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# Impact of Malocclusions on Quality of Life from Childhood to Adulthood

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## 1. Introduction

Malocclusions constitute a misalignment of the dental arches related to changes in the growth and development of the craniofacial system that affects both function and aesthetics and therefore exerts an influence on quality of life and social interactions [1-3]. High prevalence rates make malocclusions a worldwide public health problem [4].

Over the years, oral health-related quality of life (OHRQoL) measures have been used as a complement to the assessment of treatment needs as well as the prioritization of dental care and the evaluation of the outcomes of treatment strategies [5]. According to the World Health Organization [4], quality of life is the perception one has regarding one's position in life in the cultural context and the system of values in which one lives in relation to one's goals, expectations, standards and concerns. As oral health is an integral part of general health, OHRQoL is a multidimensional concept related to the impact of adverse oral conditions on psychosocial and functional well-being [6-8].

A number of assessment tools consider self-reported OHRQoL in different age groups. The use of such measures is of utmost importance, as the analysis of the results complements clinical indicators and allows the identification of the impact of oral problems, such as malocclusions, which can affect one's general well-being [9]. These assessment tools allow orthodontists to determine the consequences of malocclusion, which favors the prevention or early treatment of conditions that exert a negative impact on quality of life [10]. Indeed, orthodontic treatment is generally associated with gains in quality of life due to improvements in physical, social and psychosocial aspects [11]. As the assessment of quality of life has become an integral part of health programs, addressing this issue can contribute to the expansion of

knowledge on the importance of preventive and/or interceptive orthodontics to reduce the negative impact of malocclusions on quality of life in different age groups.

### **1.1. Aim of the chapter**

The aim of this chapter is to give a detailed description of the negative impact of malocclusions on the quality of life of individuals in different age groups (children, adolescents and adults) as well as the effect of orthodontic treatment on OHRQoL. Some of the main tools used to measure OHRQoL and the influence of the severity and type of malocclusion on quality of life are also discussed.

## **2. Problem statement**

Like other adverse oral conditions, malocclusions are highly prevalent and can have consequences that affect physical and economic well-being, thereby exerting a negative impact on quality of life [12-14]. It is common for individuals with malocclusion to develop strategies, such as hiding their teeth and avoiding smiling, and develop social anxiety, emotional insecurity, fear and difficulty regarding personal relationships [15, 16]. These aspects increase the negative impact on quality of life. Indeed, recent studies report that malocclusions stand out among the main problems that affect OHRQoL due to the impact on function, appearance, interpersonal relationships, socialization, self-esteem, and psychological well-being [12, 13].

Individuals with attractive physical characteristics make a better impression on others and obtain more privileges due to their appearance [17]. In contrast, individuals who do not display the aesthetic standards imposed by society tend to provoke negative expectations and are often forced to support greater burdens of responsibility. Studies in the field of psychology demonstrate that individuals with a more attractive appearance are considered more capable, have more friends and attain greater professional success, all of which exerts a direct influence on quality of life [16, 17, 18].

The investigation into the physical, psychological, and social impacts of malocclusions on OHRQoL allows a better understanding of the desire for orthodontic treatment. Thus, OHRQoL may be considered the best subjective measure for orthodontic treatment needs [13], as the social and psychological effects of malocclusion are often the main reason for seeking treatment. Moreover, the results of subjective measures can contribute to the establishment of public health policies and the allocation of financial resources directed at the treatment of malocclusions [14].

## **3. Application area**

Subjective measures for the assessment of OHRQoL should complement clinical indicators for the evaluation of treatment needs in oral health as well as the prioritization of care and the

evaluation of the outcomes of treatment strategies [5]. Indeed, the sole use of normative clinical measures for the evaluation of treatment needs poses limits on the reliability of the findings by overlooking psychosocial and behavioral aspects [1-3, 5, 9-15]. The assessment of orthodontic treatment needs is traditionally performed using measures such as the Index of Orthodontic Treatment Need (IOTN) [14, 18]. However, orthodontists should consider the fact that malocclusion can be perceived differently by the affected person. Therefore, when evaluating the impact of malocclusion, it is important to consider the different aspects of life that can be affected and the individual's perception of the severity of the condition, as some individuals with severe malocclusion may be satisfied with or indifferent to their dental aesthetics, whereas others may be concerned about minor irregularities [14].

#### **4. Method used**

Retrospective and prospective longitudinal studies, randomized control trials, cross-sectional studies, systematic reviews, and meta-analyses that evaluated the impact of malocclusions and/or orthodontic treatment on the OHRQoL of children, adolescents, and adults were used in the drafting of this chapter. Studies were selected from electronic databases (MEDLINE, EMBASE, Cochrane, Web of Science and others) with no language restriction. Thus, the information presented is comprehensive.

#### **5. Research course, status, and results**

The criteria employed for the selection of articles led to the most important recently published studies. Most of the studies cited in this chapter have a cross-sectional design, which offers a low degree of scientific evidence and does not allow the precise prediction of the interaction between malocclusion/orthodontic treatment and OHRQoL. Part of this insufficient evidence may be explained by the different methodological criteria employed, such as different sample sizes, study populations, and OHRQoL assessment tools. The lack of longitudinal studies that determine the causal relationship between malocclusion/orthodontic treatment and OHRQoL is partially due to the recent development of assessment tools used to investigate the impact of adverse oral conditions on quality of life. Thus, over time, well-designed studies should contribute toward scientific evidence on this issue.

In the literature, most studies involving preschool children state that malocclusions are often not associated with a negative impact on OHRQoL [17-23]. In schoolchildren and adolescents, however, the position of one's teeth is reported to exert an impact on smiling, socializing and speaking [24]. Malocclusion in these age groups is also associated with functional limitations, psychological discomfort and psychological disability [25]. Moreover, severe malocclusion exerts a greater impact on social, emotional, and functional aspects [12, 26, 27]. Impaired aesthetics due to malocclusion has been reported to affect the quality of life in schoolchildren [28]. Moreover, the desire for orthodontic treatment among adolescents is associated with most

types of malocclusion [29]. Malocclusions can also have a significant negative impact on OHRQoL among adults [30]. A recent study reports that the improvement in aesthetic satisfaction due to the treatment of severe malocclusion improves OHRQoL mainly by reducing levels of psychological discomfort and psychological disability [31].

### 5.1. Impact of malocclusions on the OHRQoL of preschool children

According to the literature, the prevalence of malocclusion ranges from 26.0% [32] to as high as 87.0% [33]. Anterior open bite (Figure 1), anterior crossbite (Figure 2), and posterior crossbite (Figure 3) are the most common types of malocclusion found in the primary dentition [34, 35]. Anterior open bite is defined as a lack of vertical overlap between the primary incisors not less than 3 mm [36]. Anterior crossbite is a vestibular-lingual alteration in the positioning of the upper and lower incisors, with an inversion of the occlusion in which the upper incisors occupies a lingual position in relation to the lower incisors [37]. Posterior crossbite is defined as a transverse discrepancy in the relationship between dental arches, in which the palatal cusps of one or more upper primary teeth do not occlude in the central fossa of the lower teeth [38].



Figure 1. Anterior open bite in deciduous teeth



Figure 2. Anterior crossbite in deciduous teeth



**Figure 3.** Posterior crossbite in deciduous teeth

The majority of studies that evaluate the impact of malocclusion on OHRQoL among preschool children employ the Early Childhood Oral Health Impact Scale (ECOHIS) [8]. This questionnaire has been translated, tested, and validated for use in different countries [39-47] and is administered to parents/caregivers in interview form. The ECOHIS is composed of 13 items distributed between the Child Impact Section, which has four subscales (symptoms, function, psychology, and social interaction/self-image), and Family Impact Section, which has two subscales (parental distress and family function). Each item is scored using a five-point scale, with responses ranging from "never" (0) to "very often" (4). The individual subscales scores are calculated through the sum of the response codes and the total score ranges from 0 to 52, with higher scores denoting a greater negative impact on quality of life. 'I don't know' responses (score 5) are excluded from the total ECOHIS score.

A number of studies report that parents/caregivers may have a limited view of the oral health status of their children [48-50]. Thus, parents/caregivers interviewed in studies involving the use of the ECOHIS may have had difficulty recognizing the contribution of malocclusion to a reduction in the quality of life of their children, since the items on this questionnaire seem to have greater sensitivity to the detection of the impact of early childhood caries, as demonstrated in previous studies [21, 22, 51-53]. Moreover, parents may not feel that malocclusions are as worrisome as other oral conditions and generally only perceive impact when an abnormality is obvious and has a psychological and/or social impact on the child.

## **5.2. Impact of malocclusion and orthodontic treatment on OHRQoL among children and adolescents**

Most orthodontic patients are children and adolescents [54, 55], who are directly influenced by the school environment, and those with better interpersonal relationships achieve a higher level of learning and academic development [56]. Moreover, attractive individuals are regarded as friendlier, more interesting and more social [57, 58].

Irregularities in the position of the teeth and jaws exert a significant impact on the attractiveness of the smile and quality of life. In the school setting, such irregularities can affect social interactions, interpersonal relationships and mental well-being and may lead to a feeling of

inferiority [59]. Indeed, children and adolescents with malocclusions can be the target of teasing and name calling [56]. Studies have demonstrated that young people with unsatisfactory dental aesthetics are sadder than those without such problems [58-62]. A disharmonious smile is the main reason for this sadness and can lead to low self-esteem, thereby impacting quality of life [58-62]. Thus, orthodontic treatment can have a positive effect on children and adolescents who experience teasing due to malocclusions [63, 64].

The face is a slightly stronger indicator of overall attractiveness than the body [65] and most parents seek specialized orthodontic care for their children to improve dental aesthetics as well as overall appearance. A number of studies have demonstrated that normative clinical criteria lead to an underestimation of problems in comparison to the subjective assessment of the affected individual [56, 57, 66]. It is therefore important for orthodontists to identify factors that directly motivate parents in order to design a treatment plan that meets the real needs of the patient and is not merely based on normative clinical indicators.

The main reasons children and adolescents seek orthodontic treatment are dissatisfaction with their dentofacial appearance, recommendations from a dentist, and the influence of school-mates who wear braces [28, 58, 67, 68]. Gender, age, intellectual level, social class, malocclusion severity, and self-perceived facial aesthetics have also been found to be associated with the desire for orthodontic care [56, 69, 70]. Studies report that upper anterior crowding  $> 2$  mm and parents' perceptions of their child's need for treatment are also factors associated with the desire for orthodontic treatment in adolescents [29]. In the study cited, the authors state that this type of malocclusion has an impact on quality of life of adolescents.

The first assessment tool designed to measure the impact of oral problems on the life of children was designed by Jokovic et al. (2002) and denominated the Child Oral Health Quality of Life Questionnaire (COHQoL). The COHQoL scales were designed to be generic assessment tools to be used as indicators in examinations, tests, and clinical practice and it is therefore necessary to investigate the performance of the COHQoL in different populations and clinical situations [7]. The Child Perceptions Questionnaire for children aged 8–10 years (CPQ<sub>8-10</sub>) and adolescents aged 11–14 years (CPQ<sub>11-14</sub>) make up part of the COHQoL [71, 72]. According to Locker et al. (2007) [73], the CPQ allows the discrimination of different clinical situations in groups of children and can be used with children in need of orthodontic treatment. The CPQ<sub>8-10</sub> has 29 items divided among 4 subscales (oral symptoms, functional limitations, emotional well-being, and social well-being) and addresses the influence of oral health status in the previous month.

A recent systematic review reports that there is strong scientific evidence that malocclusions have negative effects on the OHRQOL of children and adolescents, especially with regard to emotional and social well-being [74]. According to Martins-Júnior et al. (2012) [12], more severe malocclusions, such as upper anterior irregularity  $\geq 2$  mm, anterior open bite  $\geq 2$  mm and diastema  $\geq 2$  mm, have a greater impact with regard to social, emotional, and functional aspects among children aged 8–10 years. A recent study using the CPQ<sub>8-10</sub> found that anterior segment spacing and anterior mandibular overjet were significantly associated with a negative impact

on OHRQoL in schoolchildren [27]. In another study, increased overjet and a spaced dentition were the malocclusions with the greatest impact on OHRQoL [75].

Orthodontic treatment is associated with gains in physical, social, and psychosocial aspects of quality of life [63, 64, 76]. According to Agou et al. (2008) [77], COHQoL assessment tools are adequate for the evaluation of changes in the OHRQoL of children following orthodontic treatment. However, poor oral hygiene, speech impairment, and tooth mobility have been associated with the use of fixed orthodontic appliances, demonstrating a negative influence on the quality of life of adolescents during treatment [78].

Besides the CPQ, other measures have been used to assess whether orthodontic treatment affects OHRQoL among adolescents. A study involving the Oral Impacts on Daily Performance (OIDP) [79] and the shortened version of the Oral Health Impact Profile (OHIP-14) [80] evaluated OHRQoL among adolescents using the Index of Orthodontic Treatment Need (IOTN) and found that adolescents who had completed orthodontic treatment had better OHRQoL than those under treatment and those who had not been submitted to treatment.

A recent study compared normative methods of orthodontic treatment needs with the sociodental approach in 12-year-old students and correlated normative measures of malocclusion with the impact of oral health on daily activities [81]. The authors determined normative orthodontic treatment needs using the IOTN and DAI. The sociodental approach combines normative measures, the impact of malocclusion on daily activities (OIDP), and a propensity-related orthodontic treatment assessment. Substantial reductions in normative need estimates for orthodontic treatment were observed using the sociodental approach. According to the authors, the sociodental approach for orthodontic treatment needs can optimize the use of resources at oral health services.

### **5.3. Impact of malocclusion and orthodontic treatment on OHRQoL among adults**

The impact of oral health on quality of life among the adult population is of the utmost importance to health assessments. For young people, physical attractiveness is an important factor that affects social relationships, as abnormal facial aesthetic alterations can affect quality of life, leading to psychological discomfort [30, 82].

Malocclusions affect approximately 46% of young adults, the most common types of which are incisor crowding and misalignment of lower incisors [82]. Moreover, individuals with severe malocclusion are more likely to have a poor self-perception of their attractiveness in comparison to those with minor malocclusions [82]. The psychosocial impact of dental aesthetics is also related to malocclusion severity [83]. A recent study states that other dento-facial deformities, such as a class III occlusal relation, are associated with lower degrees of self-esteem and a greater impact on OHRQoL among adults [84].

The Oral Health Impact Profile (OHIP) and its short form, the OHIP-14, are among the most often employed OHRQoL assessment tools for adults. The OHIP-14 is the method of choice for measuring an individual's perceptions and feelings regarding his/her oral health status

and expectations with respect to dental treatment. For such, each response option is attributed a score: never = 0; hardly ever = 1; occasionally = 2; fairly often = 3; very often = 4; and don't know (exclusion). This figure is multiplied by the weight of each item (Item 1: weight = 0.51; Item 2: weight = 0.49; Item 3: weight = 0.34; Item 4: weight = 0.66; Item 5: weight = 0.45; Item 6: weight = 0.55; Item 7: weight = 0.52; Item 8: weight = 0.48; Item 9: weight = 0.60; Item 10: weight = 0.40; Item 11: weight = 0.62; Item 12: weight = 0.38; Item 13: weight = 0.59; Item 14: weight = 0.41). The final score ranges from 0 to 28 points, with higher scores denoting a greater perception of impact [80, 85-88].

The dental literature involving the OHIP-14 provides evidence of the functional and psychosocial benefits of orthodontic treatment. A recent study concluded that young adults aged 18–30 years who received orthodontic treatment had significantly better OHRQoL scores in the retention phase (after the completion of treatment) than untreated individuals [88]. The most frequent impacts in the treated and untreated groups were "painful aching" and "been self-conscious," respectively. Another study investigated dental aesthetics and quality of life among adults aged 18–61 years before and after orthodontic treatment for severe malocclusion [31]. The authors concluded that improvements in aesthetic satisfaction due to the treatment of severe malocclusion lead to an improvement in OHRQoL, particularly by decreasing psychological discomfort and psychological disability. However, another study found that fixed orthodontic therapy had a negative impact on overall OHRQoL during the first 3 months of treatment, which then improved to pre-treatment scores [89]. Moreover, a significant increase in self-esteem is observed as a final result of the treatment.

A recent systematic review with a meta-analysis summarized evidence regarding the impact of malocclusion and its treatment on quality of life of adults in studies that employed the OHIP-14 [90]. The review included studies involving groups before and after treatment (pre-post design), studies involving groups with and without malocclusion (independent groups design), and studies comparing a group that had undergone orthodontic treatment to an independent group that required treatment (treated–untreated groups design). OHIP-14 scores were significantly lower among individuals after receiving treatment for malocclusion and individuals without malocclusion compared to those with malocclusion and treatment needs (independent groups).

Thus, the evidence strongly suggests that orthodontic treatment improves OHRQoL among adults. The sociodental approach, which combines normative and psychosocial perceptions of the dentition, is also recommended for the routine evaluation of treatment needs so that measures of patients' views complement clinical measures in adults.

## 6. Further research

The scientific evidence is strong regarding the negative impact of malocclusions on the OHRQoL of children, adolescents, and adults, with the greatest impact on emotional and social

well-being. There is also strong evidence that orthodontic treatment leads to gains in quality of life, with improvements in physical, social, and psychosocial aspects. However, it is important to stress that the majority of studies presented in this chapter have a cross-sectional design, which does not allow the establishment of causality due to the fact that data are collected at a single moment in time. Thus, some of the findings should be interpreted with caution. The scarcity of longitudinal studies involving preschool children demonstrates a lack of scientific evidence on the actual impact of malocclusions on quality of life and the effectiveness of orthodontic treatment in this specific age group.

Further longitudinal studies should be carried out to determine the cause-and-effect relationship between malocclusion/orthodontic treatment and the impact on OHRQoL. It is also important to consider the diversity of assessment tools as well as the lack of uniformity and clarity in the administration of these tools. Studies are needed to compare the different measures used to evaluate OHRQoL, thereby allowing the improvement of such measures.

Since the assessment of quality of life has become an integral part of health programs, studies with a higher level of scientific evidence are fundamental to understanding how malocclusions and orthodontic treatment can affect the quality of life of children, adolescents, and adults. Such studies also contribute to strategies aimed at promoting health.

## 7. Conclusions

The analysis of studies found in the dental literature reveals that malocclusions exert a negative impact on the quality of life of children, adolescents, and adults. Among young people, psychological well-being, social interactions, and functional aspects are impacted the most. Moreover, the desire for orthodontic treatment among adolescents is associated with most types of malocclusion. Among adults, the impact on OHRQoL is often related to psychological discomfort and psychological disability. Thus, orthodontic treatment for severe malocclusion leads to an improvement in OHRQoL.

Orthodontists should be encouraged to employ OHRQoL assessment tools to measure the subjective perceptions of patients and their families as a complement to normative clinical indicators. The combination of objective and subjective evaluation methods can contribute to the establishment of a broader-scoped treatment plan as well as the determination of the best approach for each patient.

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