

Psychosocial impact of malocclusion: Is there gender difference



Received: 01/03/2023

Revised: 01/06/2023

Accepted: 02/06/2023

Published: 07/07/2023

Corresponding author:

Vildana Džemidžić

Correspondence email:

vdzemidzic@gmail.com

DOI: 10.5937/bjdm2302118D



Vildana Džemidžić, Lejla Redžepagić-Vražalica, Azra Jelesković, Alisa Tiro

University of Sarajevo, Faculty of Dentistry with Dental Clinical Center, Department of Orthodontics, Sarajevo, Bosnia and Herzegovina

Abstract:

Background/Aim: The aim of the research is to assess the psychosocial impact of malocclusion, to determine the relationship with the degree of need for orthodontic treatment, and to assess the influence of gender on this relationship in adolescents. **Material and Methods:** A total of 100 subjects, aged 12 to 18, participated in the research. The subjects had no previous orthodontic treatment. The assessment of the need for orthodontic treatment was performed using the Index of Orthodontic Treatment Need (IOTN), namely the Dental Health Component (DHC) and the Aesthetic Component (AC). The psychosocial impact of dental aesthetics was assessed using the PIDAQ questionnaire. **Results:** The total PIDAQ score, as well as its 4 subclasses, dental self-confidence, psychological impact, social impact and aesthetic concern have a positive correlation with the categories of the IOTN. The psychosocial impact of dental aesthetics is similar in boys and girls, except that girls showed a slightly greater aesthetic concern due to the presence of malocclusion. **Conclusions:** The present malocclusion has a psychological and social impact on the individual, but it also negatively affects his dental self-confidence and aesthetic concerns. The results of the PIDAQ questionnaire can guide the orthodontist to the patient's basic problem and thus provide guidelines for orthodontic treatment.

Keywords: orthodontics; psychosocial impact; malocclusion; dental aesthetic; orthodontic treatment need

INTRODUCTION

Malocclusions are a misaligned or incorrect relationship of the teeth in the same dental arch or incorrect relationship between the teeth of the upper and lower jaw. Malocclusion are not classified as a disease with clearly defined symptoms, rather it is considered more of a variation in relation to normal dental and skeletal characteristics.

All irregularities of the teeth do not imply that orthodontic treatment is necessary. There are different aspects of the need for orthodontic treatment - aesthetic, functional, oral health, psychological, social [1][2]. From the patients point of view, the desire for a better appearance, and with it greater self-confidence, is most often dominant. For orthodontists the most important reasons for orthodontic treatment are improper occlusion, improper functions of the orofacial complex (mastication, speech) and improvement of the oral health. Taking into account these different aspects of the orthodontic treatment need, it is necessary to make an assessment based on objective parameters, which implies the application of different standardized occlusal indices.

One of the indices that has found wide application both in daily clinical work and in scientific research studies is the Index of Orthodontic Treatment Need (IOTN). Index of Orthodontic Treatment Need was developed to quantify and standardize individual patient needs for orthodontic treatment, in order to identify individuals who would best benefit from orthodontic treatment [3]. The Index of Orthodontic Treatment Need (IOTN) includes two components – the Dental Health Component (DHC) and the Aesthetic Component (AC).

Priority for orthodontic treatment will be given to patients with severe, skeletal malocclusions that impair oral health and the functions of the orofacial complex. However, patients who have aesthetic problems should also be considered. The aesthetic problem may be more difficult because it can affect psychosocial development, especially when it comes to adolescents [4]. The patient's subjective assessment of the orthodontic treatment need is associated with impaired quality of life due to the presence of orthodontic irregularities [5].

Quality of life can be defined as a sense of well-being that results from satisfaction or dissatisfaction with

aspects of life that are important to a person. The specific area of quality of life represents the quality of life associated with health, and thus oral health [5]. It is well known that oral health significantly affects a person's quality of life, which can be defined as "oral health-related quality of life - OHRQoL" [6]. In order to assess the quality of life related to oral health, various questionnaires were used, which should give an answer to what extent malocclusion represents a functional, psychological or social problem for a person. The most frequently used questionnaires are: Oral health impact profile – OHIP; Oral impact on daily performances – OIDP; Child perception questionnaire – CPQ; Psychosocial impact of dental aesthetics questionnaire – PIDAQ; Orthognatic quality of life questionnaire – OQLQ [6].

PIDAQ (Psychosocial Impact of Dental Aesthetics Questionnaire) is a questionnaire related to dental aesthetics. This questionnaire consists of 23 questions, grouped into four dimensions - Dental Self-Confidence (DSC), Social Impact (SI), Psychological Impact (PI) and Aesthetic Concern (AC) [7].

The PIDAQ questionnaire was originally applied in German for younger people aged 18 to 30 years. The questionnaire was translated into English and has been used all over the world. Due to the specificity of certain language areas, this questionnaire has been translated into other languages and thus adapted for use in different parts of the world. In addition to language adaptation, this questionnaire was later adapted for younger age groups [7][8].

The social and medical aspect of malocclusion treatment is very important. Correcting irregularities improves the growth and development of the jaws, improves the functions of the orofacial complex, improves the aesthetics of the face and thus affects the psychosocial development of a person.

The aim of the research is to assess the psychosocial impact of malocclusion, to determine the relationship with the degree of need for orthodontic treatment, and to assess the influence of the gender on this relationship in adolescents.

MATERIAL AND METHODS

The research sample consisted of 100 subjects, aged 12 to 18. The subjects had no previous orthodontic treatment. The study was approved by the Ethical Commit-

tee of the School of Dental Medicine, University of Sarajevo (02-3-4-19-1-2/2022).

To assess the need for orthodontic treatment in this research, the IOTN index was used, as well as the Dental Health Component (DHC) and the Aesthetic Component (AC). The need for orthodontic treatment was assessed by an orthodontist.

According to the Dental Health Component (DHC), subjects were classified into five grades according to the need for orthodontic treatment: 1 ("no need for treatment"), 2 ("little need for treatment"), 3 ("moderate need for treatment"), 4 ("required treatment") and 5 ("expressed need for treatment").

Aesthetic components (AC) – consists of ten black and white, intraoral photographs, showing different level of dental attractiveness, were photo number 1 (Grade 1) shows the most aesthetically acceptable dental appearance while photo number 10 (Grade 10) shows the least aesthetically acceptable dental appearance. With regard to the need for treatment, subjects are classified into three categories: Grades 1 – 4 represent 'no/little need for treatment', Grades 5 – 7 'borderline need for treatment' and Grades 8 – 10 represent 'great need for treatment'.

Statistical analysis

All measurements were recorded in an Excel spreadsheet. Data were analysed using statistical parameters: mean value, chi-square test (χ^2), Spearman's correlation coefficient. Stepwise linear regression models were employed to study the linear relationship between the PIDAQ data as the dependant variable and the IOTN components (DHC and AC). The level of significance was set at 5% ($p < 0.05$). The Statistical Package for Social Sciences (SPSS, version 20.0) was used for data analysis.

RESULTS

The needs for orthodontic treatment based on the IOTN - DHC component are shown in Table 1. 34% of subjects have a definite need for orthodontic treatment (DHC 4, 5), 25% of subjects have a borderline need (DHC 3) and 41% of subjects had no or little need for orthodontic treatment (DHC 1, 2). There was no statistically significant difference between male and female ($\chi^2 = 2.334$; $p > 0.05$).

Table 1. Gender distribution of Dental Health Component (DHC) of IOTN

IOTN – DHC (Grades)	Gender				Total	
	Male		Female			
	N	%	N	%	N	%
No / Little Need (1, 2)	21	42	20	40	41	41
Borderline Need (3)	9	18	16	32	25	25
Definite Need (4, 5)	20	40	14	28	34	34
Total	50	50	50	50	100	100
IOTN – Index of Orthodontic Treatment Need; IOTN-DHC – Dental Health Component of IOTN;						

According to the Aesthetic Component (AC), 8% of subjects had a definite need for orthodontic treatment (AC 8 - 10), 11% of subjects had a borderline need (AC 5 - 7), and no or little need for orthodontic treatment (AC 1 - 4) had 81% of respondents (Table 2).

Table 2. Gender distribution of Aesthetic Component (AC) of IOTN

IOTN – AC (Grades)	Gender				Total	
	Male		Female			
	N	%	N	%	N	%
No / Little Need (Grades 1 – 4)	40	80	41	82	81	81
Borderline Need (Grades 5 – 7)	5	10	6	12	11	11
Definite Need (8 – 10)	5	10	3	6	8	8
Total	50	50	50	50	100	100

IOTN – Index of Orthodontic Treatment Need; IOTN-AC – Aesthetic Component of IOTN;

There was no statistically significant difference between gender ($\chi^2 = 3.754$; $p > 0.05$).

Table 3. shows the correlation of the results of the PIDAQ questionnaire in relation to gender.

Table 3. Scores of the PIDAQ by gender

PIDAQ Questionnaire	Gender		Statistic test χ^2
	Male (N = 50)	Female (N = 50)	
PIDAQ, mean (95% CI)			
DSC subscale	9.33 (8.62-10.04)	6.06 (5.21-6.91)	0.939
SI subscale	7.0 (6.20-7.80)	9.41 (7.93-10.89)	0.638
PI subscale	9.49 (9.13-9.85)	8.22 (7.56-8.88)	0.457
AC subscale	3.38 (2.58-4.18)	6.04 (4.31-7.77)	2.983*
PIDAQ Total	29.20 (26.67-31.73)	29.73 (25.10-34.36)	0.725

PIDAQ – Psychosocial Impact of Dental Aesthetic Questionnaire; DSC – Dental self-confidence; SI – Social impact; PI – Psychological impact; AC – Aesthetic concern; * $p > 0.05$

The total and subscale PIDAQ scores showed that there was no statistically significant difference between genders, except for the AC subscale, where females had a higher score and showed greater aesthetic concern.

Comparison of total and subscale PIDAQ scores in each grade of IOTN – DHC component is shown in Table 4. A significant positive correlation was found for all subscales of the PIDAQ questionnaire, as well as its total scores with the IOTN - DHC component.

The correlation between subscales of the PIDAQ questionnaire and its total score, and the IOTN - AC component is represented by the Spearman correlation coefficient (Table 5). A positive correlation was found for all subscales of the PIDAQ questionnaire, as well as its total scores with the IOTN - AC component.

DISCUSSION

The psychosocial aspect of dental aesthetics was evaluated using the PIDAQ questionnaire, which proved to be a valid instrument for assessing the quality of life related to oral health (OHRQoL) among adolescents [8][9][10][11]. The psychosocial impact of dental aesthetics has also been examined in adults [12][13], because it was considered that adults are more emotion-

ally stable and have a more realistic view of dentofacial aesthetics, compared to adolescents.

Table 4. Total and subscale PIDAQ scores in relation to the IOTN – DHC component

PIDAQ Questionnaire	IOTN – DHC (Grades)			Spearman's correlation coefficient
	No / Little Need (1, 2)	Borderline Need (3)	Definite Need (4, 5)	
PIDAQ, mean (95% CI)				
DSC subscale	9.3 (7.2-11.4)	7.5 (6.7-8.3)	3.3 (2.3-4.3)	0.37
SI subscale	7.4 (5.8-9.0)	5.4 (4.9-5.9)	2.3 (1.9-2.7)	0.49
PI subscale	8.5 (6.5-10.5)	6.0 (5.9-6.1)	4.7 (4.6-4.8)	0.39
AC subscale	6.7 (6.1-7.3)	3.3 (2.8-3.8)	3.1 (2.7-3.5)	0.43
PIDAQ Total	31.9 (29.8-34.0)	22.2 (19.3-25.1)	13.4 (12.1-14.7)	0.47

PIDAQ – Psychosocial Impact of Dental Aesthetic Questionnaire; IOTN – Index of Orthodontic Treatment Need; IOTN-DHC – Dental Health Component of IOTN; DSC – Dental self-confidence; SI – Social impact; PI – Psychological impact; AC – Aesthetic concern;

In this research, the impact of dental aesthetics on the psychosocial status of adolescents was examined. Adolescents are a specific age group, in which, due to sudden physiological and psychological changes, a different impact of dental aesthetics on psychosocial status can be expected, compared to other age groups. In addition, adolescents often seek orthodontic treatment, and therefore a better understanding of their psychological burden caused by irregularities related to dental aesthetics will enable better cooperation during orthodontic treatment and satisfactory results at the end of treatment. Similar research conducted in other countries also had adolescents as a target group [14][10][11][15][16][17]. PIDAQ is a specific instrument related to dental aesthetics, which does not include oral functions and pain, and is therefore suitable for assessing the impact of malocclusion on quality of life, because most orthodontic conditions are asymptomatic and related to aesthetics, without pain and discomfort [11].

The need for orthodontic treatment was assessed using the IOTN index, which is one of the most commonly used indices worldwide [18][9][10][12]. The results of this research showed that 34% of subjects defi-

nite need orthodontic treatment (DHC 4 and 5) based on an objective assessment, while a significantly smaller number of subjects had a pronounced need based on the aesthetic components (AC 8, 9 and 10). The results of studies by Bellot-Arcis (2013), Iranzo-Cortes (2020) and Pouralimardan (2022) showed similar results [9][10][19].

Table 5. Comparison of PIDAQ scores and AC grades of IOTN

PIDAQ Questionnaire	IOTN – AC (Grades)			Spearman's correlation coefficient
	No / Little Need (Grades 1-4)	Borderline Need (Grades 5-7)	Definite Need (8-10)	
PIDAQ, mean (95% CI)				
DSC subscale	12.5 (11.7-13.3)	8.0 (7.3-8.7)	3.5 (3.3-3.7)	0.36
SI subscale	9.5 (8.3-10.7)	7.5 (6.6-8.4)	8.5 (9.8-7.2)	0.36
PI subscale	7.5 (6.8-8.2)	3.0 (2.9-3.1)	10.0 (9.0-11.0)	0.36
AC subscale	18.5 (17.9-19.1)	4.5 (3.4-5.6)	7.0 (5.9-8.1)	0.47
PIDAQ Total	48.0 (46.7-49.3)	23.0 (21.2-24.8)	29.0 (27.4-30.6)	0.36

PIDAQ – Psychosocial Impact of Dental Aesthetic Questionnaire; IOTN – Index of Orthodontic Treatment Need; IOTN-AC – Aesthetic Component of IOTN; DSC – Dental self-confidence; SI – Social impact; PI – Psychological impact; AC – Aesthetic concern;

The total and subscales of PIDAQ scores in this research showed that there are no statistically significant differences between the genders, except for subclass AC where significant differences were observed between male and female subjects. Females showed more aesthetic concern about the appearance of their teeth compared to males. Similar results were also presented in the study by Bellot-Arcis (2013), with the fact that the difference between the genders was determined in the PI subscale, where the presence of malocclusion in girls had a greater negative psychological impact [10]. In a study by Iranza-Cortes (2020), women showed greater aesthetic concern and greater negative psychological impact, and also the total PIDAQ score was significantly higher in women [9]. Such results can be explained by the overall greater concern of women for health problems compared to men. This is manifested in the greater attention they pay to health, greater awareness of the impact of oral health,

the role of dental aesthetics and facial beauty in relation to quality of life [20].

The results of the PIDAQ questionnaire in relation to gender showed that male subjects have higher values of DSC and PI, while female subjects have higher values of SI and AC as well as total PIDAQ score. Although the differences are not statistically significant, except for subclass AC, it can be concluded that females showed greater aesthetic concern about the appearance of their teeth, especially in photos and videos, and that they also have a greater social problem in interacting with other people. In contrast, for males, dental aesthetics had a greater impact on emotional (DSC) and psychological state (PI).

The assessment of the need for orthodontic treatment differs significantly depending on whether it was assessed based on the DHC or AC component, which also coincides with the results of other studies [9][10][19]. The results of this research showed that there is a significant linear correlation between the results of the PIDAQ questionnaire, both the total score and the subclasses, with both components of the IOTN. The PIDAQ subclasses have shown that they can distinguish adolescents with a definite need for orthodontic treatment from those with a moderate need or no need for treatment. All subclasses as well as the total PIDAQ score were reduced in subjects who needed orthodontic treatment according to DHC, which may indicate that self-perceived oral health-related quality of life is not always a reflection of malocclusion severity. Dental self-esteem decreased with increasing need for orthodontic treatment, assessed on the basis of the DHC. Similar results were also found in studies by Bellot-Arcis (2013), Iranzo-Cortez (2020), Pavlič(2016) [9][10][16]. In these studies, the other dimensions of the PIDAQ questionnaire increased with the increase in the orthodontic treatment need, while the results of our research showed the opposite.

For the subjects in our research, pronounced malocclusion did not affect communication with other people and patients did not experience any concerns. However, subjects with minimal deviations where there is a little need for orthodontic treatment are significantly more psycho-socially concerned. These results should be taken into account when considering and planning orthodontic treatment. This indicates to the orthodontist that patients who are not concerned by the present malocclusion are likely to be less motivated for orthodontic treatment and less likely to cooperate. While in patients with minimal deviations, realistic expectations should be considered before

starting the treatment, that is, what the patient expects as the outcome of the treatment even though it is about minor corrections.

The research results showed that there is a positive correlation between all dimensions of the PIDAQ questionnaire and the AC component of the IOTN index, which would mean that the aesthetic impression left by the appearance of one's teeth is related to one's dental self-esteem, psychological and social impact as well as one's aesthetic concerns; and these results are in agreement with the results of other, similar studies [7][9][10][11][19]. Adolescents show concern for appearance and aesthetics, which is often not realistic in relation to their age. Also, the patient's perception of dental aesthetics is not always connected with the real need for orthodontic treatment, which is objectively determined by indexes. It is interesting that in this research, the greatest aesthetic concern and social impact were experienced by the subjects who did not need orthodontic treatment (1,2,3,4 AC – IOTN). This points to the fact that adolescents are very critical when it comes to the appearance of the teeth, because even small deviations (midline misalignment, minor diastema - conditions shown in photos 1, 2, 3 and 4 of the AC) represent a big problem for the patient.

The limitation of this research may be the lack of subject's self-evaluation of the aesthetic component. Recommendation for future studies would be to increase the number of subjects and include self-evaluation of dental appearance.

CONCLUSIONS

There is a correlation between the components of the IOTN index and the psychosocial aspect of dental aesthetics assessed by the PIDAQ questionnaire. The present malocclusion has a psychological and social impact on the individual, but it also negatively affects his dental self-confidence and aesthetic concerns. The psychosocial impact of dental aesthetics is similar in males and females, except that females showed a slightly greater aesthetic concern due to the presence of malocclusion. The results of the PIDAQ questionnaire can guide the orthodontist to the patient's basic problem and thus provide guidelines for orthodontic treatment.

Conflict of Interests

Nothing to declare.

Financial Disclosure Statement

Nothing to declare.

Human Rights Statement

All the procedures on humans were conducted in accordance with the Helsinki Declaration of 1975, as revised 2000. Consent was obtained from the patient/s and approved for the current study by national ethical committee.

Animal Rights Statement

None required.

REFERENCES

1. Dimberg L, Arnrup K, Bondemark L. The impact of malocclusion on the quality of life among children and adolescents: A systematic review of quantitative studies. *Eur J Orthod.* 2015;37:238-47. [[Crossref](#)] [[PubMed](#)] [[PMC](#)] [[Google Scholar](#)]
2. Pereira D, Machado V, Botelho J, Proença L, Rua J, Lemos C, et al. Impact of Malocclusion, Tooth Loss and Oral Hygiene Habits on Quality of Life in Orthodontic Patients: A Cross-Sectional Study. *Int J Environ Res Public Health.* 2021;18:7145-7145. [[Crossref](#)] [[PubMed](#)] [[PMC](#)] [[Google Scholar](#)]
3. Brook PH, Shaw WC. The development of an index of orthodontic treatment priority. *Eur J Orthod.* 1989;11:309-320. [[Crossref](#)] [[Google Scholar](#)]
4. Tiro A, Nakas E, Arslanagić A, Marković N, Džemidžić V. Perception of Dentofacial Aesthetics in School Children and Their Parents. *Eur J Dent.* 2020;15:13-19. [[Crossref](#)] [[PubMed](#)] [[PMC](#)] [[Google Scholar](#)]
5. Demirović K, Habibović J, Džemidžić V, Tiro A, Nakas E. Comparison of Oral Health-Related Quality of Life in Treated and Non-Treated Orthodontic Patients. *Med Arch.* 2019;73:113-117. [[Crossref](#)] [[PubMed](#)] [[PMC](#)] [[Google Scholar](#)]
6. Weintraub JA. Uses of oral health related quality of life measures in Public Health. *Community Dent Health.* 1998;15:8-12. [[Google Scholar](#)]
7. Klages U, Claus N, Wehrbein H, Zentner A. Development of a questionnaire for assessment of the psychosocial impact of dental aesthetics in young adults. *Eur J Orthod.* 2006;28:103-111. [[Crossref](#)] [[Google Scholar](#)]
8. Klages U, Erbe C, Sandru SD, Brüllman D, Wehrbein H. Psychosocial impact of dental aesthetics in adolescence: Validity and reliability of a questionnaire across age-groups. *Qual Life Res.* 2015;24:379-390. [[Crossref](#)] [[Google Scholar](#)]
9. Monisha J, Peter E, Ani GS. Is Psychosocial Impact of Dental Aesthetic Questionnaire (PIDAQ) valid for the Indian population? A psychometric study. *J Int Soc Prevent Communit Dent.* 2021;11:207-215. [[Google Scholar](#)]
10. Montiel-Company JM, Bellot-Arcís C, Almerich-Silla JM. Validation of the psychosocial impact of dental aesthetics questionnaire (Pidaq) in Spanish adolescents. *Oral Dis.* 2013;18:e168-173. [[Crossref](#)] [[PubMed](#)] [[PMC](#)] [[Google Scholar](#)]
11. Iranzo-Cortés JE, Montiel-Company JM, Bellot-Arcís C, Almerich-Torres T, Acevedo-Atala C, Ortolá-Siscar JC, et al. Factors related to the psychological impact of malocclusion in adolescents. *Sci Rep.* 2020;10:13471-13471. [[Crossref](#)] [[PubMed](#)] [[PMC](#)] [[Google Scholar](#)]
12. Zakyah AD. Psychosocial impact of dental aesthetics questionnaire (PIDAQ) as a subjective diagnostic instrument in orthodontic: A literature review. *Int Public Health J.* 2020;12:109-119. [[Google Scholar](#)]
13. Bellot-Arcís C, Montiel-Company JM, Almerich-Silla JM. Psychosocial impact of malocclusion in Spanish adolescents. *Korean J Orthod.* 2013;43:193-200. [[Crossref](#)] [[PubMed](#)] [[PMC](#)] [[Google Scholar](#)]
14. Bucci R, Rongo R, Zito E, Valletta R, Michelotti A, D'anto V. Translation and validation of the Italian version of the Psychosocial Impact of Dental Aesthetics Questionnaire (pidaq) among adolescents. *Eur J Paediatr Dent.* 2017;18:158-162. [[Google Scholar](#)]
15. Yi S, Zhang C, Ni C, Qian Y, Zhang J. Psychosocial impact of dental aesthetics and desire for orthodontic treatment among Chinese undergraduate students. *Patient Prefer Adherence.* 2016;10:1037-1042. [[Crossref](#)] [[PubMed](#)] [[PMC](#)] [[Google Scholar](#)]
16. Venete A, Trillo-Lumbreras E, Prado-Gascó VJ, Bellot-Arcís C, Almerich-Silla JM, Montiel-Company JM. Relationship between the psychosocial impact of dental aesthetics and perfectionism and self-esteem. *J Clin Exp Dent.* 2017;9:e1453-e1458. [[Crossref](#)] [[PubMed](#)] [[PMC](#)] [[Google Scholar](#)]
17. Motloba DP, Sethusa MPS, Ayo-Yusuf OA. The psychological impact of malocclusion on patients seeking orthodontic treatment at a South African oral health training centre. *S Af Dent J.* 2016;71:200-205. [[Google Scholar](#)]
18. Pavlić A, Roksandić VZ, Trinajstić ZM, Katić V, Špalj S. Psychosocial impact of dental aesthetics in adolescents in Croatia: Validation and reliability of a psychometric instrument. *Medicina - glasilo Hrvatskoga liječničkog zbora.* 2016;52:224-231. [[Google Scholar](#)]
19. Sari CN, Jazaldi F, Ismah N. Association between psychosocial status and orthodontic treatment needs in Indonesian high school students. *Pesqui Bras Odontopediatria Clin Integr.* 2020;20:e5649-e5649. [[Crossref](#)] [[Google Scholar](#)]
20. Pouralimardan M, Karimi AM, Karimi AM. The Correlation between Orthodontic Treatment Need and Psychosocial Impact of Dental Aesthetics among Patients Seeking Orthodontic Treatment. *J Kerman Univ Med Sci.* 2022;29:536-541. [[Crossref](#)] [[Google Scholar](#)]
21. O'brien C, Benson PE, Marshman Z. Evaluation of a quality of life measure for children with malocclusion. *J Orthod.* 2007;34:185-193. [[Google Scholar](#)]