

Systemic Review on Impact of Malocclusion on the Quality of Life

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Abstract

Aim: The aim of the study is to compile the various quantitative studies to gain knowledge on malocclusion and the impact on quality of life in children and adolescents.

Methods and Materials: An online search in the MEDLINE / PubMed and Cochrane Library database was performed for studies published in English from 1990 to January 2016. The search strategy included the following key word combinations - 'patient satisfaction' or 'personal satisfaction' or 'quality of life' or 'self-concept' and 'malocclusion' or 'orthodontics' or 'dental aesthetics'. Quality of evidence was classified according to GRADE guidelines as high, moderate, or low.

Results: The search produced 276 titles and abstracts. 38 articles which satisfy the initial pre-established criteria were obtained, and finally, 17 studies satisfied the inclusion criteria. After data assessment, five publications were eligible for final evaluation. Quality of evidence was high in three cases and moderate in the remaining two. The three high level of quality studies reported that malocclusions, particularly anterior malocclusion had a negative impact on oral health-related quality of life. Two moderate level of quality studies reported that higher orthodontic treatment need had a negative impact on oral health-related quality of life.

Conclusion: Three studies with high level of quality reported that malocclusions, particularly in the aesthetic area, have negative effects on oral health-related quality of life especially on the emotional and social wellbeing dimension. The scientific evidence was considered strong since the studies are of high level of quality.

Keywords: adolescent, emotion, child, malocclusion quality of life, quantitative research

INTRODUCTION

The oral-facial region draws the most observation from other individuals in interpersonal interactions and is the primary source of vocal, physical, and emotional communication, therefore, it is an area of significant concern for an individual. As a result, patients who seek orthodontic treatment are more interested in enhancing their appearance and social acceptance rather than they are with improving their oral health or function. Therefore, an important motive for undergoing orthodontic treatment is the need to improve these aspects of quality of life. It is important for both general dental practitioners and orthodontists to fulfil the patient's or patient's parents' expectations about improvement in oral function, aesthetics, facial appearance, body image and social acceptance when advising patients about these procedures and during the treatment process, regardless of the patient's age. Orthodontic treatments are commonly performed on adolescents, in which it is the period of when the permanent dentition is emerging. It has long been recognized that different malocclusions are associated with impaired oral health and/or function and this has long been recognize. This, together with the risk of personal dissatisfaction with noticeable malocclusions, is considered an important treatment motivating factor. Another reason for treatment at this age is that adolescents are also known as the age group where the individual has begun to consider it is of great importance to improve their own appearance and the have their full rights to independently request or reject orthodontic treatment. Malocclusion can play a significant role in social acceptance and interactions for aesthetic reasons. In a

more severe case, it can result in functional [1-4]. Hence, it is reasonable to assume that persistent but untreated malocclusions have a social and psychological impact on an individual's quality of life, especially among children and early adolescents.

The concept of oral health related quality of life (OHQoL) refers to the influence of oral health or disease has on a person's general wellbeing and day-to-day activities [5]. "The absence of negative impacts of oral conditions on social life and a positive sense of dentofacial self-confidence" or "a standard of health of oral and related tissues which enables an individual to eat, speak, and socialize without active disease, discomfort, or embarrassment" is a more specific concept of oral health related quality of life [6]. Oral diseases and disorders can have a huge impact, particularly negative affect, on the lives of those who are suffering from them [7]. For example, a person's facial appearance may have an effect on their confidence, how a person perceives themselves and how they are perceived by society [8]. Every person has their own self-perceptions, which are influenced by their way of life, dreams, desires, ambition, past encounters and hopes for the future [9]. Therefore, the quality of life is a dynamic construction [10] Based on numerous research that are available now, there has been increasing interest in quality of life-related studies as it relates to the oral health of adolescents, whose lives are likely to be negatively impacted by oral disorders and diseases [11]. Various studies have been conducted to survey the effect of malocclusion on young adult's quality of life and it has have found that malocclusion is associated with higher levels of dissatisfaction with

appearance, and have a high possibility to negatively impact the quality of life of the individual [8,12-13]. Nevertheless, the home environment, financial status, and familial influences play major roles in determining an individual's oral health and well-being.

The impact of oral health and disease, malocclusion, dental appearance and treatment for psychological and functional well-being has drawn increasing attention from dental clinicians and researchers for over the past decade. Past research on the physical, psychological and social impact of malocclusion on oral health related quality of life sheds light on the impact of malocclusion on people's lives and gives a better understanding of the requirement for orthodontic treatment beyond the measurement of clinical parameters. Furthermore, since social and psychological impacts are often the key motives for seeking orthodontic treatment, oral health related quality of life can be considered the greatest measurement for orthodontic treatment need and result [15]. Research related to this may be of great significance to researchers, health planners, and oral health care providers [12]. Based on previous studies, it is reported that the prevalence of malocclusion is between 43% and 78% in schoolchildren and over 60% in preschool children [16, 17]. The presence of malocclusion in 12-year-old is about 38.8% which is demonstrated by a data from the most recent national oral health survey in Brazil [18]. Class II malocclusions, excessive overjet and posterior crossbite are the most common reported malocclusions [19-23]. Crowded teeth due to inadequate space in the dental arches are frequent in case of older children and adolescents [23-25]. Partial lip closure with excessive overjet is associated with higher prevalence of dental trauma to the upper incisors [26]. Noticeable malocclusions, excessive overjet with partial lip closure, crowded incisors, and midline diastema between incisors have been associated with cases such as bullying and a lower self-esteem among adolescents [27-30]. Recently, a previous study done by Sardenberg et al., found that schoolchildren of 8 to 10 years old with malocclusion experienced 30% more negative effects on oral health related quality of life than those without malocclusion [31]. In spite of this, a few studies have evaluated the impact of malocclusion on oral health related quality of life and daily routine in adolescents, particularly with regard to the potential confounding effects of other clinical and socioeconomic factors [1]. From a public health perspective, this is important especially for a broader assessment of treatment outcomes and for planning public health approaches for prioritization of care [2].

Therefore, updating on current knowledge on the topic is of great importance as it provides a solid evidence base for clinical practitioners to rely on. Hence, this systemic review aims to compile the various quantitative studies to gain knowledge on malocclusion and the impact on quality of life in children and adolescents.

MATERIALS AND METHODS

All studies which analyses the impact of malocclusion of oral health related quality of life was identified through a

literature search conduct. The online search strategy involves the MEDLINE / PubMed and Cochrane Library database electronic search for articles published in English from 1990 to January 2014. The search strategy included the following key word combinations - 'patient satisfaction' or 'personal satisfaction' or 'quality of life' or 'self-concept' and 'malocclusion' or 'orthodontics' or 'dental aesthetics' and filtered for children between the age of 7 to 12 years and adolescents between the age 13 to 18 years.

This systemic review focuses on specific studies on quality of life impacted by malocclusion in children and adolescents. Therefore, a few inclusion criteria were used to conduct the study selection. The inclusion criteria are studies which involves healthy children and adolescent without severe disease or disorder with no past or presenting history of orthodontic treatment, studies which focuses on malocclusion and its impact on quality of life, studies which include assessment of malocclusion and orthodontic treatment need using standardized measures and studies which includes self-assessment of oral health related quality of life using validated questionnaire. Each full-text version of the articles were analysed and evaluated according to the inclusion criteria.

The studies were grouped according to three grades based on the GRADE system, which are high, moderate and low [32]. Articles which qualify as high quality grade are articles which fulfil these criteria; materials are sufficient, relevant subgrouping, the drop-out rate is not greater than 30% and important confounders such as age, gender, caries and socioeconomic factors are considered. Moderate quality articles are articles which lack one of the criteria above. Articles were further downgraded to low quality article when the drop-out rate is greater than 30% or the drop-out rate was not analysed, with no consideration of an important confounder (caries). Data of articles which qualify for high and moderate quality were tabulated based on author, year of publication, country, study quality, population of study, malocclusion and/or orthodontic treatment need assessment, oral health related quality of life assessment and finally results and/or conclusion. The data was tabulated and analysed using Microsoft Excel 2013.

RESULTS

Identification of studies

The initial electronic database search according to the keywords yielded 276 citations. Initially, out of the 276 articles, 238 articles were excluded as the studies did not meet the inclusion criteria. A majority of the studies which were excluded either did not cover for the children and adolescent population or involved specific groups such as patients undergoing orthognatic surgery, involved patients undergoing or have undergone orthodontic treatment, did not include assessment of malocclusion and/or orthodontic treatment need and self-assessment of oral health related quality of life, or did not cover malocclusion related to oral health related quality of life. After two rounds of analysing the inclusion criteria, a total of 17 articles were eligible for assessment.

Included studies

A total of 17 articles satisfy the inclusion criteria and were suitable for final quality analysis. 12 articles were classified as having low level of quality as none of the articles included the important confounders, a few articles did not include the drop-out rate, used selected material and some employ insufficient statistical analysis. One article was classified as moderate level of quality and the remaining four articles were high level of quality articles. Finally, five studies were included for final evaluation of evidence. Table 1 shows studies of low level of quality and the listed reason for its quality level.

Table 1 – Studies of low level quality

Author, Countries	Justification to Low Quality Level
De Baets <i>et al.</i> [33], Belgium	Selected material Important confounders not considered
Herkraht <i>et al.</i> [34], Brazil	Important confounders not considered
Kolawole <i>et al.</i> [35], Nigeria	Insufficient statistical analysis Important confounders not considered
Shah <i>et al.</i> [36], USA	Drop-out rate not included Important confounders not considered
Anosike <i>et al.</i> [37], Nigeria	Insufficient statistical analysis Important confounders not considered
de Paula <i>et al.</i> [38], Brazil	Drop-out rate not included Important confounders not considered
Zhang <i>et al.</i> [39], Hong Kong	Selected material Important confounders not considered
Marques <i>et al.</i> [40], Brazil	Important confounders not considered
Taylor <i>et al.</i> [41], USA	Drop-out rate not included Important confounders not considered
Onyiaso [42], Nigeria	Important confounders not considered Insufficient statistical analysis Difficult to interpret the results
Bernabé <i>et al.</i> [43], Brazil	Important confounders not considered
Marques <i>et al.</i> [8], Brazil	Important confounders not considered

Table 2 shows all five articles which were included for final analysis and evaluation. All five articles were of cross-sectional design. Four of the studies which were done by Paula *et al.*, Feu *et al.*, Scapini *et al.*, and Sardenberg *et al.* were reported to be performed in Brazil [12, 13, 31, 44], while the remaining one was performed by Ukra *et al.* in New Zealand [14].

Study Population and Subgrouping

With respect to the study population, four studies was based on school children population [13, 14, 31, 44], and one study was based on two groups of children which are of a comparison group and a group waiting for orthodontic treatment [12]. Subgrouping according to orthodontic treatment need was done by one study [44], and another one study compared two separate groups [12], while three studies allow subgrouping according to type of malocclusion [13, 14, 31].

Assessment of Oral Health Related Quality of Life and Malocclusions or Orthodontic Treatment Need

Oral health related quality of life was self-assessed with the Child Perception Questionnaire (CPQ 11-14 or 8-10) [45] in four studies [13, 14, 31, 44] and the Oral Health Impact Profile (OHIP-14) [46] in the remaining one study [12]. As for malocclusion or orthodontic treatment need assessment, Dental Aesthetic Index (DAI) [47] was used by four studies [13, 14, 31, 44] and one study [12] utilized the Dental Health Component and Aesthetic Component of Index of Orthodontic Treatment Need (IOTN-DC and IOTN-AC) [48].

Impact of Malocclusion on Oral Health Related Quality of Life

In four of the studies, the population involved individuals in early adolescence, ranging from 11 to 15 years of age [13, 14, 31, 44]. One study reported of a negative impact of malocclusion on oral health related quality of life in even younger children of age 8 to 10 years, particularly due to anterior overjet and spacing [31]. Two studies reported that increased orthodontic treatment need has a negative impact on oral health related quality of life [12, 44]. Three studies stated of a negative impact on oral health related quality of life in relation to severe malocclusion, predominantly spaced dentition and anterior overjet [13, 14, 31]. Apart from that, two of the studies reported that emotional wellbeing and social wellbeing were predominantly affected by malocclusion [13, 14].

Evaluation of Studies

Negative effects of severe malocclusions on oral health-related quality of life in children and adolescents was seen based on high level of scientific evidence [13, 14, 31, 44]. One study confirmed that malocclusions, predominantly in the area of aesthetic zone, such as diastema between incisors, and increased overjet was found to be associated with the negative impact on oral health-related quality of life [12]. The scientific evidence for the association of severe or moderate treatment need and the impact on oral health-related quality of life was found to be at a moderate level [12, 44]. All the most important confounders, which are age, gender, socioeconomic factor and caries was taken into account by all three studies classified under high quality in their final presentation of the results [13, 14, 31], whereas two studies were of moderate quality. Moreover, all of the five studies were found to have used sufficient sample size. In four studies, the drop-out rates were evident [12-14, 31], and ranged from 5 to 19.5% (Table 2). However, one study did not consider caries as a cofounder and there was no presentation of drop-out rate included [44]. On the other, only one study considered caries as the only cofounder when results were generated [12].

Table 2 – Summary of High and Moderate Level Quality of Study

References, year of publication, country	Study quality/ comments	Study population	Assessment of malocclusions or treatment need	Assessment of OHRQOL	Results/ conclusions
Paula <i>et al.</i> [44] (2012), Brazil	Moderate i. sufficient material ii. Sub-grouping according to treatment need iii. drop-outs not presented iv. control of confounders: gender, caries, dental treatment need, and socio-economic factors v. power analysis presented	225 boys, 290 girls, aged 12 years, from the city of Juiz de Fora, Brazil. Subgroups according to orthodontic treatment need: i. treatment need ii. no treatment need	DAI <31 = no treatment need ≥31 = treatment need	Self-assessed CPQ 11-14	64% of those with treatment need was found to have a CPQ score higher than median and 45% of those with no treatment need ($P = 0.0001$). Confounders taken into account.
Feu <i>et al.</i> [12], Brazil	Moderate i. sufficient material ii. comparable groups iii. performed drop-outs 8.8% iv. Control of confounder: caries - no control of confounders: gender, and socio-economic factors v. power analysis	225 patients aged 12-15 years at Department of Orthodontics, Rio de Janeiro State University, Brazil. Two groups: i. Orthodontic group: 92 patients scheduled for orthodontic evaluation ii. Comparison group: 102 children from a public school.	IOTN-DHCH IOTN-AC <5 = no aesthetic orthodontic treatment need ≥5 = aesthetic orthodontic treatment need IOTN-DHC 4 or 5 = treatment need	Self-assessed OHIP-14	The orthodontic group had an odds ratio of 4.7 for lower OHRQOL, in comparison to the control group. The orthodontic group had a 3.1 times higher chance of reporting worse OHRQOL.
Scapini <i>et al.</i> [13], (2013), Brazil	High i. sufficient material ii. subgrouping to orthodontic treatment need iii. drop-outs 19.5% iv. control of confounders: age, gender, ethnic group, caries, dental trauma, and socio-economic factors v. power analysis performed	270 boys and 362 girls, aged 11-14 years, from 12 selected schools in Osorio, Brazil. Four subgroups of malocclusions: 1. minor 2. definite 3. severe 4. handicapping	DAI ≤25 = minor 26–30 = definite 31–35 = severe >36 = handicapping	Self-assessed CPQ 11–14	Higher impact on OHRQOL was seen to be associated with increased severity of malocclusion. Emotional and social wellbeing, with means (SD) from 2.92(3.01) to 4.04 (3.15) and 2.16 (2.29) to 3.45 (3.03), respectively for the different malocclusion levels ($P = 0.035$ and $P < 0.001$). Multiple linear regression analysis was used to confirm the association, with confounders taken into account. Malocclusion had negative impact on OHRQOL.
Sardenberg <i>et al.</i> [31], (2012), Brazil	High i. sufficient material ii. subgrouping to malocclusions and/ or orthodontic treatment need iii. drop-outs 16.2% iv. control of confounders: gender, caries, and socio-economic factors v. power analysis included	1204 schoolchildren, aged 8-10 years, from schools in Belo Horizonte, Brazil. Two subgroups: i. malocclusion absent ii. malocclusion present	DAI <25 = malocclusion absent ≥25 = malocclusion present	Self-assessed CPQ 11–14 <10 = low impact >10 = high impact	42% of those with no malocclusion have high negative impact on OHRQOL and 57% of those with malocclusion have a high negative impact on OHRQOL. Children with malocclusion were 1.3 times more likely to experience a negative impact on OHRQOL than those without malocclusion. Confounders were taken into account in a Poisson regression analysis. Anterior spacing, maxillary overjet and anterior mandibular overjet had a negative impact on OHRQOL
Ukra <i>et al.</i> [14], (2013), New Zealand	High i. sufficient material ii. subgrouping to orthodontic treatment need iii. drop-outs <5% iv. control of confounders: gender, caries, and socio-economic factors v. power analysis included	411 boys and 372 girls, aged 12-13 years, from Taranaki and Otago, New Zealand. Four subgroups of malocclusions: i. minor ii. definite iii. severe iv. handicapping	DAI ≤25 = minor 26–30 = definite 31–35 = severe >36 = handicapping	Self-assessed CPQ 11–14	Malocclusion appeared to have a negative impact on OHRQOL. Emotional and social wellbeing, with means (SD) from 2.0 (2.5) to 3.4 (3.1) and 1.5 (1.9) to 2.9 (2.8), respectively, for the different malocclusion levels ($P < 0.001$ and $P < 0.001$). Despite the differences in socio-demographic characteristics, the association was evident in both the Taranaki and the Otago population. The association was confirmed in multiple linear regression analysis with confounders taken into account. Definite, severe and handicapping malocclusion had negative impacts on OHRQOL.

DISCUSSION

This systematic review evaluated the effect of malocclusion on oral health-related quality of life based on a full analysis of five cross sectional study. The results, which was based on a high quality evidence, suggest that there is association between malocclusion and the oral health-related quality of life. Based on a systemic review performed by Liu et al. [49], association between malocclusion/orthodontic treatment need and the quality of life were evident. However, the findings of this current systemic review is more in detail and specifically describe the correlation of malocclusion to oral health-related quality of life as the level or strength of evidence that can be gleaned from the included studies was relatively high. Severe malocclusions in the aesthetic zone, particularly anterior overjet and spaced dentition, have an impact on oral health related quality of life in children and adolescents. Results from a review conducted by Barbosa and Gavião [50] showed contradictory results among six studies on association of malocclusion on oral health-related quality of life. A recently published systemic review by Dimberg et al. [51] limited variability by confining to only high-quality studies. Impact of malocclusion was mainly on emotional and social wellbeing as suggested by both of the reviews, however, they can merely consider on other sources for inconsistency [50, 51].

Most of the studies which were assessed in this review were mostly from Brazil, and only one study was from New Zealand. Comparing to the study performed by Ukra et al. [14], high scientific evidence that negative impact of severe malocclusion on oral health-related quality of life was observed among Taranaki and Otago population in New Zealand. Studies from other parts of the world were lacking and may show a difference on the impact of malocclusion on the quality of life due to cultural differences between countries.

The results of this review also supported that severe malocclusions largely impact the social-emotional dimension of oral health-related quality of life. At the individual level, qualitative measures through interviews would be more sensitive while on a group level, measuring oral health-related quality of life with quantitative measures are thought to be satisfactory. Comprehensive analysis on group and individual level can be achieved if future studies include qualitative methods in their studies. A combination of quantitative method by means of instruments and qualitative methods by means of interviews would be a reasonable combination for future studies to achieve a more detailed information on how malocclusion may affect the oral health-related quality of life.

The study design is constantly suggestive of the level of evidence concurring to the GRADE system [32]. A cross-sectional study that is designed to grant good control of differences between study and control group concerning four types of bias, which are selection, attrition, performance and detection bias, makes it possible for a study to be classified under high level of quality [52]. Hence, all significant types of partiality was taken into

account by all three studies assessed as having high level of quality. 12 studies were excluded from final assessment due to lack of important confounders, using improper or selected material, inadequate statistical analysis or did not include drop-out rate.

All things considered, the use of consistent methods and comparable groups and as well as with extensive geographical involvement in upcoming studies can also allow meta-analysis to be performed. Evidence in a systemic review holds a strong point and are highly dependent the quality of the studies assessed rather than the degree on comprehensiveness of the study [53].

CONCLUSION

Three studies with high level of quality reported that malocclusions, particularly in the aesthetic area, have negative effects on oral health-related quality of life especially on the emotional and social wellbeing dimension. The scientific evidence was considered strong since the studies are of high level of quality.

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