

Investigation of Parents' Awareness of Early Orthodontic Evaluation and Treatment in Paediatric Patients: A Cross-Sectional Study



H. Uzunçbuk^{1*}, G. Gökulu², M. M. Marrapodi³, M. Di Blasio^{4*}, M. Cicciù⁵, G. Minervini^{6,7}

¹Trakya University, Faculty of Dentistry, Department of Orthodontics, 22030, Edirne, Turkey

²Mersin City Training and Research Hospital, Pediatric Emergency Division, 33240, Mersin, Turkey

³Department of Woman, Child and General and Specialist Surgery, University of Campania "Luigi Vanvitelli", 80138, Naples, Italy

⁴Department of Biomedical, Surgical and Dental Sciences, University of Milan, Milan, Italy

⁵Department of Biomedical and Surgical and Biomedical Sciences, Catania University, 95123 Catania, Italy

⁶Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University, Chennai, Tamil Nadu, India

⁷Multidisciplinary Department of Medical-Surgical and Odontostomatological Specialties, University of Campania "Luigi Vanvitelli", 80121 Naples, Italy

Email: marco.diblasio@unimi.it

DOI 10.23804/ejpd.2024.2150

Abstract

Objective This study aims to gauge the level of awareness among parents about the importance, timing, and benefits of early orthodontic assessments for their children.

Materials and Methods A questionnaire consisting of 12 questions was created through Google Forms to measure the knowledge about early orthodontic treatment and consultation with the parents of 1821 patients aged 6–11 years admitted to the paediatric service of a training and research hospital and filled out by the parents. The distribution of variables was examined with the Shapiro-Wilk normality test; the independent t test was used in the comparison of paired groups of normally distributed variables; and the chi-square test was used in the comparison of qualitative data. A stepwise logistic regression analysis was performed to determine the effective factors for consultation with the orthodontist.

Results The mean age of the children, the high monthly income, and the educational level of the family of the orthodontist consultant group (yes) were statistically significantly higher than those of the orthodontist non-consultant group (no) ($p = 0.0001$). The mean total number of children of the orthodontist consultant group was found to be statistically significantly lower than that in the non-orthodontist consultant group ($p = 0.003$). There was no statistically significant difference between the orthodontist consultant and non-orthodontist consultant groups in terms of their awareness of their children's dental issues related to tooth position, alignment, or symmetry ($p > 0.05$).

Conclusions The present study found a positive relationship between parents' education and monthly financial income and their knowledge of malocclusions for early orthodontic treatment. Conversely, there was a negative correlation between the number of children parents had and their awareness of malocclusions. The early identification of malocclusions allows orthodontic problems to be corrected with less complex treatment methods.

Introduction

Interceptive orthodontics, sometimes known as early orthodontic treatment, typically begins when a child still has most of their primary teeth and potentially a few of their permanent incisors. The beginning of this treatment phase might occur as early as the age of 6 or 7 [Fleming, 2017; Klumper et al., 2000]. The objective is to promptly identify and rectify any developing orthodontic problems, hence potentially streamlining or obviating the necessity for more extensive intervention in the future [Cicciù et al., 2013; Minervini et al., 2023d; Rosa et al., 2019; Rossi et al., 2022; Shalish et al., 2013]. Early assessment, ideally before the age of 7, as advised by the American and Turkish Association of Orthodontists, enables early detection and management of possible dental abnormalities. Early orthodontic assessment and the identification of malocclusions [abnormalities in tooth and jaw alignment] are crucial as they allow early correction [Giudice et al., 2020; Piancino et al., 2019; Quinzi et al., 2020; Shalish et al., 2013]. Moreover, it can help in determining the cause of misalignment of teeth and prevalent orthodontic issues, which is crucial for successful treatment and strategic public health management [daCosta et al., 2016; Ku et al., 2022; Madiraju et al., 2021; Onyeaso & Isiekwe, 2008; Rapeepattana et al., 2019]. Timely intervention can influence the development of the jaw, regulate the width of the dental arches, and facilitate the proper eruption of permanent teeth [Inchingolo et al., 2022; Malcangi et al., 2022a; Minervini et al., 2023b; Ulug and Özçırpıcı, 2021]. Additionally, it can correct detrimental oral behaviours, minimise the likelihood of damage to prominent teeth in the front, and enhance a child's physical attractiveness and self-confidence [Barzilay et al., 2020; Grippaudo et al., 2020; La Via et al., 2023; Primozi et al., 2021; Parul et al., 2022; Soni et al., 2014]. Timely identification and intervention frequently prevent the progression of more severe complications and may reduce the duration and complexity of treatment in later stages. Early orthodontic treatment is crucial for correcting malocclusions and skeletal anomalies in children. This highlights the need

KEYWORDS orthodontics, paediatrics, early diagnosis, awareness, questionnaire

for early detection, intervention, and parental knowledge in providing successful orthodontic treatment [Aldweesh et al., 2022; Alsaggaf et al., 2022; Bernardi et al., 2019; Campanella et al., 2018; Dinoi et al., 2016; Malcangi et al., 2022b; Minervini et al., 2023a; Kanavakis et al., 2021; Ren et al., 2020].

Early orthodontic consultation is essential for children, and parents' awareness of the most appropriate time for orthodontic consultation significantly impacts children's orthodontic treatment [Aldweesh et al., 2022; Dogan et al., 2010; Nongthombam et al., 2023]. Early assessment and intervention can be vital in reducing the severity of orthodontic problems and eliminating the necessity for significant procedures in the future. Initiating orthodontic treatment at an early stage can produce positive benefits for individuals with functional Class III or severe Class II malocclusion, emphasising the possibility of achieving effective outcomes with early intervention [Almeida et al., 2011; Tseng et al., 2016]. Moreover, early detection of orthodontic abnormalities is essential in motivating patients to act prior to the emergence of persistent difficulties [Badran et al., 2023; Cenzato et al., 2023; Deshmukh et al., 2022; Lanteri et al., 2023; Storari et al., 2023].

When parents have accurate and comprehensive information about early orthodontic treatment, it directly contributes to the health and well-being of their children. Hence, it is crucial for orthodontists and other healthcare practitioners to provide parents with clear and comprehensible information regarding treatment alternatives, the procedure, expected results, and instructions for care [D'Ambrosio et al., 2023; Hansa et al., 2021; Kamran et al., 2022; Moshkelgosha et al., 2016; Paglia, 2023; Price et al., 2017; Tallarico et al., 2023]. Many factors play an important role in determining parents' perceptions and attitudes towards seeking orthodontic treatment for their children. These factors encompass the funding of orthodontic treatment, one's social situation, ethnicity, access to resources, level of literacy, and understanding of malocclusion [Alsaggaf et al., 2022; Minervini et al., 2023c; Minervini et al., 2023d; Sfondrini et al., 2023; Sunnak et al., 2015]. Hence, due to a deficiency in information and awareness, parents may fail to quickly pursue orthodontic treatment for their children. The objective of this study was to assess parents' awareness of early orthodontic consultation and treatment and its correlation with educational attainment, income levels, number of children, age of children, and perceived dental problems.

The null hypotheses of our study are as follows: there is a positive relationship between the educational level of parents and their level of knowledge about early orthodontic consultation and treatment. A correlation exists between the financial level of parents and their awareness of early orthodontic treatment. Parents with higher income levels are more likely to have more knowledge about early orthodontic treatment. There could be a negative correlation between the number of children and parents' awareness of early orthodontic treatment. Parents who observe dental health issues in their children may need additional knowledge regarding early orthodontic treatment, and consultation with orthodontists is more frequent. These hypotheses guided the data collection and analysis processes of our study, and the results obtained play an important role in understanding the factors affecting parents' knowledge about early orthodontic treatment.

Materials And Methods

This research was conducted in accordance with the Helsinki

Declaration, and Toros University approved the protocol (Ethics Committee in Mersin, Turkey (Protocol number: 29, Date: January 26, 2024). All patients gave their written approval to take part in the study.

As in previous studies, our aim was to administer the questionnaire to as many parents as possible within the specified time frame [Aldweesh et al., 2022]. On average, the Department of Paediatrics at Mersin City Training and Research Hospital admits 100 patients every day. Therefore, like previous studies, the duration of the study was determined to be approximately 6 months. According to the current literature, the anticipated percentage of participants who received consultation from an orthodontist for their perceived oral problems is 72.6%. The sample size was calculated using Cochran's equation based on the study by [Alsaggaf et al., 2022]. In the present investigation, a more cautious estimate of 30% was considered. At a 95% confidence interval and 2% margin of error, the expected sample size was 1007 individuals. Our study was conducted by administering the questionnaire form to the parents of patients aged 6-11 years admitted to the Pediatrics Department of Mersin City Training and Research Hospital during their routine paediatric appointments.

In this study, we will collect data by applying questionnaires using Google Forms. After conducting a detailed literature review and addressing the deficiencies in previous studies, the questionnaire form was prepared. A QR code was created with the 'Qrafter' application to make it easier to administer the questionnaire to patients in the waiting room. Thus, the QR code made it easier for parents to fill out the questionnaire on time while waiting for the paediatrician. The questionnaires were asked to be completed by the patients themselves, without any time constraints.

In the questionnaire, parents were asked about the age of their children, how many children they have, their monthly income and education level, whether their children's teeth have an impact on their personalities, whether there is a problem with the position/symmetry of their children's teeth, if there is a problem, what kind of problem it is, whether a dentist or orthodontist has been consulted for this problem, and whether their children have received orthodontic treatment. The questionnaire contains a total of 12 questions. The parents completed the questionnaire on behalf of the child they brought for the examination.

The inclusion criteria are as follows:

- Parents of patients between 6-11 years of age admitted to the paediatric clinic.
- Parents of patients attending routine appointments.
- Individuals who can read and write.

The exclusion criteria are as follows:

- Individuals with limited reading and writing skills.

We achieved the desired number of parents within the timeframe of September 2023 to December 2023, leading to the termination of the survey. The survey received responses from a total of 2000 patients. Of the 179 responses, we found that the questionnaires were incomplete and therefore excluded from the study. The present study is a cross-sectional observational investigation that employed a questionnaire as the primary data collection instrument and was conducted on a total of 1821 parents.

Statistical Analysis

The statistical analyses in this study were conducted using

	Mean±SD	Min-Max
Age of children	8.67±1.49	6-11
Number of own children	3.03±1.35	1-7

TABLE 1 The average age of the children included in the study and the average number of children the parents own.

the NCSS (Number Cruncher Statistical System) 2007 Statistical Software package program, developed in Utah, USA. The study employed various statistical techniques to analyse the data. Descriptive statistics, such as frequency distributions, percentages, mean, and standard deviation, were used. Additionally, the Shapiro-Wilk normality test was used to assess the distribution of variables. The independent t test was employed to compare paired groups of variables that

followed a normal distribution. Lastly, the chi-square test was used to compare qualitative data. A logistic regression analysis was conducted in a sequence of steps to identify the significant factors influencing the possibility of seeking consultation with an orthodontist. We assessed the outcomes using a significance level of $p < 0.05$.

Results

Parents of children aged 6-11 years were included in the study. The mean age of the children was 8.67±1.49 years. The parents had a minimum of 1 child and a maximum of 7 children (Table 1).

The distribution of the responses of the whole parents to the survey questions shown in Table 2 and the distribution of the answers of the parents who answered the question 11 'If yes, have you consulted an orthodontist about this

		n	%
Q1. Relation to the child	Mother	575	31.58
	Father	594	32.62
	Other	652	35.80
Q2. Gender of the child	Male	920	50.52
	Female	901	49.48
Q5. Household monthly income	Low-income level	539	29.60
	Middle-income level	659	36.19
	High-income level	623	34.21
Q6. Education level	Primary School	556	30.53
	Secondary School	395	21.69
	High School	533	29.27
	University	337	18.51
Q7. Do you think your child's teeth will have a significant impact on their personality?	No	882	48.43
	Yes	939	51.57
Q8. Do you think your child has a problem with the position/alignment/symmetry of his/her teeth?	No	1.330	73.04
	Yes	491	26.96
Your child's teeth are protruding forward	No	1.677	92.09
	Yes	144	7.91
There are spaces between the teeth	No	1.680	92.26
	Yes	141	7.74
A tooth or teeth are missing	No	1.754	96.32
	Yes	67	3.68
Your child's teeth are not in the right position	No	1.619	88.91
	Yes	202	11.09
Your dentist said she/he might need orthodontic treatment	No	1.815	99.67
	Yes	6	0.33
The lower teeth are positioned posteriorly due to the relatively diminutive size of the lower jaw	No	1.820	99.95
	Yes	1	0.05
Not sure about the specific dental problem your child has, but the smile as unattractive	No	1.761	96.71
	Yes	60	3.29
Your child has extra teeth	No	1.792	98.41
	Yes	29	1.59
Q10. If YES, have you ever consulted a dentist about this problem?	No	140	28.93
	Yes	344	71.07
Q11. If YES, have you ever consulted an orthodontist about this problem?	No	261	53.70
	Yes	225	46.30
Q12. If YES, is your child receiving the necessary orthodontic treatment?	No	289	59.47
	Yes	197	40.53

TABLE 2 Distribution of the responses of the whole group of parents to the survey questions

problem?' shown in Table 3. Out of the 1821 patients, 486 provided a positive or negative response regarding their consultation with an orthodontist (Tables 2 and 3).

Table 4 displays the distribution of parents who sought advice from an orthodontist (yes) and those who did not (no), based on their responses to the provided questions. The mean age of the children in the orthodontist consultant group (yes) was statistically significantly higher than that of the orthodontist non-consultant group (no) ($p = 0.0001$). The mean total number of children in the orthodontist consultant group was found to be statistically significantly lower than that in the non-orthodontist consultant group ($p = 0.003$). The high monthly income and educational level of the family of the group who consulted an orthodontist were found to be statistically significantly higher than the group who did not consult an orthodontist ($p = 0.0001$). The group of individuals who sought advice from an orthodontist exhibited a statistically significant

increase in the belief that their child's teeth would greatly impact their personality, compared to the group that did not seek orthodontic consultation ($p = 0.039$). The likelihood of consulting a dentist about problems with the alignment of their children's teeth was found to be statistically significantly higher in the group that consulted an orthodontist than in the group that did not consult an orthodontist ($p = 0.0001$). The group that sought advice from an orthodontist had a far greater probability of their children receiving the required orthodontic treatment compared to the group that didn't ask for such advice ($p = 0.0001$) (Table 4).

Comparison of the distribution of parents who consulted (yes) and did not consult (no) an orthodontist according to their awareness of the problems related to the position/alignment/symmetry of their children's teeth is shown in Table 5. There was no statistically significant difference between the orthodontist consultant and non-orthodontist consultant

		Total	
		n	%
Relation to the child	Mother	183	37.65
	Father	183	37.65
	Other	120	24.69
Gender of the child	Male	256	52.67
	Female	230	47.33
Household monthly income	Low-income level	76	15.64
	Middle-income level	162	33.33
	High-income level	248	51.03
Education level	Primary School	84	17.28
	Secondary School	94	19.34
	High School	142	29.22
	University	166	34.16
Do you think your child's teeth will have a significant impact on their personality?	No	109	22.43
	Yes	377	77.57
Do you think your child has a problem with the position/alignment/symmetry of his/her teeth?	No	12	2.47
	Yes	474	97.53
Your child's teeth are protruding forward	No	344	70.78
	Yes	142	29.22
There are spaces between the teeth	No	348	71.60
	Yes	138	28.40
A tooth or teeth are missing	No	421	86.63
	Yes	65	13.37
Your child's teeth are not in the right position	No	286	58.85
	Yes	200	41.15
Your dentist said she/he might need orthodontic treatment	No	480	98.77
	Yes	6	1.23
lower teeth are positioned posteriorly due to the relatively diminutive size of the lower jaw	No	485	99.79
	Yes	1	0.21
Not sure about the specific dental problem your child has, but the smile as unattractive	No	433	89.09
	Yes	53	10.91
Your child has extra teeth	No	460	94.65
	Yes	26	5.35
If YES, have you ever consulted a dentist about this problem?	No	140	28.93
	Yes	344	71.07
If YES, is your child receiving the necessary orthodontic treatment?	No	289	59.47
	Yes	197	40.53

TABLE 3 Distribution of the responses of the parents who answered the question 11 'If yes, have you consulted an orthodontist about this problem?'

				Have you ever consulted any orthodontist?		p
				No (n:261)	Yes (n:225)	
Q1. Relation to the child	Mother	91	34.87%	92	40.89%	0.270+
	Father	99	37.93%	84	37.33%	
	Other	71	27.20%	49	21.78%	
Q2. Gender of the child	Male	140	53.64%	116	51.56%	0.646+
	Female	121	46.36%	109	48.44%	
Q3. Age of the child	Mean±SD	8.49±1.60		9.45±1.41		0.0001*
Q4. Number of own children	Mean±SD	2.78±1.31		2.44±1.22		0.003*
Q5. Household monthly income	Low-income level	54	20.69%	22	9.78%	0.0001+
	Middle-income level	95	36.40%	67	29.78%	
	High-income level	112	42.91%	136	60.44%	
Q6. Education level	Primary School	58	22.22%	26	11.56%	0.0001+
	Secondary School	53	20.31%	41	18.22%	
	High School	82	31.42%	60	26.67%	
	University	68	26.05%	98	43.56%	
Q7. Do you think your child's teeth will have a significant impact on their personality?	No	68	26.05%	41	18.22%	0.039+
	Yes	193	73.95%	184	81.78%	
Q8. Do you think your child has a problem with the position/alignment/symmetry of his/her teeth?	No	5	1.92%	7	3.11%	0.397+
	Yes	256	98.08%	218	96.89%	
Q10. If YES, have you ever consulted a dentist about this problem?	No	135	51.92%	5	2.23%	0.0001+
	Yes	125	48.08%	219	97.77%	
Q12. If YES, is your child receiving the necessary orthodontic treatment?	No	254	97.32%	35	15.56%	0.0001+
	Yes	7	2.68%	190	84.44%	

* Independent t test
+ Chi-Square Test
p < 0.05

TABLE 4 Comparison of the distribution of parents who consulted (yes) and did not consult (no) an orthodontist according to their answers to the questions

		Have you ever consulted any orthodontist?				
		No		Yes		
Do you think your child has a problem with the position/alignment/symmetry of his/her teeth? What are these problems?						
Your child's teeth are protruding forward	No	183	70.11%	161	71.56%	0.728
	Yes	78	29.89%	64	28.44%	
There are spaces between the teeth	No	188	72.03%	160	71.11%	0.823
	Yes	73	27.97%	65	28.89%	
A tooth or teeth are missing	No	219	83.91%	202	89.78%	0.058
	Yes	42	16.09%	23	10.22%	
Your child's teeth are not in the right position	No	164	62.84%	122	54.22%	0.054
	Yes	97	37.16%	103	45.78%	
Your dentist said she/he might need orthodontic treatment	No	257	98.47%	223	99.11%	0.522
	Yes	4	1.53%	2	0.89%	
The lower teeth are positioned posteriorly due to the relatively diminutive size of the lower jaw	No	261	100.00%	224	99.56%	0.281
	Yes	0	0.00%	1	0.44%	
Not sure about the specific dental problem your child has, but the smile as unattractive	No	228	87.36%	205	91.11%	0.185
	Yes	33	12.64%	20	8.89%	
Your child has extra teeth	No	247	94.64%	213	94.67%	0.988
	Yes	14	5.36%	12	5.33%	

+ Chi-Square Test

TABLE 5 Comparison of the distribution of parents who consulted (yes) and did not consult (no) an orthodontist according to their awareness of the problems they think are related to the position/alignment/symmetry of their children's teeth.

		Odds Ratio	95.0% CI	p
Step 1	Age	1.54	1.35-1.75	0.0001
	Constant	44.49%		
Step 2	Age	1.65	1.44-1.90	0.0001
	Number of own children	0.70	0.59-0.82	0.0001
	Constant	37.14%		
Step 3	Age	1.61	1.41-1.85	0.0001
	Number of own children	0.70	0.59-0.82	0.0001
	Household monthly income			0.005
	Low-income level	1.45	0.74-1.84	0.284
	Middle-income level	1.66	0.89-2.10	0.113
	High-income level	2.50	1.39-4.51	0.002
	Constant	41.63%		
Stepwise Logistic Regression Analysis p < 0.05				

TABLE 6 Stepwise logistic regression analysis to determine the effective factors for consultation with an orthodontist.

groups in terms of their awareness of their children's dental issues related to tooth position, alignment, or symmetry ($p > 0.05$) (Table 5).

To determine the effective factors for consultation with an orthodontist, we performed stepwise logistic regression analysis using the variables of the child's age, total number of children in the family, household monthly income, education level, and the impact of the child's teeth on personality. Step 1 identified that high age of the child ($p = 0.0001$) was effective; Step 2 revealed that high age of the child ($p = 0.0001$) and low total number of children in the family ($p = 0.0001$) were effective; Step 3 indicated that high age of the child ($p = 0.0001$), low total number of children in the family ($p = 0.0001$), and high household monthly income level ($p = 0.005$) were effective (Table 6).

Discussion

The American Association of Orthodontists recommends that children have their first orthodontic evaluation by the age of 7. At this stage of development, individuals have a combination of primary and permanent teeth, enabling orthodontists to identify any problems related to jaw growth and the eruption of new teeth. These problems might include severe crossbite, underbite, overbite, and crowding. The main objective of early orthodontic treatment is to take advantage of a child's continuous growth. Phase 1 orthodontic treatment addresses jaw and bite alignment and is typically applied during a child's growth and development stages, usually between the ages of 6 and 11. Phase 2 usually begins once most or all the permanent teeth have erupted, focusing on final tooth alignment and detailed adjustments [Aldweesh et al., 2022; Alsaggaf et al., 2022; Kluemper et al., 2000; Soni et al., 2014]. Thus, this study included parents of children aged 6 to 11 (Table 1).

According to Hassan et al. [2016], Alnaafa et al. [2020], and Dann et al. [1995], the aesthetic aspect of an individual's appearance significantly influences their level of attractiveness. Aldweesh et al. [2022] stated that most parents believed that their children's teeth would have a significant impact on their

lives. In contrast, in this study, almost half of the parents did not believe that their children's teeth had an impact on their lives (51.57% yes, 48.43% no). Moreover, a significant proportion of parents, namely one-third, are not aware that there is a problem with the position/alignment/symmetry of their child's teeth (26.96% yes, 73.04% no). Our study findings suggest that general paediatricians should inform and educate parents about the importance of early orthodontic treatment, which has significant implications for both the oral and general health of the child, to increase parental awareness. Based on our study findings, the number of parents who were aware of their children's oral structures and consulted a dentist for a problem was 344, while the number of those who consulted an orthodontist was only 197. Also, only 197 (40.53%) of them receive the necessary orthodontic treatment (Table 2). The significance of general paediatricians recommending parents to dentists and orthodontists is evident based on these findings. Paediatricians can detect potential orthodontic problems during a general health checkup of children. Timely identification allows for rectifying orthodontic issues with less complex and more efficient procedures.

Aldweesh et al. [2022] found that 76% of parents consulted an orthodontist, and of these, 55% initiated the required orthodontic treatment. This indicates a relatively high rate of parental referrals for early orthodontic treatment. However, the study of Alshahrani and Patil [2014] revealed that almost all the respondents (97%) identified the cases that must be referred to the orthodontist, while more than half (55%) did not know the ideal time to initiate orthodontic treatment. Furthermore, Kamran-Abdullah et al. [2022] found that 53.5% of general dental practitioners and 33% of non-orthodontic specialists practiced orthodontic referral in their practices. In this study, the number of parents who answered the question 'If YES, have you ever consulted an orthodontist about this problem?' was 486 and 377 (77.57%) of them think that their children's teeth have an impact on their personality. At the same time, 474 (97.53%) of them are aware that their children have teeth position/alignment/symmetry problems (Table 3). Based on this outcome, it can be inferred that parents who seek advice from an orthodontist are aware of their children's

malocclusion and recognise it as a concern that will impact their children's personalities and lifestyles. Parents who were aware of the need to visit an orthodontist had a better understanding of their child's malocclusion. However, based on the findings presented in Table 5, they were unable to correctly identify the specific type of malocclusion. The dental and craniofacial characteristics of each child are unique. The orthodontist determines the optimal treatment plan based on this unique anatomical structure. The orthodontist establishes this plan by considering the child's current condition and future dental development.

Aldweesh et al. [2022] found a significant association between this knowledge and the parents' level of education, number of children, and monthly income. Similarly, Alsaggaf et al. [2022] reported that parents' age, educational status, and monthly household income were significantly associated with their awareness about early orthodontic treatment for their children. Furthermore, Moshkelgosha et al. [2016] found a significant effect of higher social class on parents' knowledge and attitude, as well as a beneficial impact of a higher educational level on parents' attitude towards early orthodontic treatment. This indicates that socioeconomic factors play a role in shaping parents' knowledge and attitudes regarding orthodontic treatment for their children. In addition, Uhae et al. [2022] highlighted that there is a higher level of concordance between older children and their parents or caregivers, suggesting that cognitive and communication skills may affect parent-child agreement on orthodontic treatment. This implies that the age of the children may also influence the relationship between parental knowledge and the decision-making process for orthodontic treatment. Our study findings indicate that parents with fewer children, a higher monthly income, and a higher education level had a higher rate of orthodontic consultations. These results are consistent with our null hypotheses at the beginning of the study. It can be concluded that parents with higher socioeconomic status demonstrate higher awareness and consultation rates with orthodontists.

Stepwise regression analysis identifies the most significant variables that explain the variance in a dependent variable. It is a systematic process that involves adding or removing independent variables from the regression model based on their statistical significance. This method aims to select a subset of independent variables that best predict the dependent variable while avoiding issues such as multicollinearity and overfitting [Merlo et al., 2016]. In this study, stepwise logistic regression analysis was utilised to explore the relationship between various factors such as parental education and financial level, the number of children, and their level of knowledge about early orthodontic consultation and treatment. By employing stepwise logistic regression analysis, the researchers determined which of these factors significantly contributes to the understanding of parental knowledge about orthodontic care for their children. This statistical approach allowed for the identification of the most influential variables and their respective impacts on parental awareness and attitudes towards early orthodontic consultation and treatment. In this study, the most effective factors for consulting an orthodontist were found to be the high age of the child, the low total number of children, and high monthly income of the family. It can be said that as the age of the children increases and the socioeconomic level rises, families become more aware of malocclusions.

The present study has some limitations. A survey can identify

correlations between variables but cannot establish causation. For instance, while the study might find a correlation between income levels and awareness of orthodontic needs, it cannot conclusively prove that one causes the other. Furthermore, the current study did not incorporate inquiries evaluating the parents' understanding of the optimal timing for starting orthodontic treatment. Future investigations should prioritise assessing parents' awareness of the optimal timing to initiate orthodontic treatment, their understanding of various orthodontic treatment alternatives, and their knowledge of the availability of different orthodontic appliances. On the other hand, this research was carried out in a location that experiences a substantial population of migrants. Hence, the study's distinctiveness lies in the many ethnic backgrounds of the individuals residing in the region. Furthermore, the sample size is significantly larger in comparison to the research documented in the current body of literature. These characteristics of our study set it apart from other studies.

Conclusions

Parents' awareness of malocclusions for early orthodontic treatment positively correlated with their education and monthly financial income, while negatively correlating with the number of children they had, in the present study. General paediatricians should direct parents of growing and developing children to dentists and orthodontists, as observed in the present study. Paediatricians' referrals will enhance families' and children's awareness of the importance of preventing and intervening early in health issues. The implementation of this multidisciplinary strategy is a crucial healthcare service that has a beneficial impact on the physical and psychological well-being of children.

References

- › Aldweesh AH, Ben Gassem AA, AlShehri BM, AlTowajjri 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
- › Almeida MR, Almeida RR, Oltramari-Navarro PV, Conti AC, Navarro Rde L, Camacho JG. Early treatment of Class III malocclusion: 10-year clinical follow-up. *J Appl Oral Sci*. 2011 Aug;19(4):431-9. doi: 10.1590/s1678-77572011000400022. PMID: 21952927; PMCID: PMC4223798.
- › Alnaafa M, Altamimi Y, Alajlan S, Alateeq N, Almarshedi A, Alsaleh M, Alsuwailem R, Patil S, Alam MK. The parental awareness regarding early orthodontic treatment in Hail city. *Int. Med. J.* 2020, 27, 220–223.
- › Alsaggaf DH, Alqarni MZ, Barayan SA, Assaggaf AA, Alansari RA. Parents' Awareness of Malocclusion and Orthodontic Consultation for Their Children: A Cross-Sectional Study. *Children*. 2022; 9(12):1974. <https://doi.org/10.3390/children9121974>
- › AlShahrani I, Patil S. Diagnosis and Referral of Orthodontic Cases: An Institutional Survey among Dental Graduates. *World Journal of Dentistry*. 2014, 5(1), 33–36. <https://doi.org/10.5005/jp-journals-10015-1254>
- › Badran A, Allam G, Shalaby R. Impact of Dental Features and Treatment of Dental Problems on a Group of Adolescents' Experience of Being Bullied. A Cross-Sectional Study. *Eur J Paediatr Dent*. 2023 Dec 1;24(4):272 - 276. doi: 10.23804/ejpd.2023.1836. Epub 2023 Oct 1. PMID: 37873639
- › Barzilay V, Ratson T, Sadan N, Dagon N, Shpack N. Orthodontic knowledge and referral patterns: a survey of paediatric specialists and general dental practitioners. *Australasian Orthodontic Journal*. 2020;36(1): 55-61. <https://doi.org/10.21307/aoj-2020-007>
- › Bernardi S, Mummolo S, Varvara G, Marchetti E, Continenza MA, Marzo

- G, Macchiarelli G. Bio-morphological evaluation of periodontal ligament fibroblasts on mineralized dentin graft: an in vitro study. *J Biol Regul Homeost Agents*. 2019 Jan-Feb;33(1):275-280. PMID: 30729763
- › Campanella V, Syed J, Santacroce L, Saini R, Ballini A, Inchingolo F. Oral probiotics influence oral and respiratory tract infections in pediatric population: a randomized double-blinded placebo-controlled pilot study. *Eur Rev Med Pharmacol Sci*. 2018 Nov;22(22):8034-8041. doi: 10.26355/eurrev_201811_16433. PMID: 30536353.
- › Cenzato N, Berti C, Cazzaniga F, Di lasio G, Scolaro A, Maspero C. Influence of the type of breastfeeding as a risk or protective factor for the onset of malocclusions: a systematic review. *Eur J Paediatr Dent*. 2023 Dec 1;24(4):329-333. doi: 10.23804/ejpd.2023.2015. PMID: 38015113.
- › Ciccù M, Matacena G, Signorino F, Brugaletta A, Ciccù A, Bramanti E. Relationship between oral health and its impact on the quality life of Alzheimer's disease patients: a supportive care trial. *Int J Clin Exp Med*. 2013 Sep 25;6(9):766-72. PMID: 24179569; PMCID: PMC3798211.
- › daCosta O, Aikins E, Isiekwe G, Adediran V. Malocclusion and early orthodontic treatment requirements in the mixed dentitions of a population of Nigerian children. *Journal of Orthodontic Science*. 2016, 5(3), 81. <https://doi.org/10.4103/2278-0203.186164>
- › D'Ambrosio F, Giordano F, Sangiovanni G, Di Palo MP, Amato M. Conventional versus Digital Dental Impression Techniques: What Is the Future? *An Umbrella Review*. *Prosthesis*. 2023; 5(3):851-875. <https://doi.org/10.3390/prosthesis5030060>
- › Dann C, Phillips C, Broder HL, Tulloch C. Self-concept, Class II malocclusion, and early treatment. *Angle Orthod*. 1995, 65, 411–416.
- › Deshmukh S, Jatania A, Tiwari A, Charde P, Dalvi R. Knowledge and Attitude of General Dentists and Non-Orthodontic Specialists Towards Early Orthodontic Treatment – A Cross-Sectional Analytical Study. *Orthod J Nepal [Internet]*. 2022 Aug. 15 [cited 2024 Mar. 5];12(1):17-22. Available from: <https://nepjol.info/index.php/OJN/article/view/47483>
- › Dinoi MT, Marchetti E, Garagiola U, Caruso S, Mummolo S, Marzo G. Orthodontic treatment of an unerupted mandibular canine tooth in a patient with mixed dentition: a case report. *J Med Case Rep*. 2016 Jun 10;10:170. doi: 10.1186/s13256-016-0923-6. PMID: 27286815; PMCID: PMC4902959.
- › 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.
- › Fleming P. Timing orthodontic treatment: early or late? *Australian Dental Journal*. 2017; 62(S1), 11–19. <https://doi.org/10.1111/adj.12474>
- › Giudice A, Antonelli A, Bennardo F. To test or not to test? An opportunity to restart dentistry sustainably in 'COVID-19 era'. *International Endodontic Journal*. 2020; 53, 1020–1021.
- › Grippaudo MM, Quinzi V, Manai A, Paolantonio EG, Valente F, La Torre G, Marzo G. Orthodontic treatment need and timing: Assessment of evolutive malocclusion conditions and associated risk factors. *Eur J Paediatr Dent*. 2020 Sep;21(3):203-208. doi: 10.23804/ejpd.2020.21.03.09. PMID: 32893653.
- › Hansa I, Katyal V, Semaan SJ, Coyne R, Vaid NR. Artificial Intelligence Driven Remote Monitoring of orthodontic patients: Clinical applicability and rationale. *Seminars in Orthodontics* 2021; 27(2), 138–156. <https://doi.org/10.1053/j.sodo.2021.05.010>
- › 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.
- › Inchingolo AD, Ceci S, Patano A, Inchingolo AM, Montenegro V, Di Pede C, Malcangi G, Marinelli G, Coloccia G, Garibaldi M, et al. Elastodontic Therapy of Hyperdivergent Class II Patients Using AMCOP® Devices: A Retrospective Study. *Applied Sciences*. 2022; 12(7):3259. <https://doi.org/10.3390/app12073259>
- › Kamran M, Saddah R, Alasmari A, Almoammar S, Alnazeh A, Alshahrani I. Awareness of patient's orthodontic problems and referral practices among general dental practitioners and non-orthodontic specialists. *Vojnosanitetski Pregled*. 2022; 79(7), 692–696. <https://doi.org/10.2298/VSP200807026K>
- › Kanavakis G, Halazonetis D, Katsaros C, Gkantidis N. Facial shape affects self-perceived facial attractiveness. *PLoS One*. 2021 Feb 3;16(2):e0245557. doi: 10.1371/journal.pone.0245557. PMID: 33534847; PMCID: PMC7857636.
- › Kluemper GT, Beeman CS, Hicks EP. Early orthodontic treatment: what are the imperatives? *J Am Dent Assoc*. 2000 May;131(5):613-20. doi: 10.14219/jada.archive.2000.0235. PMID: 10832255.
- › Ku JH, Han B, Kim J, Oh J, Kook YA, Kim Y. Common dental anomalies in Korean orthodontic patients: An update. *Korean J Orthod*. 2022 Jul 18;52(5):324-333. doi: 10.4041/kjod21.280. PMID: 35844099; PMCID: PMC9512625.
- › La Via L, Falsaperla D, Merola F, Messina S, Lanzafame B, Borzi SR, Basile A, Sanfilippo F. Comparison of the Airway Anatomy between Infants and Three Paediatric Simulators: A Radiological Study on Premature Anne, Infant AM Trainer and Simbaby Manikins. *Prosthesis*. 2023; 5(3), 602–609. <https://doi.org/10.3390/prosthesis5030042>
- › Lanteri V, Cagetti MG, Ugolini A, Gaffuri F, Maspero C, Abate A. Skeletal and dento-alveolar changes obtained with customised and preformed eruption guidance appliances after 1-year treatment in early mixed dentition. *Eur J Paediatr Dent*. 2023 Sep 1;24(3):180 - 187. doi: 10.23804/ejpd.2023.1727. Epub 2023 Jun 1. PMID: 37337957.
- › Madiraju GS, Ahmed Alabd-Rab Alnabi S, Almarzooq AS. Orthodontic treatment need and occlusal traits in the early mixed dentition among 8-9-year old Saudi children. *Eur Oral Res*. 2021 Sep 1;55(3):110-115. doi: 10.26650/eor.2021836877. PMID: 34746781; PMCID: PMC8547751.
- › Malcangi G, Inchingolo AD, Patano A, Coloccia G, Ceci S, Garibaldi M, Inchingolo AM, Piras F, Cardarelli F, Settanni V, et al. Impacted Central Incisors in the Upper Jaw in an Adolescent Patient: Orthodontic-Surgical Treatment—A Case Report. *Applied Sciences*. 2022a; 12(5):2657. <https://doi.org/10.3390/app12052657>
- › Malcangi G, Inchingolo AD, Patano A, Coloccia G, Ceci S, Garibaldi M, Inchingolo AM, Piras F, Cardarelli F, Settanni V, et al. Impacted Central Incisors in the Upper Jaw in an Adolescent Patient: Orthodontic-Surgical Treatment—A Case Report. *Applied Sciences*. 2022b; 12(5):2657. <https://doi.org/10.3390/app12052657>
- › Merlo J, Wagner P, Ghith N, Leckie G. An Original Stepwise Multilevel Logistic Regression Analysis of Discriminatory Accuracy: The Case of Neighbourhoods and Health. *PLoS One*. 2016 Apr 27;11(4):e0153778. doi: 10.1371/journal.pone.0153778. PMID: 27120054; PMCID: PMC4847925.
- › Minervini G, Franco R, Marrapodi MM, Almeida LE, Ronsivalle V, Ciccù M. Prevalence of temporomandibular disorders (TMD) in obesity patients: A systematic review and meta-analysis. *J Oral Rehabil*. 2023a Dec;50(12):1544-1553. doi: 10.1111/joor.13573. Epub 2023 Aug 27. PMID: 37635375.
- › Minervini G, Franco R, Marrapodi MM, Di Blasio M, Isola G, Ciccù M. Conservative treatment of temporomandibular joint condylar fractures: A systematic review conducted according to PRISMA guidelines and the Cochrane Handbook for Systematic Reviews of Interventions. *J Oral Rehabil*. 2023b Sep;50(9):886-893. doi: 10.1111/joor.13497. Epub 2023 May 24. PMID: 37191365.
- › Minervini G, Franco R, Marrapodi MM, Di Blasio M, Ronsivalle V, Ciccù M. Children oral health and parents education status: a cross sectional study. *BMC Oral Health*. 2023c Oct 24;23(1):787. doi: 10.1186/s12903-023-03424-x. PMID: 37875845; PMCID: PMC10594879.
- › Minervini G, Franco R, Marrapodi MM, Fiorillo L, Cervino G, Ciccù M. Post-traumatic stress, prevalence of temporomandibular disorders in war veterans: Systematic review with meta-analysis. *J Oral Rehabil*. 2023d Oct;50(10):1101-1109. doi: 10.1111/joor.13535. Epub 2023 Jun 23. PMID: 37300526.
- › Minervini G, Franco R, Marrapodi MM, Fiorillo L, Cervino G, Ciccù M. The association between parent education level, oral health, and oral-related

- sleep disturbance. An observational cross-sectional study. *Eur J Paediatr Dent.* 2023e Sep 1;24(3):218-223. doi: 10.23804/ejpd.2023.1910. PMID: 37668455.
- › Moshkelgosha V, Kazemi M, Pakshir H, Safari R. Parental Knowledge and Attitude Towards Early Orthodontic Treatment for Their Primary School Children. *Iranian Journal of Orthodontics.* 2016; 12(2). <https://doi.org/10.5812/ijo.7377>
 - › Nongthombam H, Kumar M, Goyal M, Kumar S, Yadav E. Idiopathic osteosclerosis in a Class III patient treated with facemask therapy and hybrid hyrax- A case report. *Journal of Contemporary Orthodontics.* 2023; 7(1), 47–55. <https://doi.org/10.18231/j.jco.2023.009>
 - › Onyeano CO and Isiekwe MC. Occlusal Changes from Primary to Mixed Dentitions in Nigerian Children. *The Angle Orthodontist.* 2008; 78(1), 64–69. <https://doi.org/10.2319/021207-66.1>
 - › Paglia L. Interceptive orthodontics: awareness and prevention is the first cure. *European Journal of Paediatric Dentistry.* 2023; 24(1), 5. <https://doi.org/10.23804/ejpd.2023.24.01.01>
 - › Parul P, Kumar M, Goyal M, Mishra S, Shaha K, Abrar M. Impact of facial components on the attractiveness of face: A perception-based study. *Am J Orthod Dentofacial Orthop.* 2022 Nov;162(5):e218-e229. doi: 10.1016/j.ajodo.2022.07.012. Epub 2022 Aug 26. PMID: 36031510.
 - › Piancino MG, Di Benedetto L, Maticena G, Deregibus A, Marzo G, Quinzi V. Paediatric Orthodontics Part 3: Masticatory function during development. *Eur J Paediatr Dent.* 2019 Sep;20(3):247-249. doi: 10.23804/ejpd.2019.20.03.15. PMID: 31489827.
 - › Price J, Whittaker W, Birch S, Brocklehurst P, Tickle M. Socioeconomic disparities in orthodontic treatment outcomes and expenditure on orthodontics in England's state-funded National Health Service: a retrospective observational study. *BMC Oral Health.* 2017 Sep 19;17(1):123. doi: 10.1186/s12903-017-0414-1. PMID: 28927396; PMCID: PMC5605975.
 - › Primožic J, Federici Canova F, Rizzo FA, Marzo G, Quinzi V. Diagnostic ability of the primary second molar crown-to-root length ratio and the corresponding underlying premolar position in estimating future expander anchoring teeth exfoliation. *Orthod Craniofac Res.* 2021 Nov;24(4):561-567. doi: 10.1111/ocr.12478. Epub 2021 Feb 28. PMID: 33606329.
 - › Quinzi V, Marchetti E, Guerriero L, Bosco F, Marzo G, Mummolo S. Dentoskeletal Class II Malocclusion: Maxillary Molar Distalization with No-Compliance Fixed Orthodontic Equipment. *Dent J (Basel).* 2020 Mar 18;8(1):26. doi: 10.3390/dj8010026. PMID: 32197301; PMCID: PMC7175134.
 - › Rapeepattana S, Thearmontree A, Suntornlohanakul S. Etiology of Malocclusion and Dominant Orthodontic Problems in Mixed Dentition: A Cross-sectional Study in a Group of Thai Children Aged 8-9 Years. *J Int Soc Prev Community Dent.* 2019 Jul 5;9(4):383-389. doi: 10.4103/jispcd.JISPCD_120_19. PMID: 31516872; PMCID: PMC6714419.
 - › Ren H, Chen X, Zhang Y. Correlation between facial attractiveness and facial components assessed by laypersons and orthodontists. *J Dent Sci.* 2021 Jan;16(1):431-436. doi: 10.1016/j.jds.2020.07.012. Epub 2020 Aug 13. PMID: 33384831; PMCID: PMC7770325.
 - › Rosa M, Quinzi V, Marzo G. Paediatric Orthodontics Part 1: Anterior open bite in the mixed dentition. *Eur J Paediatr Dent.* 2019 Mar;20(1):80-82. doi: 10.23804/ejpd.2019.20.01.15. PMID: 30919650.
 - › Rossi F, Tortora C, Paoletta M, Marrapodi MM, Argenziano M, Di Paola A, Pota E, Di Pinto D, Di Martino M, Iolascon G. Osteoporosis in Childhood Cancer Survivors: Physiopathology, Prevention, Therapy and Future Perspectives. *Cancers (Basel).* 2022 Sep 6;14(18):4349. doi: 10.3390/cancers14184349. PMID: 36139510; PMCID: PMC9496695.
 - › Sfondrini MF, Gallo S, Pascadopoli M, Licari A, Marseglia GL, Gandini P, Turcato B, Nardi MG, Scribante A. The knowledge of orthodontic and craniofacial growth amongst Italian Pediatric Medical Residents for early diagnosis in growing patients: a cross-sectional study. *J Clin Pediatr Dent.* 2023 Nov;47(6):64-73. doi: 10.22514/jocpd.2023.072. Epub 2023 Nov 3. PMID: 37997237.
 - › Shalish M, Gal A, Brin I, Zini A, Ben-Bassat Y. Prevalence of dental features that indicate a need for early orthodontic treatment. *Eur J Orthod.* 2013 Aug;35(4):454-9. doi: 10.1093/ejo/cjs011. Epub 2012 Mar 30. PMID: 22467567.
 - › Soni U, Baheti M, Dash S, Toshniwal N, Baldawa R. Knowledge and awareness of malocclusion among rural population in India. *Asian Pacific Journal of Health Sciences.* 2014; 1(4), 329–334. <https://doi.org/10.21276/apjhs.2014.1.4.6>
 - › Storari M, Serri M, Aprile M, Denotti G, Viscuso D. Bruxism in children: What do we know? Narrative Review of the current evidence. *Eur J Paediatr Dent.* 2023 Sep 1;24(3):207-210. doi: 10.23804/ejpd.2023.24.03.02. PMID: 37668461.
 - › Sunnak R, Johal A, Fleming PS. Is orthodontics prior to 11 years of age evidence-based? A systematic review and meta-analysis. *J Dent.* 2015 May;43(5):477-86. doi: 10.1016/j.jdent.2015.02.003. Epub 2015 Feb 12. PMID: 25684602.
 - › Tallarico M, Cuccu M, Meloni SM, Lumbau AI, Baldoni E, Pisano M, Fiorillo L, Cervino G. Digital Analysis of a Novel Impression Method Named the Biological-Oriented Digital Impression Technique: A Clinical Audit. *Prosthesis.* 2023; 5(4):992-1001. <https://doi.org/10.3390/prosthesis5040068>
 - › Tseng LL, Chang CH, Roberts WE. Diagnosis and conservative treatment of skeletal Class III malocclusion with anterior crossbite and asymmetric maxillary crowding. *Am J Orthod Dentofacial Orthop.* 2016 Apr;149(4):555-66. doi: 10.1016/j.ajodo.2015.04.042. PMID: 27021460.
 - › Uhač M, Zibar Belasic T, Perkovic V, Matijevic M, Spalj S. Orthodontic treatment demand in young adolescents - Are parents familiar with their children's desires and reasons? *Int J Paediatr Dent.* 2022 May;32(3):383-391. doi: 10.1111/ipd.12893. Epub 2021 Nov 28. PMID: 34402117.
 - › Ulug B, Arman Özçirpıcı A. Early Maxillary Expansion with the Ni-Ti Memory Leaf Expander-A Compliance-Free Fixed Slow Maxillary Expansion Screw: A Report of 2 Cases. *Turk J Orthod.* 2021 Jun;34(2):143-149. doi: 10.5152/TurkJOrthod.2021.20154. PMID: 35110164; PMCID: PMC8939589.