

**Impact of Orthodontic treatment on Self-esteem and Psychosocial Impact of Adolescents - A Systematic Review**

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**Conflicts of Interest:** Nil

**Abstract**

**Objectives:** The present systematic review was carried out to evaluate changes in the psychology of adolescent patients after orthodontic treatment.

**Materials and methods:** An electronic search was conducted in the PubMed and Cochrane Library. The review followed PRISMA guidelines for systematic reviews and meta-analyses. Information was extracted from included studies independently by both authors. Methodological quality was assessed using the New Castle Ottawa Scale.

**Results:** Of the 825 studies identified in the initial search, only 13 met the inclusion criteria. In relation to the instrument used to assess oral health-related quality of life (OH RQoL), most studies used the PIDAQ and OHIP-14 and the self- esteem outcome measure used was Harter's Self Perception Profile for Children and Lawrence's Self-Esteem Questionnaire. All the studies, with the exception of Vulugundam S et al., reported a significant improvement in Self-esteem after orthodontic treatment.

**Conclusions:** There is a positive association between orthodontic treatment and psychosocial aspect of adolescent patients.

**Keywords:** Adolescence, Young Adults, Malocclusion, Orthodontic Treatment, Crowded Teeth, Self-Esteem, Psychosocial Impact.

## Introduction

The word “adolescence” is derived from the Latin word “a doles cere” which is composed of “ad” (to), “oleve” (to grow) or “olere” (to nourish).<sup>[1]</sup> Adolescence is the transitional period between childhood and adulthood, characterised by rapid biological growth, changes, and social role transformations.<sup>[2]</sup> They are no longer children yet not adults. It is marked by rapid physical development, as well as emotional, psychological, and spiritual transformations. It has been defined as the period between 10 and up to 24 years.<sup>[2]</sup>

American Academy of Paediatric Dentistry (AAPD) recognized that adolescent patients have been amounted with four basic needs. (1) To identify an identity (2) To accept sexuality and find the sexual role (3) To establish

independence from the family (4) To establish a career or vocational choice.<sup>[3]</sup>

Ephebodontics is the term coined for Adolescent Dentistry in the April 1969 issue of Dental Clinics of North America.[4] Ephebos is a Greek noun derived from the method Ephebodontics, meaning "youth attaining manhood".

Adolescence is a critical period in a child's dental treatment. The dental treatment of the teenage patient might be complicated and multi-faceted.<sup>[5]</sup> The major dental diseases and conditions affecting adolescence are Dental caries, Periodontal diseases and Malocclusion.<sup>[6]</sup>

Malocclusion is a common problem among adolescents with a worldwide prevalence of 56%[7] and the reasons can be varying including genetics, childhood habits, trauma and early exfoliation of deciduous teeth. Except for genetics, other reasons can be eliminated by early dental intervention. Since the adolescence falls in the growth period, this natural growth can be harnessed with orthodontic treatment to guide the teeth and jaw into an ideal position.<sup>[8]</sup>

Table 1. Selection criteria applied for this review - PICO-S format.

<b>Participants (P)</b>	Adolescent patients who are undergoing or have undergone orthodontic treatment
<b>Interventions (I)</b>	Any form of orthodontic treatment provided during preventive, interceptive and comprehensive corrective phase of orthodontic treatment. Studies involving treatment either with Fixed or removable orthodontic appliances.
<b>Comparator (C):</b>	Studies that included assessment of either of both of psychosocial impact and SE during pre- and post-orthodontic treatment. Studies that included a comparison group of subjects who are due for orthodontic treatment and those who have not undergone any form of orthodontic treatment.
<b>Outcome measures (O)</b>	The main outcome was to measure the psychology and Self-esteem after orthodontic treatment
<b>Study design (S)</b>	Randomized clinical and control trials (RCT), clinical trials

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Self-esteem (SE) influences the Oral health-related Quality of life, <sup>[9,10]</sup> although its specific role, as well as its relation to oral health perceptions, lacks in evidence.

Several crosssectional studies have reported that people who are satisfied with their facial appearance seem to be more self-confident and have higher self-esteem than those who are dissatisfied with their facial

appearance.<sup>[11]</sup> Malocclusion can have an impact on the overall facial appearance.<sup>[12]</sup> Moreover, some patients who have a severe malocclusion report that they have a feeling that they are useless, shameful and inferior,<sup>[13]</sup> and the more severe the malocclusion, the greater the embarrassment felt by the individual.<sup>[14,15]</sup> Longitudinal studies have suggested that malocclusion may adversely affect self-concept not only during adolescence, but also in adulthood.<sup>[16]</sup>

Numerous population-based studies have suggested that children with certain malocclusions are more likely to be the victims of bullying, such as teasing, name-calling and physical bullying.<sup>[17]</sup> It has been suggested that bullying experiences can impact not only concurrent psychosocial action, but also future psychosocial action.<sup>[18,19]</sup> A meta-analysis on the social effects of bullying associated with malocclusion has suggested that victims are often socially isolated and suffer psychological problems including anxiety and depression.<sup>[20]</sup> Some studies have suggested that incisor crowding and median diastemas have the greatest negative impact on perceived intelligence and beauty, and people with crowding and median diastemas are judged to be from a lower social class than those with ideal occlusion.<sup>[12]</sup>

Although a few systematic reviews discussed the impact of orthodontic treatment on OHRQoL of the patient, so far no systematic review interpreted the relation between the patient's psychological changes and orthodontic treatment. So, the present systematic review aims to identify the changes in the self-esteem and psychosocial aspects of the patients following orthodontic treatment procedures.

## Materials and methods

### Protocol registration

The protocol for the present study was registered with the PROSPERO international prospective register (PROSPERO 2022: CRD42022309871) for systematic reviews.

### Eligibility criteria

The selection criteria based on the PICO-s format was applied in this review (Table 1).

### Information sources, search strategy, study selection and data extraction

An extensive database search was performed in PubMed and Cochrane Library covering the period from January 1, 2012 to January 1, 2022.

The search was done using the keywords “adolescence”, “young adults”, “malocclusion”, “orthodontic treatment”, “crowded teeth”, “self-esteem”, “psychosocial impact” or by using free text words and their synonyms with multiple combinations using Boolean operators (“or” and “and”) in the English language.

A supplementary search was performed in Google scholar and in grey literature. Manual search of the cross-references in the published reviews on the topic were also assessed and studies that met the inclusion criteria were added to the data base. However, the narrative and systemic reviews themselves were not included.

### Exclusion criteria

Studies in which treatment is incomplete, patients assessed for self-esteem/psychosocial impact without malocclusion, surgery patients, cleft palate and cleft lip cases excluded and studies involving adjunctive orthodontic treatment were excluded.

Narrative reviews and systematic reviews were excluded for the present review before the final eligibility.

## Data items and collection

Data extraction was performed independently in a similar method that was utilized for initial evaluation. Apilotedelectronic excel spreadsheets were utilized to record the data. The following demographic information was recorded: author and year of publication, country, sample size and age, type of study design, type of orthodontic treatment and questionnaire employed.

## Method of quality assessment of individual studies

The quality of the studies was assessed by two independent reviewers (H-B-N and J-T) using the Newcastle-Ottawa Quality Assessment Scale (NOS) comprising eight items in three categories. Each item is scored with a star, with the exception of “comparability,” which is scored with two stars, making a maximum score of nine stars. In cases of disagreement between reviewers, the case was discussed and if disagreement persisted, a third reviewer was consulted (C-S-R).

Table 2: Characteristics of studies investigating the relation between orthodontic treatment and Self-esteem/OHR.

Author (Year), Country	N (losses) % sex (n), Mean age (SD), Age range	1. Study design/ 2. Type of orthodontic treatment 3. Questionnaire/Instrument	Assessments and follow-up times	Results	Quality Newcastle Ottawa Scale
Feu D et al. [11] (2012) Brazil	4% loss; 77.7% girls, 22.3% boys, 12 to 15 years	1. Prospective study 2. Fixed orthodontic appliance 3. IOTN-AC/DHC	Thrice : Before the treatment, 1 year after placement of the fixed appliances, 2 years after placement of the fixed appliances	Fixed orthodontic treatment in patients 12 to 15 years of age significantly improved their esthetic self-perceptions	7
Seehra J et al. [12] (2013), UK	37.2% loss, 48% male, 52% female, 14.6 years	1. Follow-up study 2. fixed appliances, functional appliances and retainers 3. Olweus Bully/Victim Questionnaire/Harter's Self Perception Profile/ CPQ-11-14	Twice - before and after the treatment	Orthodontic treatment may have a positive effect on adolescents experiencing bullying related to their malocclusion and their OHRQoL.	7
Prado RF et al. [13] (2015) Brazil	120(-), 50% males, 50% females, 18-30years	1. Prospective study 2. Fixed orthodontic appliances 3. PIDAQ	Twice - before the placement of appliances and after 6 months of usage	The first 6 months of orthodontic treatment seem to improve the psychosocial impact of malocclusion. The patients analyzed in the present study reported a greater esthetic impact and less psychological impact after 6 months of using an orthodontic appliance.	6
Garg K et al. [14] (2017), India	93 (-), 46.2% males, 53.7% females, 17.46 years	1. Prospective study 2. fixed orthodontic appliance 3. PIDAQ/IOTN-AC	Twice - before and after the treatment	Results showed significant improvement in the psychosocial impact of malocclusion with a reduction in the self-perceived needs of patients with orthodontic treatment.	6

Deng X et al. [15] (2018), China	.1090(31%), 402 males, 688 females; 11-18 years	1. prospective longitudinal study 2. Fixed orthodontic appliance 3. IOTN-AC /PIDAQ	Twice : before and after the orthodontic treatment	This study establishes a biopsychological model for understanding the psychoso- cial impact of dental esthetics and its improvement after orthodontic treatment among adolescent orthodontic patients. The findings highlight the importance of psychological parameters in orthodontic research and clinical practice.	6
Vulugundam S et al. [16] (2021) UK	2600(-), 42% males, 58% females; 10-16years	1. Cohort study 2. FOA 3. LAWSEQ	Once	This six-year longitudinal study provided no evidence for an association between history of orthodontic treatment and changes in self-esteem during adolescence.	6
Iranzo-Cortés JE et al. [17] (2020) Spain	1,158 (-), 47.67% male, 52.33% female, 12-15years	1. transversal study 2. Fixed orthodontic appliance 3. DAI/IOTN/PIDAQ	Once	The psychosocial impact of dental aesthetics in adolescents is associated with the presence of malocclusion and the female sex, while the condition of having previously worn an orthodontic device reduces the psychosocial impact	7
Taibah SM et al. [18] (2017), Saudi Arabia	886(-), 62.9% femsles, 37.1% males, 12-19years	1. cross-sectional, descriptive and analytic study 2. - 3. self-esteem measurement scale/IOTN	Twice - at the beginning of the study and after 2weeks interval	The study supports that malocclusion has negative effects on self-esteem; multiple malocclusions with spacing, crowding, and overjet had the greatest effects.	6
Navabi N et al. [19] (2012), Iran	301(-), 62% fe- male; mean age- 21.71 years	1. Cross-sectional design 2. FOA 3. OHIP-14	Once	Patients who had completed orthodontic treatment had a better OH- QoL in physical aspects than those who never had treatment.	6
Palomares NB et al. [20] (2012) Brazil	200(-), 137 females, 63 males, 18-30years	1. cross-sectional study 2. FOA/Retainer 3. IOTN-AC / OHIP-14	once	Young Brazilian adults who received orthodontic treatment had significantly better oral health-related quality of life scores in the retention phase, after treatment completion, than did nontreated subjects.	5
Mihailescu A et al. [21] (2018) Romania	300(58.3%), 71.4% females, 28.6% males, 16-25years	1. Survey 2. Fixed/removable orthodontic appliance 3. Questionnaire	Once	Patients' satisfaction was improved during and after appliance therapy, for more than half of the participants. Self- confidence was low in relation to school/work performances; almost half of the patients reported stagnation in their school/work performances during the fix appliance therapy. However, more than 64% of the patients participating in this study were quite satisfied about their facial aspect during and after the orthodontic treatment.	6
Twigge E et al. [22] (2015), Australia	105(-); 42 males and 63 females, 12-17years	1. cross-sectional and interview-based study 2. - 3. PIDAQ/OIDP/DAI/ICON	Once	Female adolescent patients tended to experience worse psycho-social impacts related to their malocclusions compared with males with similar index-determined OT need. Index- determined OT need scores did not correlate with the OHRQoL scales. Adolescent patients expected OT to improve their dental appearance and QoL aspects.	7
Farooq MU et al. [23] (2020), India	400(-), 42.7% males, 53.3% females; 12-15years	1. cross-sectional study 2. - 3. COHIP	Once	In this study, orthodontic treatment needs influenced SE and OHRQoL in the children. Hence, early diagnosis and prompt treatment can improve SE and OHRQoL.	6



## Results

### Study selection and flow diagram

The initial electronic search obtained a total of 825 articles (176 in PubMed-Medline, and 626 in Cochrane). The manual search identified a further 23 articles, and the grey literature search found none. 723 articles were rejected after screening the titles and further 68 articles were rejected after reading the abstracts, leaving a total of 34. Afterwards a detailed analysis of each work, another 21 articles were excluded for the following reasons: study did not correspond to the study type specified (4); study did not focus on the age range specified (2); unrelated to the review objectives (15). Finally, 13 studies fulfilled the inclusion criteria. The selection process is illustrated in the PRISMA flow diagram (Figure 1)

### Qualitative synthesis

All the works focused on adolescents aged between 10 and 19 years, with the exception of four that included patients aged above 19 years. Most of the articles only included treatments with conventional fixed apparatus, although some mentioned additional treatment types.

Regarding the instrument used to assess self-esteem and psychosocial aspects, the reviewed articles [21,22,23] used the Dental health component/Aesthetic component of the index of orthodontic treatment need, Olweus Bully/Victim Questionnaire/Harter's Self Perception Profile, IOTN/IOTN-AC, LAWSEQ, DAI, PIDAQ, self-esteem measurement scale, OHIP-14, GSES, COHIP. Most of the works reported that patients filled out the questionnaires without external support.

As for the time when OHRQ o L assessments were made, five studies limited assessment to before starting treatment and end of treatment; [22-25,26] one work assessed before treatment, immediately after treatment and 6months/2years after treatment;.[21] and remaining

studies performed assessments only once with a questionnaire surveys. [27,28,29-33] The reviewed works showed significant differences between pre- and post-treatment assessments. In almost all the studies, greater changes were observed related to psychological discomfort and self-esteem with the orthodontic treatment of malocclusion using either removable or fixed orthodontic appliances. However, most of the studies used Fixed orthodontic appliance for the malocclusion correction for adolescent patients. Table 2 summarizes the data collected from the studies reviewed.

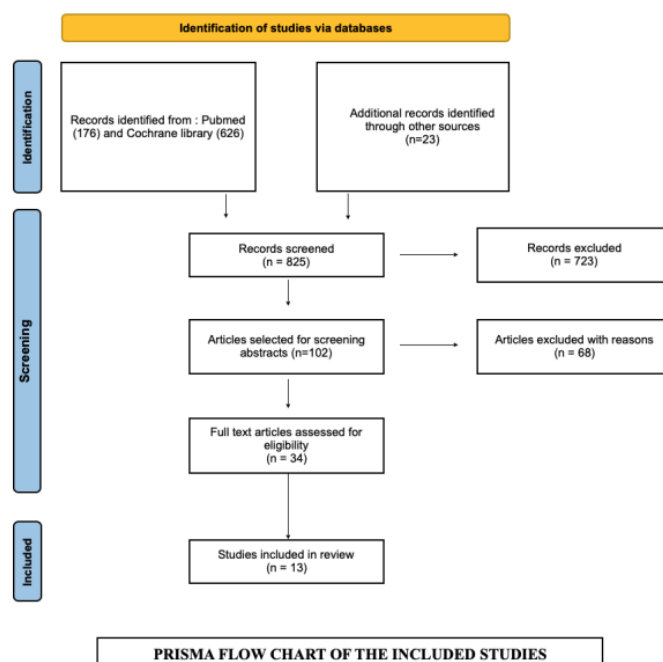


Figure 1

### Study Quality

According to the Newcastle-Ottawa Quality Assessment Scale (Table 3), all thirteen studies were considered of moderate quality, none being of high quality, as none of the study designs made it possible to demonstrate that the outcome of interest was not present at the start of the study. The comparability criterion was fulfilled in twelve of the studies.

### Discussion

Evaluation of self - esteem and psychosocial impact due to malocclusion is a critical feature of orthodontic

therapy and should be undertaken prior to any preventive or corrective therapy, specifically when treating a

malocclusion due to the significant psychosocial factors involved.

Table 3: Quality of the studies on the Newcastle-Ottawa Quality Assessment Scale for cohort studies.

Author (Year)	Selection (****)				Comparability (**)		Outcome (***)			Total score
Feu D et al. [11](2012)	*	*	*		*	*		*	*	7
Seehra J et al.[12](2013)	*	*	*		*	*		*	*	7
Garg K et al. [14] (2017)	*		*		*	*		*	*	6
Vulugundam S et al. [16] (2021)	*	*	*		*	*			*	6
Iranzo-Cortés JE et al. [17] (2020)	*	*	*		*	*			*	6
Taibah SM et al. [18] (2017)	*	*	*		*			*	*	6
Prado RF et al. [13] (2015)	*	*	*		*	*		*	*	7
Navabi N et al. [19] (2012)	*	*	*		*	*			*	6
Palomares NB et al. [20] (2012)	*	*	*		*	*			*	6
Mihailescu A et al. [21] (2018)	*		*		*	*			*	5
Twigge E et al. [22] (2015)	*	*	*		*	*			*	6
Deng X et al. [15] (2018)	*	*	*		*	*		*	*	7
Farooq MU et al. [23] (2020)	*	*	*		*	*			*	6

GGG The purpose of this systematic review was to explore existing scientific evidence array of issues in the psychology and self-esteem of adolescent patients receiving orthodontic treatment between the commencement of treatment and the post-treatment stages. Apart from one study by Vulugundam S et al. [27], which found no positive correlations between history of orthodontic treatment and differences in self-esteem during teenage years, qualitative analysis of the articles examined contended that orthodontic treatment using both fixed and removable orthodontic therapy produces a beneficial increase in self-esteem among young adults by the final follow - up.

Despite the fact that there are several systematic reviews on this topic, neither of them have reviewed studies on bullying suffered by malocclusion and the effects of

treatment on the very same. Retrospective investigations have revealed that adults with extensive malocclusion are given nicknames based on their childhood facial deformities. [14,15] The current study incorporated the work of J. Seehra et al., who revealed that orthodontic treatment may benefit teenagers who are bullied because of their malocclusion and their OHRQoL.

In terms of the characteristics of the research analysed, the majority of them mentioned that the apparatus employed was fixed orthodontic device, i.e. 10 of the thirteen articles included in the analysis focused on fixed appliances, whilst just one focused at both fixed and removable appliances. As a result, it is reasonable to infer that permanent mechanotherapy enhances OHRQoL, despite

the lack of a large number of trials comparing it to removable appliances. This finding is consistent with the findings of a systematic review by Pacha MM et al,<sup>[34]</sup> which imply that there is inadequate data to discriminate between fixed and removable variations in terms of dental and skeletal outcomes, as well as patient experiences. More well-designed randomised clinical trials are needed to compare the efficacy of fixed versus removable functional appliances, with a focus on patient-oriented assessments.

In the evaluated research, multiple assessment instruments have been utilised. Psychosocial impact of dental aesthetics questionnaire (PIDAQ) was used in 5 studies for OHRQoL outcome measurement,<sup>[23,24,25,28,32]</sup> OHIP-14 was used in two studies,<sup>[30,35]</sup> COHIP was used in one study<sup>[33]</sup>, and only one study employed OIDP instrument<sup>[32]</sup> Harter's Self Perception Profile for Children and Lawrence's Self-Esteem Questionnaire were used to assess self-esteem outcomes.<sup>[22,26,27]</sup> The Olweus Bully/ Victim Questionnaire was used in one study that focused on the relationship between malocclusion and bullying to measure the prevalence, nature, and degree of bullying.<sup>[22]</sup> The fact that not all of the research used the same instrument to assess self-esteem could be deemed a "limitation". According to Wan Hassan WN et al <sup>[36]</sup>, PIDAQ can discern orthodontic-related modifications in the psychological well-being of patients, and the majority of the studies examined in this systematic-review used PIDAQ as an evaluation tool.

The objective of this investigation is to explore whether self-perception of dentofacial aesthetics influences psychosocial development from childhood to maturity. Self-perception can boost self-concept and thus self-esteem. In recent years, QOL has been used to ensure patient preconceived notion in the form of subjective

awareness, with a focus on patient-reported outcome measures (PROM). Greater levels of self-esteem, or one's overall assessment or appraisal of one's own merit, are generally associated with higher levels of subjective wellbeing. It is reasonable to infer that the relationship between reported OHRQoL and malocclusion, as well as treatment outcomes, is mediated by innate psychological attributes such as self-esteem in forecasting the impact of health issues on quality of life. This study's evidence supports the importance of SE as a mediator in measuring OHRQoL in youngsters. As a result, it is conceivable to suggest that malocclusion be corrected as quick as practicable within ethical boundaries. Given the available literature that malocclusion influences children's self-concept, several recent research have investigated how orthodontic treatment can improve one's selfconcept. O'Brien et al. <sup>[18]</sup> discovered that using a Twin-Block device to treat a Class II, division 1 malocclusion led to a boost in self-concept, notably self-esteem.

Five studies just assessed SE/PIDAQ/ QoL at the beginning and end of treatment, whereas one study by Daniela Feu et al. evaluated SE and QoL three times and discovered that the dental wellness and aesthetic component scores were significantly lower by an overall mean of 3.0 and 3.1 pts, respectively, in the group receiving orthodontic treatment especially in comparison to the groups that did not.

The current systematic review's observations back up earlier studies which indicated a correlation between orthodontic treatment and improvements in SE, psychosocial effect, and OHRQoL. <sup>[37,38]</sup> Certain limitations should be considered when analysing the results of the current systematic review. Although the study populations were limited to adolescents, the age ranges varied between studies. Concerning the gender



variable, the percentage of female patients was rather higher in all of the studies, which may be read as the number of women requiring dental care being slightly higher than men. Jung et al. [39] encountered that following fixed orthodontic treatment, the females had higher levels of self-esteem than the males and the untreated malocclusion group in a study of Korean middle school children. Additionally, the study revealed that malocclusion has a significant impact on female self-esteem but had no effect on male self-esteem. Patient attrition during the course of the investigation might also be rendered a constraint, and only three of the studies revealed patient losses. However, only sample attrition of more than 40% towards the conclusion of the course of the study are regarded a constraint.

The level of evidence of the association under investigation is based on the quality of the studies analyzed, which were considered of moderate quality. The reasons limiting the quality of the studies (according to the Newcastle-Ottawa Scale) were as follows: no study could demonstrate that the outcome of interest was not already present at the start of the study; none of the studies had randomized samples; being longitudinal studies with long follow-up periods there were considerable losses in five studies.

## Conclusion

A positive correlation was established between orthodontic therapy and adolescent patients' self-esteem; orthodontic intervention of adolescent patients with malocclusion using fixed/removable appliance results in a significantly enhanced psychosocial impact by the end of the treatment period.

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