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RESEARCH ARTICLE

The Impact of Malocclusions and Orthodontic Treatments on a Patient's Quality of Life

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ABSTRACT

Aim : This study aimed to compare the variations in patients' perception of oral health related quality of life (OHRQoL), using the Moroccan version of PIDAQ, before and after orthodontic treatment among patients with the same initial PAR Index score, age and gender.

Methods: In this study, 67 participants were divided into 2 groups. Group A (treated, control group) consisted of 30 patients who received orthodontic treatment; group B comprised of 37 patients who were either at the initiation stage of treatment or potential candidates. The matching of group A and group B was achieved by reaching a compromise between PAR index score, age and gender. The assessment of the psychosocial impact of malocclusion was carried out using the Moroccan version of PIDAQ. The Chi-square test was used to establish associations between qualitative variables. Levene and Mann Whitney's tests were employed to determine the associations between quantitative variables.

Results : The age of the patients ranges from 7 to 58 years, with an mean age of 23 years +/_10. 22. While 41 subjects (61.2%) consulted for aesthetic reasons, 26 subjects (38.8%) consulted for a functional reason. The distribution of scores of the two groups before and after orthodontic intervention showed no significant difference between the mean scores of the four PIDAQ domains.

Conclusion : The results of our study showed a significant improvement in the psychosocial impact of malocclusion when comparing the two case-control groups, with a reduction in the perceived needs of patients who completed orthodontic treatment.

KEYWORDS: Oral health; Quality of life ; Malocclusion ; Psychosocial Impact of Dental Aesthetics Questionnaire; Morocco.

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BACKGROUND

Physical appearance, a major contributor to self-esteem, exerts a strong impact on individuals' social interactions and well-being. An unpleasant physical look may stigmatize a person, and reinforce negative stereotypes. According to Langlois et al (1), people are treated differently based on how physically attractive they are perceived to be. Given the influence that physical attractiveness plays in our contemporary society, it is perhaps not surprising that people seek different ways to change their appearance to conform to societal ideals of physical attractiveness, and thus to the "beauty canon" consecrated by the collective imagination.

Malocclusion has been traditionally defined as a disorder of alignment and interrelation of teeth and dental arches related to changes in the growth and development of the craniofacial system which affects both function and

aesthetics and influences social interactions and the quality of life (QoL) of individuals.

Much research (2, 3) of the last decades has reported an association between malocclusion and oral health related quality of life (OHRQoL). Therefore, in addition to improving oral health, function and aesthetics, orthodontic treatment should contribute to an improvement in the QoL overall and in OHRQoL; hence, resulting in increasing self-esteem and decreasing uneasiness in social settings. To assess the success of orthodontic treatment, several indices have been developed and widely used in clinical and scientific research. For example, the Peer Assessment Rating Index (PAR Index) has been designed to provide a single score for all occlusal anomalies that may be found in a malocclusion (5). The difference in pre-treatment and post-treatment scores reflects the degree of improvement in occlusion and, therefore, accounts for the success of the treatment. However, the PAR Index does not give us enough information about how the occlusion affects the patient's QoL.

Although QoL cannot be measured by material tools, it can be accessible through other means of evaluation such as the "Psychosocial Impact of Dental Aesthetics Questionnaire" (PIDAQ), which assesses the psycho-social impacts of dental aesthetics in young adults, providing information on the oral health aspect of QoL. It is a derivative of the "Orthognathic Quality of Life Questionnaire" (OQLQ) with 23 elements divided into 4 domains: Self-confidence (SC), social impact (SI), psycho-social impact (PI) and aesthetic impact (AI) (6,7).

The need to improve dental aesthetics, psycho-social well-being is the fundamental motivation for undertaking orthodontic treatment. This need is influenced by a number factors, including the severity of the malocclusion, dental care including orthodontic treatment, self-perception and facial aesthetics.

It was against the above background that the present study was conducted. This study aimed to compare the variations in patients' perception of OHRQoL, using the Moroccan version of PIDAQ, before and after orthodontic treatment among subjects with the same initial PAR Index score, age and gender.

METHODS

We conducted a cross-sectional case-control study. Which focused on patients who benefited or wished to benefit from orthodontic treatment. A total of 67 patients took part in this study. Participants were selected according to the following inclusion criteria: Complete orthodontic file, Initial "PAR index" score of the two very similar case-control matched patients, have consented to participate in the study. The study took place at Casablanca Dentofacial Orthopedic Center at Ibn Rochd University Hospital over a period of 12 weeks from 15 September to 15 December 2017.

Participants were divided into two groups: Group A (treated, control group) consisted of 30 patients who received orthodontic treatment; group B comprised of 37 patients who were either at the initiation stage of treatment or potential candidates for orthodontic treatment.

The participants were administered the Moroccan version of PIDAQ, translated and validated in 2015 (8) to assess the psychosocial impact of malocclusion. The malocclusion of the two groups was assessed by the PAR Index. The individual scores were summed up to obtain a total score representing the degree of deviation of a case from normal alignment. A score of zero would indicate good alignment and higher scores would point to an increase in irregularity levels. The overall score is recorded on the pre- and post- treatment dental casts. The difference between these scores represents the degree of improvement resulting from orthodontic intervention (5).

The data were collected via a questionnaire consisting of 3 parts:

- The first part included socio-demographic characteristics of patients (age, profession, dental history, reason for consultation).
- The second part involved data from the PAR Index. The data were collected by a single operator after t-test-retest was performed on 12 preliminary models. The second calculations were performed after an interval of 5 weeks. Using Cohen's Kappa index, the validity and reliability of the calculations were confirmed. The average value of the concordance rates of the results was 0.84, which was considered very good or excellent.
- The last part consisted of the Moroccan version of PIDAQ, with a view to assessing OHRQoL.

Patient data and patient records were collected from residents and specialists undertaking training at Casablanca Dentofacial Orthopedics Department. Participants who we were unable to reach out to were contacted via Facebook. The calculation of PAR Index scores was performed on preliminary models of patients. The questionnaires were completed through telephone calls. In order to arrive at two lists of similar pre/post treatment patient profiles, the matching of Group A and Group B was achieved by reaching a compromise between the PAR index score, age and gender: (1) Similar or approximately similar Scores PAR Index; (2) a similar age group, and same gender.

Data analysis was carried out by the Medical Informatics Laboratory at Casablanca School of Medicine and Pharmacy using with the Statistical Package Epi Info 3.5.4 and Microsoft Excel 2007. The validity of the calculations was assessed using Cohen's Kappa index by comparing the results of the calculations between T1 and T2 to determine their consistency. The Chi-square test was used to establish associations between qualitative variables. Finally, Levene and Mann Whitney's tests were performed to establish associations between quantitative variables.

The study was submitted to and approved by the Thesis Commission, which acts as an Ethics committee in Casablanca School of Dentistry. Patients in both groups were informed about the purpose of the study and were willing to participate.

RESULTS

Descriptive data

Table 1 illustrates information about the socio-demographics of the patients. 67 patients (22 males, 45 females) ranging in age from 7 to 58 years, mean age (23 years +/_10. 22) were divided into two groups: The first group A consisted of 30 patients who underwent orthodontic treatment. The second group B involved 37 patients who were at the beginning or candidates for orthodontic treatment. 38 subjects (56.7%) were students. 2 subjects (3%) had a liberal profession. 14 subjects (20.9%) were employees. 3 subjects (4.5%) were civil servants. 9 subjects (13.4%) were unemployed. 41 subjects (61.2%) consulted for aesthetic reasons, while 26 subjects (38.8%) consulted for functional reasons.

Table 2 shows that 34 subjects (50.8%) of the sample claimed their approach to orthodontic treatment was personal. 22 subjects (32.8%) maintained they were influenced by their dentist while 11 subjects (16.4%) were encouraged by friends, and family.

Table 3 gives information about the reasons for the need for orthodontic treatment. What stands out from table 3 is that 59 subjects (88.1%) sought treatment to improve their self-confidence, 13 subjects (19.4%) to improve their social interactions, and 10 subjects (14.9%) wanted to increase employment opportunities.

All 30 patients in the first group who completed their orthodontic treatment reported being satisfied with the outcome of their orthodontic treatment.

PIDAQ

The values of the different domains of the PIDAQ within groups A and B (figure 1) are shown below:

Group A:

- The area of aesthetic concerns (AC) has a mean of 0.266 and a standard deviation of 0.63 with a minimum value of 0 and a maximum value of 3.
- The Psychological Impact (PI) domain has a mean of 1.56 and a standard deviation of 1.30 with a minimum value of 0 and a maximum value of 4.
- The Social Impact (SI) domain has a mean of 3.13 and a standard deviation of 2.40 with a minimum value of 0 and a maximum value of 12.
- The Dental self-confidence domain (DSC) has a mean of 3.20 and a standard deviation of 2.73 with a minimum value of 0 and a maximum value of 10.

Group B:

- The area of Aesthetic Concern (AC) has a mean of 8.83 and a standard deviation of 2.52 with a minimum value of 4 and a maximum value of 12.
- The Psychological Impact (PI) domain has a mean of 13.05 and a standard deviation of 5.32 with a minimum value of 3 and a maximum value of 23.
- The Social Impact (SI) domain has a mean of 15.45 and a standard deviation of 7.90 with a minimum value of 1 and a maximum value of 32.
- The Dental Self-confidence Domain (DSC) has a mean of 21.89 and a standard deviation of 2.46 with a minimum value of 15 and a maximum value of 24.

The average score values for the different PIDAQ domains and their standard deviation are given in Table 4.

Comparison of the paired groups are illustrated in Table 5 below:

- The standardized mean of the Dental Self-Confidence Determinant (DSD) for Group A was 13.33 while the mean for Group B was 90.69.
- The standardized mean of the Social Impact Determinant (SI) for Group A was 9.79 while the mean for Group B was 46.66.
- The standardized mean for the Psychological Impact Determinant (PI) for Group A was 6.52 while the mean for Group B was 54.16.
- The normalized average for the determinant of esthetic dentistry (AC) for group A was 2.22 while the average for group B was 69.44.

Correlations of the matched samples revealed that:

- The pair formed by groups A & B for the determinant of dental self-confidence (DSC) has a correlation of -0.31 and a significance of 0.871.
- The Social Impact Determinant (SI) pair for Groups A & B has a correlation of -0.120 and a significance of .529.
- The pair formed by groups A & B for the psychological impact determinant (PI) has a correlation of 0.133 and a significance of 0.489.
- The pair of groups A & B for the determinant of dental aesthetics (DA) has a correlation of -0.189 and a significance of 0.316.

Table 1 : Sample distribution according to age group

Age group	Number	Pourcentage %
7-17 years	23	34.3
18-25 years	20	29.9
26-39 years	17	25.4
40 years or more	7	10.4
Total	67	100

Table 2: Distribution of the sample by reason for consultation.

Nature of the approach	Number	Pourcentage%
Personal approach	34	50.8
Addressed by the dentist	22	32.8
Encouragement by the family and friends	11	16.4
Total	67	100

Table 3 : Distribution of the sample by factors motivating orthodontic treatment.

Motivations	Number	Pourcentage %
Improving self-confidence	59	88.1
Improving social interactions	13	19.4
Increasing employment opportunities	10	14.9

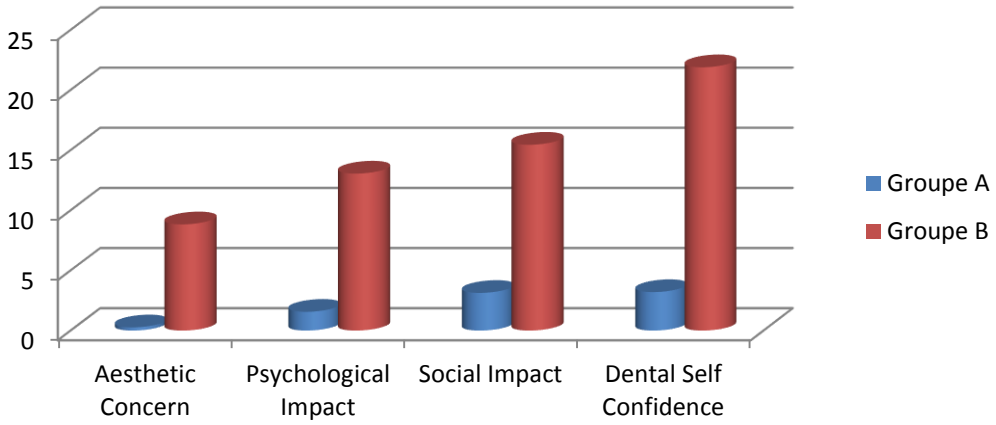

Figure 1 : Values of the different PIDAQ's domains within both groups A and B.

Table 4 : The average score values of PIDAQ's domains within both groups A and B.

PIDAQ's domains	Group A	Group B
Aesthetic Concern (AC)	0.266 (0-3)	8.83 (4-12)
Psychological Impact (PI)	8.83 (0-4)	13.05 (3-19)
Social Impact (SI)	3.13 (0-12)	15.45 (1-32)
Dental Self Confidence (DSC)	3.2 (0-10)	21.89 (15-24)

Table 5 : Paired sample data.

		Mean	N	Standard deviation	Mean standard error
Pair 1	DSC Norm A	13.33	30	11.39	2.07
	DSC Norm B	90.69	30	9.51	1.73
Pair 2	SI Norm A	9.79	30	7.50	1.37
	SI Norm B	46.66	30	24.66	4.50
Pair 3	PI Norm A	6.52	30	5.43	0.99
	PI Norm B	54.16	30	22.34	4.07
Pair 4	AC Norm A	2.22	30	5.33	0.97
	AC Norm B	69.44	30	20.56	3.75

The distribution of scores of the two groups before and after orthodontic intervention showed a significant difference between the mean scores of the four PIDAQ domains. In fact, for the DSC determinant, there was a difference of 71 points between patients in Group A and Group B. With regards to the SI, a difference of 26 points was noted. According to the PI scores, there was a significant increase in scores of 39 points. For DA, the difference between the scores amounted to 58 points. The negative differences between Group A and Group B scores demonstrated that, for all four PIDAQ determinants, Group B scores were higher than Group A scores. According to the PIDAQ scoring, the higher a score, the greater the impact of malocclusion on quality of life is. Therefore, Group B, which represents patients before orthodontic intervention with higher scores, showed a greater impact of malocclusion on quality of life than Group A subjects with lower scores.

The results of the distribution of patients by gender and motive for consultation reported no significant association between gender and motive for consultation, (p) = 0.412 > 0.05. Also there was no significant association between gender and demand for orthodontic treatment, p>0.05. However, our results showed a significant association between gender and the need to improve self-confidence, (p)= 0.013 < 0.05; there was neither significant association between gender and the need to improve social interactions, (p)= 0.327 > 0.05, nor between gender and the need to increase job opportunities, (p) = 0.277 > 0.05.

The distribution of the sample according to the average of the 4 PIDAQ domains by gender showed no significant association between gender and the PIDAQ score (table 6).

Table 6 : Distribution of the sample according to the PIDAQ score by gender.

	Gender	Number	Mean	Standard deviation	(p) Value
DSC normalized	Female	45	55.27	38.74	(p) = 0.772 > 0.05
	Male	22	58.52	44.64	
SI normalized	Female	45	29.16	27.10	(p) = 0.415 > 0.05
	Male	22	34.94	27.04	
PI normalized	Female	45	31.20	29.57	(p) = 0.630 > 0.05
	Male	22	36.55	28.95	
AC normalized	Female	45	39.25	38.70	(p) = 0.476 > 0.05
	Male	22	46.59	40.55	

DISCUSSION

The main objective of this study was to compare the variations in patients' perception of OHRQoL, using the Moroccan version of PIDAQ, before and after orthodontic treatment among subjects with the same initial PAR Index score, age and gender.

The averages of the 4 PIDAQ domains (AC, PI, SI and DSC) were different between the 2 pre- and post-treatment groups. Indeed, the low averages of group A refer us to the low (Table 5) psychosocial impact of dental aesthetics after orthodontic treatment, contrary to the high averages of group B which reflected the measurable impact of dental malocclusion on the QoL of patients. These results, thus, confirm the benefits of orthodontic treatment and its contribution to improved QoL.

Recently, significant progress has been made in assessing quality of life measurement for health care, with over 1000 new articles each year, indexed under MeSH "quality of life". In addition to studies on patients' satisfaction after orthodontic treatment, various studies have been conducted to assess the impact of malocclusion on patients' QoL (9).

Today, there is a growing awareness of the multidimensional potential of oral health and the inadequacy of existing normative measures that have prompted the development of QoL tools, being now used to capture variables related to an individual's feelings, functioning, and coping strategies.

Although the clinical outcomes of orthodontic treatment are well established, relatively little is known about its psychological effects. It has been found in the orthodontic literature that improved smile aesthetics and subsequent improvement in psychosocial well-being are the most common reasons for undergoing orthodontic treatment. In particular, patients seek treatment with a view to gain psychosocial benefits. The PIDAQ is used for its specificity and selectivity to the orthodontic aspects of measuring and evaluating OHRQoL (10).

Several studies that have evaluated the relationship between malocclusion and OHRQoL, the impact of treatment and patient characteristics, were able to identify differences between treated and untreated patients' cohort (11). A study carried out in Iran (12), on a sample of 71 patients, was able to highlight the improvement of OHRQoL after orthodontic intervention using a questionnaire evaluating 4 areas related to oral symptoms, functional limitations, emotional well-being and social well-being. Previous studies reported that patients' motivations for seeking orthodontic treatment were primarily related to appearance and self-image rather than to functional motives (13).

In the present study, patients' demand for orthodontic treatment appears to be largely related to the desire to improve facial appearance. Thus, 64.3% of the patients surveyed reported that their reason for consulting was purely aesthetic.

In terms of the gender ratio, the need for orthodontic treatment was higher among females (67.2%) than males (32.8%). Several authors reported a similar distribution. Indeed, in a longitudinal study carried out in the UK included a sample of 337 subjects, the need for orthodontic treatment was higher among females (57%) (14). Studies conducted in Brazil (15) and Iran (16) included samples with 75.50% and 65.54% female predominance, respectively. This predominance can be explained by the fact that female patients perceive a malocclusion as aesthetically unpleasing and, therefore, are more motivated to seek treatment.

For the present study, the averages of the four PIDAQ domains (AC, PI, SI and DSC) were significantly different between group A and group B before and after treatment. Specifically, the low averages of group A refer us to the low psychosocial impact of dental aesthetics after orthodontic intervention, contrary to the high averages of group B which reflect the measurable impact of dental malocclusion on the quality of life of patients. These results help us to gain insights into the benefits of orthodontic treatment and its contribution to improved QoL.

A study carried out in Iksan, South Korea (17) was designed to evaluate the effect of malocclusion on the QoL of patients. This study was conducted on 860 people who needed clinical need for corrective treatment. The sample was divided into four groups: "normal occlusion," "malocclusion," "orthodontic treatment," and a final group "retention," which included patients who completed their orthodontic treatment. Patients in the "malocclusion" group had the highest PIDAQ scores compared to patients in the "normal occlusion" and "retention" groups. Female patients had higher scores than male patients.

A similar study undertaken in Seoul, South Korea (18) showed that patients requiring orthodontic treatment were 2.7 times more likely to have a poor OHRoL compared to the control group who did not need treatment. Malocclusion is significantly associated with functional limitations, social disability and physical pain in young adults.

The most important contribution of our results is the matching between subjects with the same PAR Index score, in the same age group and of the same gender.

According to a study conducted in India that evaluated the effect of malocclusion in patients before treatment and treatment after a year , using a Hindi version of the PIDAQ (10), the mean PIDAQ score obtained in pre-treatment patients was 59.59, indicating that malocclusion had a very strong PI in all patients who participated in the study. All subjects showed significantly reduced DSC with a score of 19.19. The high scores of the SI factor (score of 17.01) seemed to indicate that malocclusion greatly affected the psychological well-being of patients in social interactions. Subjects also showed great aesthetic concern for their dental appearance (score of 8.10). A very significant reduction in the PIDAQ score was observed with fixed orthodontic treatment during the one-year study period ($p<0.001$). In this study, since each patient was in control of his or her own case, significant differences in the mean values of the scores of the four factors before and during treatment were extremely reliable. The decrease in PI as assessed by the Hindi version of PIDAQ can be attributed to the correction of their malocclusion. The results support the assertion that orthodontic treatment not only results in improved dental aesthetics, but also impacts significantly the psychological aspects of patients.

In Jerusalem, a study (19) was conducted to evaluate the short-term psychosocial impact of improving dental aesthetics in adult subjects using PIDAQ. A statistically significant improvement $P<0.001$ was found for all four factors: DSC, SI, PI and AC.

The previous results are in agreement with the results of the present study. Indeed, the DSC domain was determinant with the highest score, 90.69, followed by the determinant of the AC with a score of 69.44 and then the PI and the SI with scores of 54.16 and 46.66, respectively. There were notable reductions in scores in all areas of PIDAQ. The scores of the determinant DSC dropped by 77.36 points. The AC decreased by 67.22 points, as did the scores for PI and SI, which decreased by 47.63 and 36.87 points. The differences in scores that we were able to identify in our study were certainly greater than the differences in PIDAQ scores identified in the Indian study. One explanation for this is that we interviewed patients before and after treatment and that the divergence of responses was notable, unlike the Indian patients who completed the questionnaires with an interval of 6 months and therefore still had a minimal impact of malocclusion. In the same vein, the results of our study asserted that orthodontic treatment, in addition to improving dental aesthetics, contributed significantly to improving the psychosocial aspects of the patients' life.

Using the different tests of associations between the variables, Chi2 and Levene and Mann Whitney, it was possible to demonstrate that aesthetics was the most common reason for consultation, regardless of the patient's gender. 68% of the male patients and 57.8 % the female patients consulted for aesthetic reasons. These results were not compatible with studies carried out in China (20) and Spain (21), which demonstrated females' sensitivity patients to aesthetics compared to males' patients. This difference can be explained by cultural, traditional or social differences.

Furthermore, our study showed no significant association between gender and orthodontic need for treatment. Nevertheless, with a significant difference $(p) = 0.013 < 0.05$, female patients were more motivated by improved self-confidence than male patients. This sensitivity of females to self-confidence could be accounted for by the fact that female patients make their appearance a central pillar and the main factor contributing to increased self-esteem. However, there was no significant association between gender and the need to improve social interactions or increase work opportunities.

Comparison of the results of the different studies with ours is limited due to differences in methodology. Thus, to allow direct comparison, case-control studies with a matching process by age, gender, and degree of malocclusion should be conducted to allow for more relevant results. On the other hand, the significance of these results remains controversial due to the subjectivity of patients' responses and individual and personal perception of malocclusion, and the inability to take into account imperceptible variables such as personality traits and treatment circumstances.

Indeed, the association between the severity of the malocclusion and its psychosocial impact is generally modest. For example, some patients show a remarkable level of concern for minor abnormalities, paradoxically, others tolerate severe occlusal problems. Not to mention the fact that the improvement in QoL after treatment does not depend exclusively on orthodontic intervention, but also on the psychological well-being of the patient (22).

CONCLUSION

The present study confirmed the association between quality of life and malocclusion reported in the literature. The importance of dental aesthetics for the social and psychological life of the individual, as well as for the general attractiveness of the face, cannot be underestimated. Dental aesthetics plays a significant role in human social interaction and the teeth are important features in determining the attractiveness of a face.

Mostly motivated by the improvement of self-confidence, the patients in our sample were mainly concerned with improving their dental appearance and most of them took a personal approach to undertake corrective treatment.

The results of our study showed a significant improvement in the psychosocial impact of malocclusion when comparing the two case-control groups, with a reduction in the perceived needs of patients who completed orthodontic treatment. The psychometric instrument used can be used as a reliable tool to assess the OHRQoL for the Moroccan population for subsequent case-control or longitudinal research.

LISTS OF ABBREVIATIONS

OHRQoL: Oral Health Related Quality of Life
PIDAQ: Psychosocial Impact of Dental Aesthetics Questionnaire
QoL: Quality of Life
PAR Index: Peer Assessment Rating Index
OQLQ: Orthognathic Quality of Life Questionnaire
SC: Self-confidence
SI: Social Impact
PI: Psycho-social Impact
AI: Aesthetic Impact
AC: Aesthetic Concerns
DSC: Dental Self-Confidence

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was submitted to and approved by the Thesis Committee, which acts as an **Ethics Committee in Casablanca School of Dentistry.** Patients in both groups were informed about the purpose of the study and were willing to participate. Verbal consent was obtained from adult participants and from parents for participants under 16 years old. Verbal consent was then approved by the **Ethics Committee in Casablanca School of Dentistry.**

CONSENT TO PUBLISH

All authors stated that no conflict could influence their participation in this study.

AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analysed during the current study are available from the corresponding author.

COMPETING INTERESTS

The authors declare that they have no competing interests.

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REFERENCES

[1] Langlois JH, Kalakanis LE, Rubenstein AJ, Larson AD, Hallam MJ, Smoot MT. Maxims and myths of beauty: A meta-analytic and theoretic review. Psychol Bull. 2000;126:390–423.
[2] Andiappan M, Gao W, Bernab_e E, Kandala NB, Donaldson AN. Malocclusion, orthodontic treatment, and the oral health impact profile (OHIP-14): Systematic review and meta-analysis. *Angle Orthod 2015;85:493-500.*
[3] Masood M, Masood Y, Zainul NN, Araby NB, Hussain SF, Newton T. Impact of malocclusion on oral health related quality of life in young people. Health Qual Life Outcomes 2013;11 (1) : 25.
[4] Oxford University Press on behalf of the European Orthodontic Society.Psychosocial reward of orthodontic treatment in adult patients. Eur J Orthod, 2010, 32 (4) : 441–446
[5] Richmond S, Shaw WC, O'Brien KD, Buchanan IB, Jones R, Stephens CD, Roberts CT, Andrews M. The development of the PAR Index (Peer Assessment Rating): reliability and validity. Eur J Orthod. 1992 ;14(2):125-39.
[6] Locker D.Measuring oral health: a conceptual framework. Com Dent Health .1988; 5(1):3–18
[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 28 (2006) 103–111
[8] Bourzgui.F, Z. Serhier , M. Sebbar, S. Diouny, M. Bennani Othmani, P.I. Ngom. Adaptation and validation of the Moroccan Arabic version of the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ). The Saudi Dental Journal (2015) 27, 180–186
[9] Muldoon MF, Barger SD, Flory JD, Manuck SB. What are quality of life measurements measuring? Br Med J 1998; 316:542–5.
[10] Kanika G, Tulika T, Priyank R, Nandini S, Anup K. Prospective evaluation of psychosocial impact after one year of orthodontic treatment using PIDAQ adapted for Indian Population. J Clin Diag Res. 2017, 11(8): ZC44-ZC48
[11] Kiyak HA. Does Orthodontic Treatment Affect Patients' Quality of Life? J Dent Educ. 2008 Aug;72(8):886-94.
[12] Fahimeh F, Farzin H, Behrad T, Elham N. Changes of Oral Health Related Quality of Life During and After Fixed Orthodontic Treatment. Adv Dent Oral Health. 2016; 2(4): 1-5.
[13] Cunningham SJ, Hunt NP. Quality of life and its importance in orthodontics. J Orthod 2001;28:152-8.
[14] Shaw WC, Richmond S, Kenealy PM, Kingdon A, Worthington H. A 20-year cohort study of health gain from orthodontic treatment: psychological outcome. Am J Orthod Dentofacial Orthop. 2007 Aug;132(2):146-57.
[15] de Couto Nascimento , de Castro Ferreira Conti AC, de Almeida Cardoso M, Valarelli DP, de Almeida-Pedrin RR. Impact of orthodontic treatment on self-esteem and

quality of life of adult patients requiring oral rehabilitation. Angle Orthod. 2016 Sep;86(5):839-45.

[16] Farzanegan F, Heravi F, Ramezani M. Evaluation of health related quality of life changes after initial orthodontic treatment. Oral Health Prev Dent. 2015;13(2):143-7.

[17] Jang-Mi Kang, Kyung-Hwa Kang. Effect of malocclusion or orthodontic treatment on oral health-related quality of life in adults. Korean J Orthod 2014;44(6):304-311

[18] Choi SH, Kim BI, Cha JY, Hwang CJ. Impact of malocclusion and common oral diseases on oral health-related quality of life in young adults. Am J Orthod Dentofacial Orthop. 2015 May;147(5):587-95.

[19] Gazit-Rappaport T, Haisraeli-Shalish M, Gazit E. Psychosocial reward of orthodontic treatment in adult patients. Eur J Orthod. 2010 Aug;32(4):441-6.

[20] Yi S., Chuqin Zh., Chulei Ni, Ying Q, Jun Zh. Psychosocial impact of dental aesthetics and desire for orthodontic treatment among Chinese undergraduate students. Patient Preference and Adherence 2016, 10 : 1037–1042

[21] Bellot-Arcís C, Montiel-Company JM, Almerich-Silla JM. Psychosocial impact of malocclusion in Spanish adolescents. Korean J Orthod. 2013 Aug;43(4):193-200.

[22] Xiao Deng,aYun-ji Wang, Feng Deng, Pang-li Liu, Yan Wua. Psychological well-being, dentalesthetics, and psychosocial impactsin adolescent orthodontic patients:A prospective longitudinal study. Am J Orthod Dentofacial Orthop 2018;153:87–96.