage to the dentition and supporting structures [Bahreman, 2013]. Early intervention during primary and mixed dentition stages allows for optimal control overgrowth changes and occlusal development, enhancing function, aesthetics, and psychological well-being [Bahreman, 2013; Greco et al., 2021; Bottini et al., 2023].

Interceptive orthodontics, defined by the American Association of Orthodontists, aims to identify and eliminate potential irregularities and disorders in the developing dentofacial complex [Bahreman, 2013; Greco et al., 2021; Gavetti et al., 2023]. The goals of early orthodontic and orthopaedic intervention encompass the correction of evident anomalies, the elimination of primary aetiological factors, the interception of emerging issues, the prevention of exacerbating conditions, the establishment of a conducive environment for occlusal development, the guidance of growth through the removal of occlusal interferences, the management of arch size-tooth size discrepancies, and the reduction of susceptibility to trauma and incisor fractures [Bahreman, 2013; Greco et al., 2021; Gavetti et al., 2023]. This treatment may involve either a single phase or two phases, depending on the patient's age, the stage of dentition, and the nature of the condition. Single-phase treatment targets abnormalities during the primary, mixed, or permanent dentition stages, whereas two-phase treatment addresses skeletal, dental, and neuromuscular conditions through an initial phase followed by a comprehensive phase [Shaw, 1985; Tulloch et al., 1998]. Untreated malocclusions can lead to other oral problems as dental caries, periodontal disease, bone loss, and temporomandibular joint problems, while severe malocclusion can be a social handicap, affecting facial aesthetics and psychological development [Shaw et al., 1985; Tung and Kiyak, 1998]. Early treatment aims to reduce the time and complexity of fixed appliance therapy and minimise damage to occlusion from delayed treatment [Harris and Johnson, 1991; Instituto Maxilofacial, 2019], and aims to optimise normal growth and occlusal development, with genetic and environmental factors playing significant roles [Harris and Johnson, 1991; De Stefani et al., 2021]. This should be particularly considered in Class II and III malocclusions which often require early treatment to control skeletal disharmony, guide tooth eruption, and improve psychosocial outcomes [Tweed, 1963; Ngan et al., 1996; Baccetti et al., 1997; Bishara, 1998; Arvystas, 1998; Mangla et al., 2011; Gavetti et al.,2023]. Parental involvement is crucial in initiating orthodontic care, with parents often aware of their children's occlusal irregularities. Factors influencing the decision to seek treatment include aesthetics, self-esteem, social acceptance, and recommendations from dental professionals. Parents might choose orthodontic care to improve their child's appearance and boost their confidence, while also responding to advice from their dentist regarding the potential long-term benefits of early intervention [Klages et al., 2004; Abu Alhaija et al., 2005; Doğan et al., 2010; Momeni Danaei and Salehi, 2010; Siddegowda, 2013; Aldweesh et al., 2022; Cocchiaro et al., 2024]. This study evaluates parents' knowledge about early orthodontic consultation and treatment and its association with their level of education, number of children per family, children's age, and perceived dental problems.

Material and Methods

A cross-sectional study based on a questionnaire was used to

Question	Response	n	%
Q1: Relation to the child	Mother	162	75%
	Father	35	16.2%
	Tutor	19	8.80%
Q2: Gender of the child	Females	116	53.70%
	Males	100	46.30%
Q3: Age distribution of the children (years)	[6-9]	68	31.48%
	[10-13]	117	54.17%
	[14-17]	31	14.35%
Q4: Number of own children	1	50	23.15%
	2	88	40.74%
	3	48	22.22%
	4	26	12.04%
	>4	4	1.85%

TABLE 1 Demographic information and characteristics of participants in the study

Question	Response	Orthodontist Consultation				Pearson's Chi Squared test of Independence	
		Yes		No			
		n	%	n	%	χ^2	p-Value
Age	6–9	7	8.43	43	66.25	68.4	0.00001
	10–13	57	68.67	20	30.77		
	14–17	19	22.89	2	3.08		
You think that your child's teeth are moving forward	Yes	32	72.73	12	27.27	8.374	0.003806
	No	44	54.32	37	45.68		
There are spaces between the teeth	Yes	28	66.67	14	33.33	0.0485	0.82569
	No	57	68.67	26	31.33		
Your child's teeth are crooked/not in a proper position	Yes	37	71.15	15	28.85	3,9979	0.045557
	No	39	53.32	34	46.58		
You think that a tooth or teeth is/are missing	Yes	12	60.00	8	40.00	0,2404	0.62391
	No	69	65.71	36	34.29		
You think that your child has extra teeth	Yes	8	38.09	13	61.90	8.4595	0.003631
	No	74	71.15	30	28.85		
You are not sure about the problem of your child's teeth but you think that his/her smile is not pleasing	Yes	26	70.27	11	29.73	7.7939	0.005242
	No	45	51.14	43	48.86		

TABLE 2 Association between age, perceived dental issues, and orthodontist consultations in children.

assess parents' perception of early interceptive orthodontics and malocclusion in their children. We utilised an adapted version of a survey previously employed in a study conducted by Hassan et al. [2016] (Appendix 1). Before widespread implementation, a pilot study ensured the questionnaire's comprehensibility and ease of completion. The final questionnaire was distributed through stratified random sampling among parents and guardians at the Universidad Católica de Valencia (UCV), Spain. Parental consent was obtained through a consent form. The study adhered to the Helsinki Declaration and received approval from the Comité de Ética de la Investigación (CEI) de la Universidad Católica de Valencia San Vicente Mártir (UCV/2023-2024/065). The sample size was determined employing a formula appropriate for cross-sectional qualitative studies, utilising the software provided by Fisterra.com, and accounting for an anticipated 15% attrition rate. The initial estimate was augmented by 28, culminating in a total sample size of 216 participants deemed suitable for the study. The selection criteria for the study included both male and female children aged 6 - 17 years attending the UCV clinics. Participation required signed informed consent from the participants. Exclusion criteria were applied to students with craniofacial anomalies and syndromes. As a primary variable, this study examined parents' perception of early interceptive orthodontics. The secondary variables included the child's gender, age, perceived dental misalignment, perceived overjet, and perceived overbite. The questionnaire responses underwent analysis utilising Microsoft Excel Office 2021, with frequencies and percentages reported. To evaluate potential interdependence among responses, Pearson's chi-squared test of independence was conducted, with statistical significance set at $p < 0.05$.

Results

Of the distributed questionnaires, 216 were returned, with one questionnaire being excluded due to improper information provided. Participants were classified into three age brackets: 68 individuals aged 6 - 9 years, 117 individuals aged 10 - 13 years, and 31 individuals aged 14 - 17 years. The most substantial group, comprising 117 participants (54.17%), was in the 10 - 13-year age range. Regarding family size within the sampled population, the distribution was as follows: 40.74% of families had two children, 23.15% had a single child, 22.22% had three children, and 12.04% had four children. A minority, comprising 1.85% of families, reported having more than four children. The demographic characteristics of the sample are presented in Table 1. Overall, most parents (81.94%) expressed the belief that their children's dental condition significantly influenced their personality. Conversely, a minority of 39 parents (18.10%) held the opposite view. Moreover, a total of 153 parents (70.83%) expressed concerns about their children's dental condition. Among these, 47 parents (30.72%) specifically noted issues related to dental alignment, while 5 parents (3.27%) observed crooked anterior teeth, and 2 parents (1.31%) identified protrusion of mandibular anterior teeth. Furthermore, 35 parents (22.88%) cited concerns regarding both the position and alignment of teeth, with an additional 10 parents (6.54%) attributing the issue to the position and symmetry of teeth. Moreover, 42 parents (27.45%) solely attributed the problem to the position of the teeth, while 11 parents (7.19%) attributed it to the symmetry of the teeth. Additionally, one parent (0.65%) identified the issue as stemming from the position and lack of space in the mouth (Figure 1). Within the sample, 107 parents (72.30% of respondents) sought professional dental consultation for their children's perceived dental issues. Subsequently, of these 107 parents, 87 individuals, representing 57.24% of the total sample, pursued further evaluation by an orthodontist. Within the subgroup of 83 parents who sought advice from an orthodontist, 27 individuals (20.00%) elected to proceed with the recommended treatment plan. Among those who initiated treatment, 1 child (3.7% of treated cases) began participation in an orthodontic study, while 5 children (18.52% of treated cases) underwent treatment involving the application of a maxillary expansion device. However, most cases, 21 children (77.78% of treated cases), received orthodontic treatment with brackets (Figure 2). A chi-square test was conducted to assess the correlation between various factors (number of children per family, perceived overjet, spacing between teeth, crooked/inappropriate tooth position, missing teeth, extra teeth) and the need for dental or orthodontic consultations. Results indicated that the number of children per family was not significantly associated with dental consultations ($p = 0.0506$). Demographic data analysis, specifically the number of children per family, did not reveal a significant association with orthodontic consultations ($p = 0.0506$). Forty-one percent of parents who consulted a dentist had two children, while nineteen percent had four or more children. However, a significant association was found between the age of children and the initiation of orthodontic consultations. Analysis of age and perceived dental issues showed that the number of children consulting an orthodontist increased with age ($p = 0.00001$), with 57 (68.67%) of consultations occurring in children aged 10-13 years. Additionally, a perceived overjet and crooked or

Appendix 1

Questionnaire for early orthodontic intervention of interceptive orthodontics for parents

Question	Response Options	Additional Information
Q1: What's your relation to the child (circle) mother/ father/ guardian/ other (if other specify)	mother / father / guardian / other	Specify if other:
Q2: Gender of the child (circle)	male / female	
Q3: Age of the child		
Q4: Number of own children		
Q5: Household monthly income		
Q6: Do you think that your child's teeth would ever have an impact on his/ her personality (circle)	yes / no	
Q7: Do you think your child has problems with the positioning/ alignment/ symmetry of their teeth (circle)	yes / no	If yes, specify the problem:
Q8: Have you ever consulted a dentist about it (circle)	yes / no	
Q9: Have you ever consulted an orthodontist about it (circle)	yes / no	
Q10: If yes, is your child going through treatment to fix it (state the treatment)		Specify the treatment:
Orthodontic questionnaire		
Q1: Do you think your child's teeth are coming forward (circle)	yes / no	
Q2: Are there any teeth missing (circle)	yes / no	
Q3: Are there spaces between teeth (circle)	yes / no	
Q4: Are your child's teeth bent/not in a proper position (circle)	yes / no	
Q5: Do you think your child has extra teeth (circle)	yes / no	
Q6: Does your child have all their permanent teeth (circle)	yes / no	
Q7: Are you unsure about the problem with your child's teeth but you think the child's smile is unpleasant (circle)	yes / no	

malpositioned teeth were significantly associated with increased orthodontic consultations ($p = 0.00380$ and $p = 0.0455$, respectively). Moreover, the presence of extra teeth also displayed a significant association with orthodontic consultation ($p = 0.0036$). Conversely, factors such as tooth spacing and missing teeth showed no significant correlation with orthodontic consultation (Table 2). Among the included children, despite Class I molar relationships being the most prevalent (58.5%), those with Class II (32.7%) and Class III (8.3%) molar relationships were more likely to seek orthodontic consultation (Figure 6). Specifically, 33% of children with Class I molars, 78.87% of those with Class II molars, and 66.66% of those with Class III molars sought orthodontic consultation. Among the patients surveyed for orthodontic consultation (48.15% of the total), various overjet and overbite measurements were recorded. For overjet values, the distribution was as follows: 1 mm (5.09%), 2 mm (30.56%), 3 mm (18.52%), 4 mm (17.13%), 5 mm (10.19%), 6 mm (4.17%), exceeding 6 mm (5.56%), with 6.48% showing a negative overjet. Concerning overbite, the percentages were: 1 mm (8.33%), 2 mm (37.04%), 3 mm (18.52%), 4 mm (6.48%), 5 mm (8.80%), 6 mm (6.94%), and open bite (5.56%). Consultation rates varied based on the severity of malocclusion (Figure 3). Similarly, among those with varying overbite degrees, consultation rates ranged from 8 to 31 individuals, depending on the severity (Figure 4).

Discussion

Currently, preventive and interceptive treatment approaches are crucial in modern medical practice. However, within contemporary orthodontics, there are two distinct perspectives: one supports early intervention before the eruption of permanent teeth, while the other challenges this approach, questioning the efficacy of interceptive treatments [Lahcen and Laila, 2011], although it is important to consider that these early interventions may not completely resolve anomalies but greatly facilitate subsequent orthodontic treatments [Parisi et al., 2024]. According to the American Association of Orthodontists' Council of Orthodontic Education, it is recommended a child's first orthodontic visit by the age of 7 years to detect any of these dental anomalies [American Medical Association, 2024; Carli et al., 2023]. In the present study, most parents (81.94%) expressed the belief that their children's dental conditions significantly influenced their personality. These findings are consistent with previous research conducted by Aldweesh et al. [2022], who reported similar trends (79.35%). This difference in opinions may stem from the understanding that dentofacial appearance is a critical factor in an individual's overall appearance, which significantly contributes to facial beauty [Onyeaso and Sanu, 2005; Hassan et al. 2016; Parisi et al., 2024]. More than half of the parents (70.83%) reported that their children had dental problems, which is consistent with the prevalence found by Aldweesh et al. [2022] (64.5%). In contrast, Hassan et al. [2016] indicated that fewer than half of the parents (48.10%) perceived their child as having dental issues [Aldweesh et al., 2022]. The distribution of parental perceptions regarding their children's dental issues aligns closely with findings of Aldweesh et al. [2022], where 32.50% of the parents reported dental protrusion, 29.75% observed interdental spaces, and 33.35% noted dental misalignment. In our study, 5.5% of parents reported missing teeth, 3.18% suspected extra teeth, and 20.1% were uncertain about specific dental issues but were dissatisfied with their child's smile. The study of Hassan et al. [2016] also shows both similarities and differences, as 26.60% of parents perceived dental protrusion, 25.90% noted interdental spaces, and 28.80% expressed uncertainty about dental issues while finding their child's smile

FIG. 1
Parental concerns regarding their children's dental health

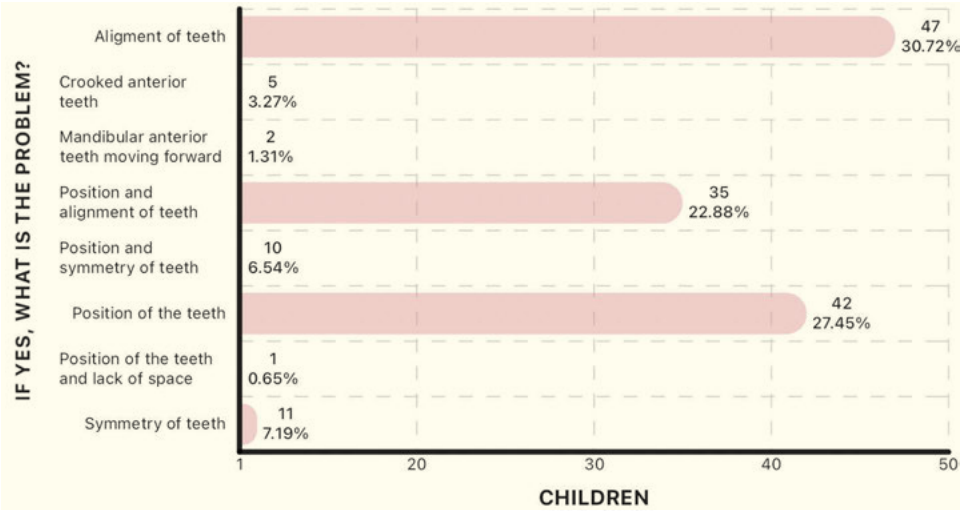


FIG. 2
Initiation of orthodontic treatment in children: timing and types following consultation

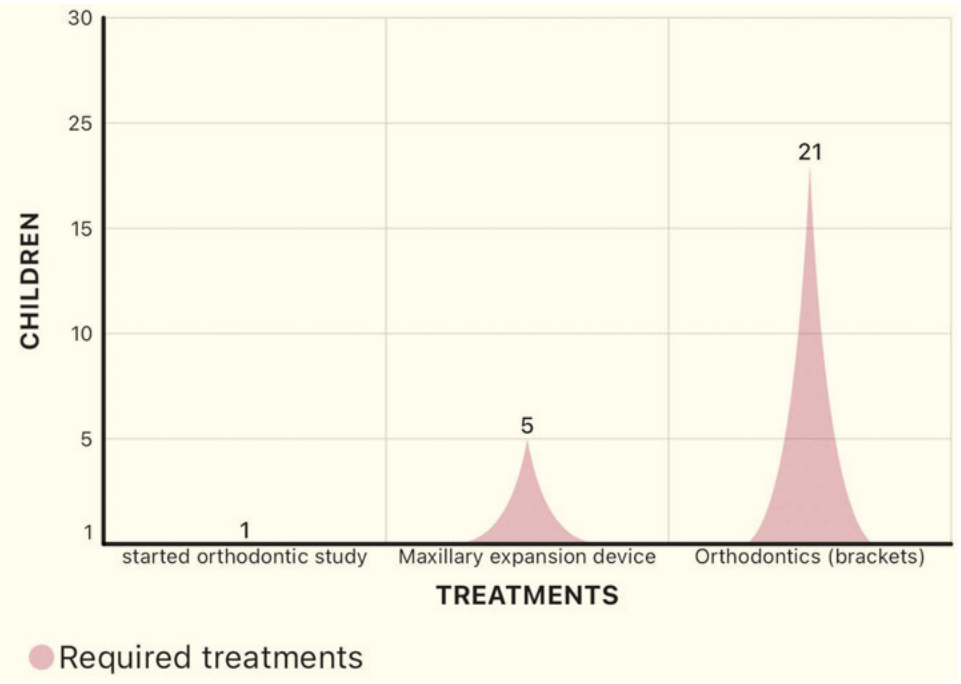
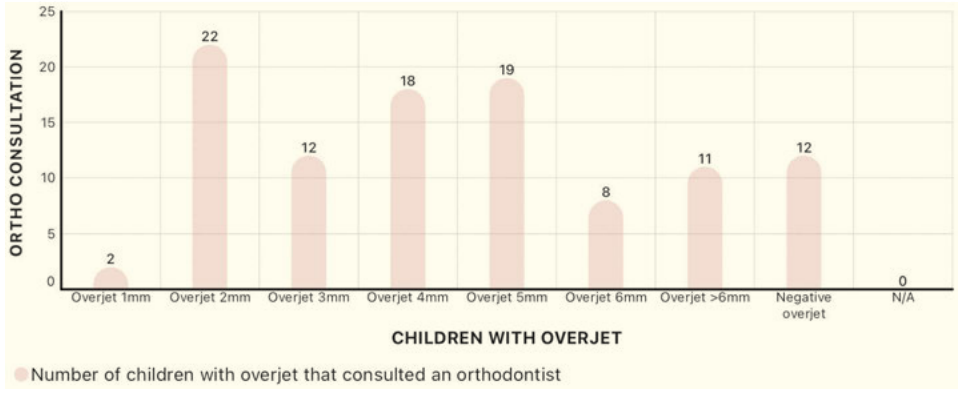


FIG. 3
Orthodontic consultations among children with perceived overjet.



unsatisfactory. Differences include a higher percentage of parents in Hassan et al.'s [2016] study perceiving improper tooth positioning (73.40%) and suspecting extra teeth (16.50%) compared to our findings. Variations in parental perceptions of dental issues can be influenced by factors such as cultural norms, personal experiences, and access to dental care. Parents' own dental experiences and awareness significantly shape their views on their child's oral health. Additionally, disparities in access to dental services can affect how well parents recognise and understand dental problems, with those having better access to dental care being more likely to identify and address concerns promptly. In our study, a significant majority of parents (72.30%)

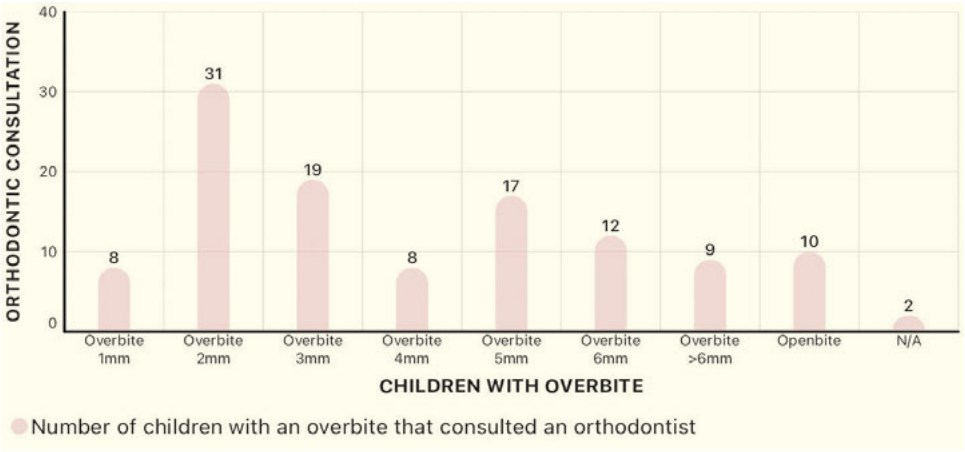


FIG. 4
Orthodontic consultations among children with perceived overbite

sought consultation from a dentist regarding those orthodontic concerns. This proportion exceeded those reported in both the studies by Aldweesh et al. [2022] and Hassan et al. [2016], which documented dentist consultation rates of 65.97% and 51.1% among parents, respectively. This slight variation may be attributed to a higher awareness and recognition of the importance of dental health among parents, leading to an increased likelihood of seeking professional advice and intervention for perceived dental issues. Furthermore, among these parents, a substantial 57.24% opted to consult an orthodontist. Although this figure closely aligns with the attendance rate reported by Hassan et al. [2016] (54.90%), it falls short of the proportion indicated by Aldweesh et al. [2022] (76.02%). Possible explanations for these discrepancies include variations in sample size and geographical location, which could influence access to orthodontic services and parental attitudes towards orthodontic consultation. Additionally, the decision of parents to initiate orthodontic treatment for their child is influenced not only by parental discretion but also by recommendations from other healthcare professionals, such as dentists, speech therapists, and physicians [Birkeland et al., 1996]. Among the parents who sought advice from an orthodontist, 20% disclosed that their children underwent orthodontic treatment (18.52% embarked on treatment involving a maxillary expansion; 77.78% received bracket orthodontic treatment). This pattern contrasts with the observations of Aldweesh et al. [2022] and Hassan et al. [2016], where 54.69% and 58.1% of participants, respectively, proceeded with orthodontic treatment post-consultation. Differences in treatment approaches may arise from factors such as demographic variations, the severity of dental issues, and preferences of parents and clinicians, as well as differences in healthcare systems and access to orthodontic services. Moreover, the treatment methods used in our study were not directly compared with those in previous research, as they were not examined in earlier studies. Pearson's chi-squared test in our study showed no statistically significant association (p=0.0506) between the number of children per household and the likelihood of initiating orthodontic consultations (p>0.05), consistent with Aldweesh et al.'s findings [2022]. Notably, among the parents who sought orthodontic consultation in our study, 40% had two children and 19% had four or more children. This contrasts with Aldweesh et al. [2022], where 30.73% of parents consulting an orthodontist had four or more children. The variance in these proportions may be attributable to differences in sample demographics, cultural factors, or access to dental services. Our study found a significant correlation between children's age and the initiation of orthodontic consultations (p=0.0001), which aligns with Aldweesh et al.'s [2022] findings (p=0.0057). This correlation likely reflects how age-related factors, such as the emergence of dental issues and optimal timing for intervention, influence parental decisions about orthodontic care. The analysis revealed a significant increase in the likelihood of children consulting an orthodontist with age (p=0.00001), with most consultations occurring in the 10-13 age bracket (54.17%). This trend is consistent with Aldweesh et al.'s [2022] findings, where 79.63% of children consulting an orthodontist were 11 years old. These results highlight that as children age, they experience considerable dental development and changes, which often necessitate orthodontic intervention. Older children may also become more aware of their dental appearance, leading to increased consultations for aesthetic or functional issues. Additionally, parental awareness and willingness to pursue orthodontic care generally rise with the child's age, contributing to higher consultation rates in older age groups. Our study found a significant association between perceived overjet and a higher rate of orthodontic consultations (p=0.00380), consistent with Aldweesh et al.'s [2022] findings (p=0.0326). Crooked or malpositioned teeth also showed a significant correlation with orthodontic consultations in our study (p=0.0455), though the authors found this association to be insignificant (p=0.3814). Similarly, the presence of supernumerary teeth was significantly correlated with orthodontic consultations in our study (p=0.0036), contrasting with Aldweesh et al.'s [2022] results, where this correlation was not significant (p=0.5916). Conversely, tooth spacing (p=0.825) and missing teeth (p=0.623) did not show a significant correlation with orthodontic consultations in our study, aligning with Aldweesh et al.'s [2022] findings (tooth spacing: p=0.0597; missing teeth: p=0.5667). In this study, children with a perceived overjet were significantly more likely to consult an orthodontist compared to those without one. This finding is consistent with Aldweesh et al. [2022], which reported that orthodontic consultations increased by 1.5 times with a higher perceived overjet. The higher consultation rates for children with a noticeable overjet may be attributed to concerns about potential malocclusion or misaligned teeth, as well as social norms and heightened awareness of dental aesthetics. However, the overjet measurements used in this study may not be directly comparable to those in previous research due to differences in measurement standards. Kilpeläinen et al. [1993] found that parents of children with an overjet greater than 7 mm were 5.5 times more likely to report their children being teased compared to those with a smaller overjet. Distinct variations were observed in the rates of

orthodontic consultation based on the severity of overbite. These results indicate a trend where more severe overbites correlate with higher consultation rates. However, overbite measurements used in this study may not be directly comparable to those in other research, as measurement standards have varied. In terms of molar classifications, there is a higher inclination for consultation among those with Class II and III molars. This finding aligns with Al-Bitar et al. [2022], who noted increased bullying associated with Class II and III malocclusions. Additionally, Aldweesh et al. [2022] found that parents with personal experience or interest in orthodontics are more likely to pursue such treatment for their children. The study's limitations stem from its exclusive focus on individuals seeking treatment at the clinics of the Universidad Católica de Valencia, potentially restricting the applicability of the findings. Additionally, it did not evaluate parents' understanding of the optimal timing for orthodontic treatment, underscoring the importance of future research in exploring this aspect, as well as parents' awareness of different orthodontic treatment options and appliances. The findings' broader applicability may be compromised due to the necessity for a larger sample including parents from various regions and cities.

Conclusions

- Parents' perceptions of early interceptive orthodontics positively correlate with their attitudes towards its effectiveness.
- Parents perceive their children's dental conditions as significantly impacting their lives.
- Children with Class II and III molar malocclusions, especially those with pronounced overjet and dental misalignment, are more likely to undergo orthodontic consultations.
- Child's age and perceived overjet are the main factors driving the initiation of orthodontic treatment, with older age increasing the likelihood.
- Besides parental awareness, the severity of malocclusion and dentist recommendations are crucial in deciding to start orthodontic treatment.

Acknowledgments

The authors thank the Catholic University of Valencia San Vicente Mártir for their contribution and help in the payment of the open access publication fee. Likewise, they appreciate the encouragement and guidance from their Vice-Rector for Research.

References

› Abu Alhaija ES, Al-Nimri KS, Al-Khateeb SN. Self-perception of malocclusion among north Jordanian school children. Eur J Orthod. 2005 Jun;27(3):292-5. doi: 10.1093/ejo/cjh094. PMID: 15947230.
› Aldweesh AH, Ben Gassem AA, AlShehri BM, AlTowaijri AA, Albarakati SF. Parents' Awareness of Early Orthodontic Consultation: A Cross-Sectional Study. Int J Environ Res Public Health. 2022 Feb 5;19(3):1800. doi: 10.3390/ijerph19031800. PMID: 35162824; PMCID: PMC8835264.
› Al-Bitar ZB, Sonbol HN, Al-Omari IK, Badran SA, Naini FB, Al-Omiri MK, Hamdan AM. Self-harm, dentofacial features, and bullying. Am J Orthod Dentofacial Orthop. 2022 Jul;162(1):80-92. doi: 10.1016/j.ajodo.2021.02.025. Epub 2022 Mar 26. PMID: 35346538.
› American Medical Association, [n.d.]. American Medical Association. [Consulted June 2, 2024]. Available at: https://www.ama-assn.org
› Arvystas MG. The rationale for early orthodontic treatment. Am J Orthod Dentofacial Orthop. 1998 Jan;113(1):15-8. doi: 10.1016/S0889-5406(98)70271-9. PMID: 9457014.
› Baccetti T, Franchi L, McNamara JA Jr, Tollaro I. Early dentofacial features of Class II malocclusion: a longitudinal study from the deciduous through the mixed dentition. Am J Orthod Dentofacial Orthop. 1997 May;111(5):502-9. doi: 10.1016/s0889-5406(97)70287-7. PMID: 9155809.
› Bahreman A. Early-age orthodontic treatment. 2013 Chicago: Quintessence Publ.
› Bishara SE. Mandibular changes in persons with untreated and treated Class II division 1 malocclusion. Am J Orthod Dentofacial Orthop. 1998 Jun;113(6):661-73. doi: 10.1016/s0889-5406(98)70227-6. PMID: 9637570.
› Birkeland K, Boe OE, Wisth PJ. Orthodontic concern among 11-year-old children and their parents compared with orthodontic treatment need assessed by index of orthodontic treatment need. Am J Orthod Dentofacial Orthop. 1996 Aug;110(2):197-205. doi: 10.1016/s0889-5406(96)70109-9. PMID: 8760847.
› Bottini G, De Angelis F, De Luca M, et al. The impact of early orthodontic treatment on the quality of life of children: a systematic review. Eur J Paediatr Dent 2023; 24:45-50.
› Carli E, Fambrini E, Lardani L, Derchi G, Defabianis P. Early orthodontic treatment need in paediatric age: a prospective observational study in Italian school-children. Eur J Paediatr Dent. 2023 Jun 9;24(2):94-98. doi: 10.23804/ejpd.2023.1835. Epub 2023 Apr 1. PMID: 37066972.
› Cocchiaro A, D'Amico C, Mazzarella A, et al. The role of parental perception in the decision-making process for interceptive orthodontic treatment. Eur J Paediatr Dent2024; 25:15-20.
› De Stefani A, Bruno G, Visentin S, Lucchi P, Gracco A. Rapid maxillary expansion for interceptive orthodontic treatment of palatally displaced canine: A systematic review. Eur J Paediatr Dent. 2021 Jun;22(2):139-143. doi: 10.23804/ejpd.2021.22.02.10. PMID: 34238005.
› Doğan AA, Sari E, Uskun E, Sağlam AM. Comparison of orthodontic treatment need by professionals and parents with different socio-demographic characteristics. Eur J Orthod. 2010 Dec;32(6):672-6. doi: 10.1093/ejo/cjp161. Epub 2010 Mar 18. PMID: 20299423..
› Gavetti F, Severino M, Gatto R, et al. Long-term effects of early orthodontic treatment on dental and skeletal relationships: a retrospective study. Eur J Paediatr Dent2022; 23:75-80.
› Greco AM, Gavetti F, Severino M, Gatto R. Use of a modified vertical holding appliance for open bite interceptive treatment in growing patients. Eur J Paediatr Dent. 2021;22(1):35-40. doi: 10.23804/ejpd.2021.22.01.07. PMID: 33719481.
› Harris EF, Johnson MG. Heritability of craniometric and occlusal variables: a longitudinal sib analysis. Am J Orthod Dentofacial Orthop. 1991 Mar;99(3):258-68. doi: 10.1016/0889-5406(91)70007-J. PMID: 1998301.
› Hassan F., Shafique U., Mahmood A. Parental motivation for orthodontic consultation during their child's mixed dentition phase: A questionnaire study. Pak. Orthod. J. 2016;7:51–55.
› Instituto Maxilofacial, 2019. What is a class I, class II or class III bite? [Internet]. [Consulted May 21, 2024]. Available at: https://www.institutomaxilofacial.com/es/2019/11/15/clasificacion-de-la-mordida/
› Kilpeläinen, P.V., Phillips, C., & Tulloch, J.F., 1993. Anterior tooth position and motivation for early treatment. Angle Orthod, 63[3], pp.171-174.
› Klages, U., Bruckner, A., & Zentner, A., 2004. Dental aesthetics, self-awareness, and oral health-related quality of life in young adults. Eur J Orthod, 26[5], pp.507-514.
› Lahcen, O., & Laila, L., 2011. Early Treatments in Orthodontics. In: Principles in Contemporary Orthodontics [Internet]. IntechOpen. [Consulted May 21, 2024]. Available at: https://www.intechopen.com/chapters/24352
› Mangla, R., Singh, N., Dua, V., Padmanabhan, P., & Khanna, M., 2011. Evaluation of mandibular morphology in different facial types. Contemp Clin Dent, 2[3], pp.200-206.
› Momeni Danaei, S., & Salehi, P., 2010. Association between normative and self-perceived orthodontic treatment need among 12to 15-year-old students in Shiraz, Iran. Eur J Orthod, 32[5], pp.530-534. doi: 10.1093/ejo/cjp139. Epub 2010 Jan 27. PMID: 20106996.
› Ngan, P., Hägg, U., Yiu, C., Merwin, D., & Wei, S.H., 1996. Soft tissue and dentoskeletal profile changes associated with maxillary expansion and protraction headgear treatment. Am J Orthod Dentofac Orthop, 109[1], pp.38-49.
› Naretto, S., [2011]. Early Treatments in Orthodontics [Internet]. IntechOpen. [Consulted June 2, 2024]. Available at: https://www.intechopen.com/chapters/24352
› Onyeaso CO, Sanu OO. Perception of personal dental appearance in Nigerian adolescents. Am J Orthod Dentofacial Orthop. 2005 Jun;127(6):700-6. doi: 10.1016/j.ajodo.2003.12.028. PMID: 15953895.
› Parisi, G., Partipilo, E., Gisondi, C., Codro, P., Anastasio, M.D., Brescia, A.V., & Docimo, R., 2024. Aesthetic perception of patient in developmental age in interceptive orthodontic treatment. Eur J Paediatr Dent, 25, p.1.
› Shaw, W.C., Rees, G., Dawe, M., & Charles, C.R., 1985. The influence of dentofacial appearance on the social attractiveness of young adults. Am J Orthod, 87[1], pp.21-26.
› Siddegowda, R., 2013. Awareness of Orthodontic Treatment in School Children of Karnataka State – A Survey. IOSR J Appl Phys, 4, pp.1-6.
› Tessarollo, F.R., Feldens, C.A., & Closs, L.Q., 2012. The impact of malocclusion on adolescents' dissatisfaction with dental appearance and oral functions. Angle Orthod, 82[3], pp.403-409. doi: 10.2319/031911-195.1. Epub 2011 Sep 26. PMID: 21942720; PMCID: PMC8865825.
› Tulloch, J.F., Phillips, C., & Proffit, W.R., 1998. Benefit of early Class II treatment: progress report of a two-phase randomized clinical trial. Am J Orthod Dentofac Orthop, 113[1], pp.62-72, quiz 73-74.
› Tung, A.W., & Kiyak, H.A., 1998. Psychological influences on the timing of orthodontic treatment. Am J Orthod Dentofac Orthop, 113[1], pp.29-39.
› Tweed, C.H., 1963. Treatment planning and therapy in the mixed dentition. Am J Orthod, 49[12], pp.881-906.