

# Oral health-related quality of life of children seeking orthodontic treatment based on child oral health impact profile: A cross-sectional study

G. THIRUVENKADAM, SHARATH ASOKAN, J. BABY JOHN, P. R. GEETHA PRIYA, J. PRATHIBA

## Abstract

**Aims:** The aim of this study was to assess oral health-related quality of life (OHRQoL) using short form (SF) of child oral health impact profile (COHIP) in children aged 11–15 years who sought orthodontic treatment. A comparison was done between these children and age-matched peers who never had or sought orthodontic treatment. **Methodology:** This cross-sectional study included 227 children aged 11–15 years. A total of 110 participants had sought orthodontic treatment at KSR Institute of Dental Science and Research (orthodontic group) and 117 participants from a nearby school who had never undergone or sought orthodontic treatment (comparison group). OHRQoL was assessed with the SF of the COHIP, and malocclusion severity was assessed with the index of orthodontic treatment needs. Data presentation and statistical analysis were performed with the Statistical Package for the Social Sciences Software (Version 19, SPSS, Chicago, IL, USA). The Chi-square test and Fischer exact tests were used to analyze the qualitative data. **Results:** Children with little to borderline treatment needs have a better quality of life when compared to children with definitive treatment needs ( $P = 0.049$ ). No statistically significant difference in COHIP-SF scores was found between boys and girls ( $P > 1.000$ ). In the orthodontic group, children with little to borderline treatment needs were 4.8 times ( $P = 0.037$ ) more likely to report better OHRQoL when compared to children with definitive treatment needs. **Conclusion:** Children who sought orthodontic treatment had lower quality of life scores than those who never had or never sought treatment.

**Keywords:** Child oral health impact profile-short form scale, oral health-related quality of life, index of orthodontic treatment need index

## Introduction

The constitution of the World Health Organization defines quality of life (QoL) as individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns.<sup>[1]</sup> Dealing only with the disease and not the other domains such as environmental, psychosocial, and cultural influences is one of the principal limitations of biomedical paradigm.<sup>[2]</sup> In recent years, there has been a broad paradigm shift from medical model of health care to socioenvironmental model, which involves a change


in aspects that constitute the health and the strategies necessary to construct it.<sup>[3]</sup> Earlier, there was a tendency to treat oral cavity as an autonomous anatomical entity. This approach was challenged by socioenvironmental model of health care necessitating the understanding of physical and social environments as one of the major determinants of health status.<sup>[4]</sup> As a result, an atomistic or reductionist way of thinking was replaced by a more holistic perspective, thereby enhancing the health outcomes and QoL of an individual.<sup>[5]</sup>

Oral health related QoL (OHRQoL) is a rapidly emerging phenomenon, which has surfaced over the past two decades. Locker and Allen defined OHRQoL as “the impact of oral diseases and disorders on aspects of everyday life that a patient or person values, which are of sufficient magnitude, in terms of frequency, severity or duration to affect their experience, and perception of their life overall.”<sup>[6]</sup> In other words, OHRQoL is “a multidimensional construct that reflects (among other things) people’s comfort when eating, sleeping, and engaging in social interaction; their self-esteem; their satisfaction with respect to their oral health.”<sup>[7]</sup> Various studies have demonstrated that oral diseases can have significant influences on the QoL of individuals.<sup>[8-10]</sup> Although common oral diseases are not life-threatening, their outcomes may influence the overall well-being of the individuals. This has resulted in greater clinical focus on improving QoL as a major objective of dental care for conditions like orthodontic problems.<sup>[11]</sup>

The impact of dental esthetics on social acceptance and self-concept dictates the need for evaluating OHRQoL among

*Department of Pedodontics and Preventive Dentistry, KSR Institute of Dental Science and Research, Tiruchengode, Tamil Nadu, India*

**Correspondence:** Dr. Sharath Asokan,  
Department of Pedodontics and Preventive Dentistry, KSR Institute of Dental Science and Research, Tiruchengode - 637 215, Tamil Nadu, India.  
E-mail: asokansharath@yahoo.com

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orthodontic patients. Zhang *et al.* have shown that patients with malocclusion can develop feelings of self-consciousness and shame about their dental condition or feel shy in social contexts.<sup>[12]</sup> Nevertheless, a malocclusion can be perceived differently by the affected person, and a person's self-awareness of the malocclusion might not be related to its severity. A variety of index systems have been developed to measure OHRQoL. Among these, child oral health impact profile (COHIP) and its short form (SF) is the first children's questionnaire to incorporate positive and negative health impacts.<sup>[13]</sup> With its five domains (oral health, functional well-being, social-emotional well-being, school environment, and self-image), the SF of COHIP is an established instrument for measuring OHRQoL in children and adolescents.<sup>[14]</sup> The aim of this study was to assess OHRQoL using SF of COHIP in children aged 11–15 years who sought orthodontic treatment. A comparison was also done between these children and age-matched peers who were not seeking orthodontic treatment.

## Methodology

This cross-sectional study was conducted in the Department of Pedodontics and Preventive Dentistry, KSR Institute of Dental Science and Research (KSRIDSR), Tiruchengode, Tamil Nadu, India from June 2014 to October 2014. The study protocol was approved by the Institutional Review Board and the ethical committee of KSRIDSR. Children with chronic medical conditions, craniofacial abnormalities, untreated severe dental caries, and poor periodontal health status were excluded from the study to prevent possible confounding bias as these conditions could influence their QoL.

Children in the age range of 11–15 years participated in the study. Totally, 115 children who sought orthodontic treatment at KSRIDSR constituted the orthodontic group. Informed consent was obtained from the parents who accompanied their children to the hospital. Only those children who had the consent to participate were included into this study. Five parents did not allow their children to participate in the study (4.3% loss), and hence the orthodontic group had a final sample size of 110 children. All the children in the orthodontic group belonged to private schools in and around Tiruchengode. After the inclusion of children into the orthodontic group, the participants in the comparison group were recruited. This group comprised of 125 age-matched children from a private school in Tiruchengode. The type of school can be used as an alternative indicator for socioeconomic status.<sup>[15]</sup> Hence, matching based on age, place, and socioeconomic status was possible in this study. The purpose of the study was explained to the school authorities, and their approval was obtained. A consent form was sent to each parent along with a question, asking whether their children had already sought or undergone any kind of orthodontic treatment. Eight children were excluded as they already had undergone orthodontic treatment. Therefore, the comparison group

consisted of 117 children (6.4% loss). Hence, the final study sample consisted of 227 children belonging to two groups: The orthodontic group (110) and the comparison group (117). This cross-sectional study carried out over a period of 4 months used a convenience sampling method. Care was taken to include a sample size similar to the study done by Feu *et al.*,<sup>[9]</sup> as this sample size was sufficient to estimate the difference between the comparison group and the orthodontic group, with a power of 80% at a significance level of 0.05.

The OHRQoL of all these children (OHRQoL) was assessed by SF of COHIP-SF. It consists of 19 items (17 negative, 2 positive) forming five conceptually distinct domains. The questionnaire was designed to be completed in 10–15 min. Any difficulties faced by the child in understanding the questions were clarified by the primary investigator (PI). For the 2 positive items, ordinal responses were recorded as “never = 0,” “almost never = 1,” “sometimes = 2,” “fairly often = 3,” and “almost all of the time = 4.” Scoring for the 17 negatively worded items was reversed. Higher COHIP scores reflected more positive OHRQoL while lower scores reflected lower OHRQoL.

After completion of the questionnaires, children were clinically examined to assess malocclusion severity and orthodontic treatment needs using dental health component (DHC) of the index of orthodontic treatment need (IOTN). The malocclusion severity was based on the evaluation of five occlusal traits: Missing teeth, overjet, crossbite, displacements of contact points, and overbite. The most severe occlusal trait was identified for each person, and children were categorized according to it. The DHC of IOTN consists of five grades that have been grouped following validation into Grades 1 and 2 representing “slight or no need for treatment,” Grade 3 representing “borderline” cases, and Grades 4 and 5 representing those in “definitive need of orthodontic treatment.”

Students in the comparison group were examined in their school premises under natural light with adequate illumination (American Dental Association Type III examination). Clinical examination for all the children was done by the PI. To test intra-examiner agreement, 25 children were re-examined approximately 6 weeks later after their initial examination (10 from the comparison group and 15 from the orthodontic group).

Data presentation and statistical analysis were performed with the Statistical Package for the Social Sciences statistical package (Version 19, SPSS, Chicago, IL, USA). The Chi-square test and Fischer exact test were used to analyze the qualitative data. Significance level was set at 0.05. Kappa statistics was used to evaluate the consistency of intra-examiner reliability.

For COHIP-SF analysis, all the 19 ordinal responses were summed to produce an overall score that could range from

0 to 76, with higher score indicating better OHRQoL. In the statistical analysis, COHIP-SF scores were transformed into a dichotomous variable using a cut-off value, the median for the whole sample ( $n = 227$ ). Scores higher than median value indicate better QoL, while lower scores indicate lower QoL. A score of sometimes, fairly often, and almost all of the time was used to indicate participants who had experienced at least some oral health impact. For the DHC scores (range, 1–5), subjects with scores  $>3$  were considered to have an objective orthodontic treatment need. These determinations of orthodontic treatment needs were based on the cut-off points for index dichotomization of Mandall *et al.*<sup>[16]</sup>

## Results

Intra-examiner reliability was very good (Kappa, 0.91), indicating substantial consistency in DHC assessment. The median value for the whole sample ( $n = 227$ ) was 59. Thus, COHIP-SF scores higher than 59 were considered to reflect positive OHQoL and those lower than or equal to 59 indicated lower OHQoL. The mean age of the orthodontic group and comparison group were  $12.99 \pm 1.36$  years and  $13.01 \pm 1.41$ , respectively ( $P = 0.91$ ).

Table 1 shows the distribution of study sample, according to gender and treatment needs. Table 2 shows the distribution of DHC component of IOTN in both the groups based on index dichotomization.

Overall, children with little to borderline treatment needs have better QoL when compared to children with definitive treatment needs (odds ratio [OR] = 1.88, confidence interval [CI] = 1.03–3.43,  $P = 0.049$ ). COHIP-SF scores were significantly higher in comparison group when compared to children who seek orthodontic treatment (OR = 1.99, CI = 1.17–3.38,  $P = 0.0117$ ). However, no statistically significant difference in COHIP-SF scores was found between boys and girls (OR = 1.03, CI = 0.609–1.72,  $P > 1.000$ ) as shown in Table 3.

In the orthodontic treatment group, children with IOTN-DHC scores of 1–3 were 4.8 times (OR = 4.87, CI = 2.039–11.69,  $P = 0.037$ ) more likely to report better OHRQoL when compared to children with definitive treatment needs (Scores 4–5). Even though girls reported better COHIP-SF

scores than the boys, the difference was not statistically significant (OR = 1.03, CI = 0.478–2.22,  $P > 1.000$ ) [Table 4]. Self-image, social-emotional well-being, and oral health well-being were the most negatively affected domains in both boys and girls. However, girls were comparatively more negatively affected than the boys [Table 5].

## Discussion

OHRQoL is a multidimensional phenomenon that records an individual's well-being and perceptions. It can play an important role in understanding subjective evaluations. The subjective evaluation of an individual in healthcare decision-making process leads to a change in dynamics of clinical practice and health outcomes.<sup>[17]</sup> OHRQoL instruments may be used in clinical practice as they reflect “a better understanding of treatment needs and outcomes from the patient's perspective.”<sup>[18]</sup>

This cross-sectional study was done to assess the relationship between OHRQoL and orthodontic treatment needs in adolescents with reliable and valid instruments: The COHIP-SF and the DHC of IOTN. Various other instruments are available to measure the QoL in children. Michigan OHRQoL<sup>[19]</sup> and the early childhood oral health impact score<sup>[20]</sup> are targeted for preschool children. The child perceptions questionnaire (CPQ) was the first instrument created for school-aged children. It has been validated for children 8–10 years (CPQ<sub>8-10</sub>)<sup>[21]</sup> and 11–14 years (CPQ<sub>11-14</sub>).<sup>[22]</sup> In 2011, the pediatric OHRQoL was created and had been validated for use in preschool, school-aged, and preteen children.<sup>[23]</sup> None of these instruments includes positive and negative items to assess the QoL. As both are needed to encompass all aspects of well-being, the COHIP scale was introduced.

The original COHIP, developed by Broder *et al.* in 2007, consists of 34 items (28 negative, 6 positive).<sup>[24]</sup> Later in 2012, a SF of COHIP was developed, which contains 19 items (17 negative, 2 positive). Reliability and validity testing verified that the COHIP-SF had good psychometric properties and can be used as a stable instrument to measure OHRQoL across school-aged pediatric populations.<sup>[14]</sup> Even though COHIP-SF is suitable for ages between 8 and 15 years, children in the age range of 11–15 years were selected for

**Table 1: Distribution of study sample according to gender and treatment needs**

Treatment needs (IOTN-DHC)	Comparison group (n=117) (%)		Orthodontic group (n=110) (%)		Total (%)
	Boys	Girls	Boys	Girls	
Little/no need	21 (17.94)	29 (24.78)	15 (13.63)	27 (24.54)	92 (40.52)
Borderline need	23 (19.65)	14 (11.96)	18 (16.36)	20 (18.18)	75 (33.03)
Definitive need	16 (13.67)	14 (11.96)	13 (11.81)	17 (15.45)	60 (26.43)
Total	60 (51.3)	57 (48.7)	46 (41.8)	64 (58.2)	227

Boys=106 (46.7%), Girls=121 (53.3%). IOTN-DHC: Index of orthodontic treatment need-dental health component

**Table 2: Distribution of DHC component of IOTN in comparison and orthodontic group**

IOTN-DHC	Comparison group (%)	Orthodontic group (%)	Total
Score 1-3	87 (74.4)	80 (72.7)	167
Score 4-5	30 (25.6)	30 (27.3)	60
Total	117	110	227

IOTN-DHC: Index of orthodontic treatment need-dental health component

**Table 3: Association between IOTN-DHC, groups, gender, and COHIP-SF scores**

Variables	>59 (higher OHRQoL)	<59 (lower OHRQoL)	OR	CI	P*
IOTN-DHC					
Score 1-3	93	74	1.88	1.03-3.43	0.049
Score 4-5	24	36			
Groups					
Comparison group	70	47	1.99	1.17-3.38	0.0117
Orthodontic group	47	63			
Gender					
Boys	55	51	1.03	0.609-1.72	>1.000
Girls	62	59			

\*Fisher exact test. OR: Odds ratio; CI: Confidence interval; IOTN-DHC: Index of orthodontic treatment need-dental health component; COHIP-SF: Child oral health impact profile-short form; OHRQoL: Oral health-related quality of life

**Table 4: Association between IOTN-DHC, gender and COHIP-SF scores within the orthodontic group**

Variables	>59 (higher OHRQoL)	<59 (lower OHRQoL)	OR	CI	P*
IOTN-DHC					
Score 1-3	39	41	4.87	2.039-11.69	0.037
Score 4-5	8	22			
Gender					
Boys	19	27	1.03	0.478-2.22	>1.000
Girls	26	38			

\*Chi-square test. OR: Odds ratio; CI: Confidence interval; IOTN-DHC: Index of orthodontic treatment need-dental health component; COHIP-SF: Child oral health impact profile-short form; OHRQoL: Oral health-related quality of life

**Table 5: Impact percentage of boys and girls in the orthodontic group on the specific domains of COHIP-SF**

Domains	Impact percentage	
	Boys	Girls
Self-image	45.5	49.5
Social-emotional well-being	36.7	39
Oral health well-being	36	38.6
School environment	27	18.5
Functional well-being	20	18

COHIP-SF: Child oral health impact profile-short form

this study, as they are capable of abstract thinking, reckoning about timing of past events, and correlating them with their experiences.<sup>[25]</sup>

The IOTN was described by Brook and Shaw and modified by Richmond (1990).<sup>[26]</sup> It consists of two components, DHC and esthetic component and is known to provide reliable and practical results. In various populations, malocclusion was examined using the IOTN, and the reproducibility of IOTN has been proven.<sup>[27,28]</sup> However, the major disadvantage of this index is risk of insensitivity and its inability to map the minor irregularities about which a patient is deeply concerned.<sup>[29]</sup> Only DHC of IOTN was used in this study to ascertain the need for orthodontic treatment.

Similar to the previous literature, more girls sought dental treatment than boys during the recruitment period of this study.<sup>[30,31]</sup> It was not surprising to find that those children who sought orthodontic treatment had more negative OHRQoL impacts since these conditions may cause discomfort at school and other social situations.<sup>[32]</sup> In this study, orthodontic treatment needs had almost similar impact on the OHRQoL of both males and females. This is in concordance with the study done by Feu *et al.*<sup>[9]</sup> and in contrast to the studies done by Tung and Kiyak<sup>[33]</sup> and Oliveira and Sheiham<sup>[11]</sup> who demonstrated that children with definitive treatment need had no overall health impact. A study done by Calis *et al.* demonstrated that boys scored significantly lower (higher impact) on the subscales “oral symptoms” and “emotional well-being” than girls.<sup>[34]</sup> However, in this study, impact was higher in girls than boys. The domains that were more negatively affected were in the order of self-image, social-emotional well-being, and oral well-being. Their greatest impact was at the psychosocial level. Feu *et al.* have shown that the individual personality behavior probably has an impact on OHQOL and making negative impacts might not be dependent on malocclusion severity.<sup>[9]</sup>

Esthetics and appearance assume paramount importance during adolescence. Children who seek orthodontic treatment are concerned of improving their appearance and social acceptance. Apart from improving oral function, health, and esthetics, it is important to enhance self-esteem and QoL of an individual through orthodontic treatment.<sup>[33]</sup> The OHRQoL questionnaire, as a part of treatment planning, could help to identify the individuals’ perceptions and thereby enhance their satisfaction to the treatment outcome.

**Conclusion**

Within the limitations of this cross-sectional study, it could be demonstrated that children who sought orthodontic treatment had lower QoL than those who had never sought treatment. There was no significant difference in the impact on OHRQoL between boys and girls.

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