(RESEARCH ARTICLE)

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Does Malocclusion Severity affect the Psychosocial Impact of Dental Aesthetics among Nigerian Adolescents?

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Abstract

The impact of malocclusion on the psyche of an individual could range from mild reservations about teeth appearance to debilitating anxiety about self-image and self-esteem. The purpose of this study was to evaluate the psychosocial impact of malocclusion, determine its association with severity of malocclusion, and assess the effect of gender, age and academic level on psychosocial impact of malocclusion in Nigerian adolescents. A cross-sectional study was conducted on a random sample of 96 adolescents with an age range of 13 to 19 years recruited from patients at a hospital dental clinic in Lagos, Nigeria. A questionnaire was administered having sociodemographic section and the English version of the standardized questionnaire measuring the Psychosocial Impact of Dental Aesthetics (PIDAQ). The participants were assessed clinically and categorized into four malocclusion severity levels based on their Dental Aesthetic Index (DAI) scores. Descriptive statistics was used to describe the sample's sociodemographic characteristics as well as the mean PIDAQ and DAI scores. Bivariate analysis (ANOVA) was used to investigate the impact of the DAI scores on the mean PIDAQ scores. The interrelation among DAI and PIDAQ was analyzed using correlation analysis. The mean PIDAQ score was 42.5 ± 11.0. Severity of malocclusion as measured by DAI had no significant effect on psychosocial impact of dental aesthetics. The total PIDAQ score and its subscales showed no significant differences ($p > 0.05$) by age, gender, and academic level. Malocclusion severity has no significant linear relationship with the psychosocial impact of malocclusion.

Keywords: Malocclusion; Psychology; Quality of life; Adolescence

1. Introduction

The aesthetic appearance of an individual influence the psychosocial status and can affect the social integration of an adolescent into the society or influence the acceptance of such individual into a social circle.

Dental aesthetics is the cosmetic look of the teeth and a significant factor of psychological, emotional, and social well-being [1]. Physical appearance is a crucial factor in people's lives, and orofacial aesthetics may have a big impact, especially when it comes to social interactions [2]. Therefore, regardless of whether there is a meaningful functional or aesthetic impairment, the perception of dentition features such as tooth color, shape, size, and position may become psychosocially important [2].

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Malocclusion can be described as a physical handicap when it limits a person's social stereotype and opportunities [3]. Social and appearance norms set by peers and community may impact on individuals significantly [4] resulting in lack of self-esteem related to appearance with a sense of inferiority, thus having a negative impact on their quality of life [5].

Traditional methods of estimating orthodontic treatment need are mainly based on assessment of normative need with occlusal indices or cephalometric measurements [6,7]. These measures reflect only the viewpoint of professionals, rather than consumer expectations. This is however a shortcoming, because there are considerable differences between professional and patient perceptions of dental appearance and the need for orthodontic intervention [1,6,8].

An instrument often used to assess malocclusion and orthodontic treatment needs is the Dental Aesthetic Index (DAI) [9] but it does not give any information about how malocclusion affects a patient's self-image and quality of life in terms of subjective well-being and daily functioning [10]. This led to the introduction of psychometric instruments that measure oral health–related quality-of-life (OHRQOL) outcomes [10-11] during the orthodontic treatment planning process. The Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) was created as an OHRQoL psychometric tool to assess the apparent effects that dental aesthetic concerns of patients have on their self-esteem [8]. It is made up of four subscales including Dental Self-Confidence (DSC), Social Impact (SI), Psychological Impact (PI) and Aesthetic Concern (AC).

Body image plays an important role in psychological, social adjustment and educational success among adolescents which makes them a relevant age group for the study of aesthetic perceptions and OHRQOL outcomes [12].

Among different nationalities, several research works has been done relating factors like age, gender, educational level, level of income and severity of malocclusion with psychosocial Impact of dental aesthetics [13-16]. In Nigeria, there have been very few studies of the psychosocial impact of malocclusion [1,17,18]. This paucity of research-based information is a barrier to the development and implementation of public policy aimed at the integration of multiple dimensions of health care, such as improvement in quality of life and self-image related to body satisfaction, effectiveness of intervention, and cost/benefit assessments [19,20].

Thus, the aim of this study was to investigate the effect of severity of malocclusion on psychosocial impact of malocclusion in a sample of adolescents.

2. Material and methods

2.1. Study Population

The subjects were adolescents recruited from patients who visited Lagos State University Teaching Hospital dental outpatients' clinic between March and December 2019.

2.2. Inclusion Criteria

Adolescents between the ages of 13 – 19 years who are of Nigerian descent, have not undergone any orthodontic therapy and gave consent to participate in the study.

2.3. Exclusion Criteria

Adolescents who have undergone orthodontic treatment or any major maxillofacial surgical/ reconstructive procedure; those who have facial asymmetry or deformities; those with visual/hearing impairment, physical deformities, autism, and those with history of trauma to their anterior teeth, whose anterior teeth presented visible caries lesions, dental hypoplasia or fluorotic lesions were excluded from the analysis.

2.4. Study Design

A cross-sectional descriptive study using convenient sampling of consecutive patients who presented at the dental clinic for oral diagnosis. The final sample included questionnaires from 96 patients.

2.5. Questionnaire

A questionnaire was administered having 2 sections, namely sociodemographic, and the standardized questionnaire measuring the Psychosocial Impact of Dental Aesthetics (PIDAQ).

The Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) [8] was developed to evaluate self-perception of dental aesthetics and evaluate the psychosocial influence of dental aesthetics in adolescents seeking treatment. It is a validated self-rating 23-item tool that measures important aspects of the oral health-related quality of life, Dental Self-confidence (DSC), Social Impact (SI), Psychological Impact (PI), and Aesthetic Concerns (AC).

It is made up of four subscales which represent 4 domains: aesthetic concern (AC; 3 items), psychological impact (PI; 6 items), social impact (SI; 8 items) and dental self-confidence (DSC; 6 items). A five-point Likert scale is used, ranging from 0 (no impact of dental aesthetics on quality of life) to 4 (maximal impact of dental aesthetics) for each item (Table 1). The response options are as follows: 0 = not at all; 1= a little; 2 = somewhat; 3 = strongly; and 4 = very strongly. The DSC, SI, PI, AC scores were calculated by summing the participants' responses from the corresponding question items of each domain in the questionnaire. To ensure the same direction of scoring for all questionnaire items and to produce a consistent measure of impacts, the items in dental self-confidence (DSC) were scored in a reversed mode. Additionally, the total PIDAQ score was calculated from the sum scores of the subdivisions AC, PI, SI, and the reversed scores of the positive domain DSC.

2.6. Clinical Examination

Clinical examinations were performed by a calibrated investigator. The students who were surveyed and were willing to participate in clinical examinations received malocclusion severity examination using the DAI [17]. They were then categorized into four malocclusion severity groups using their DAI scores+, normal or minimal malocclusion (DAI score of ≤25), definite malocclusion (DAI score of 26 – 30), severe malocclusion (DAI score of 31 – 35), and handicapping malocclusion (DAI score >35).

2.7. Measurement Reliability

The PIDAQ and DAI measurements were repeated for twenty study participants two weeks after the initial measurements by the same examiner. Pearson's coefficient analysis was utilized to determine intra-examiner reliability.

2.8. Data Analysis

Data was analyzed with the IBM Statistical Package for Social Sciences (SPSS) for Windows Version 23.0. (IBM Corp., Armonk, NY, USA). To test the internal consistency of the instrument, Cronbach's alpha (α) was calculated for the scale as a whole and for each individual domain. Descriptive statistics of clinical characteristics and scores were obtained. Bivariate analysis was performed using ANOVA test and Pearson's correlation coefficient. Multiple linear regression analysis was used to test the influence of age, gender, academic level, and malocclusion severity on the PIDAQ scale and subscales. Statistical significance was put at a 5% level and a Confidence Interval of 95%.

3. Results and discussion

Overall, 96 respondents met the inclusion criteria, of which 33.3% were male, and 66.7% were females. They were aged 13 – 19 years with a mean age of 17.99 ± 0.95. Most students (60.4%) had no treatment need or only a slight need (grade 1), and 4.2% (n = 4) had very severe malocclusion (grade 4).

Table 1 includes data on the clinical characteristics of subjects assessed using the DAI and PIDAQ. Reliability analysis showed that internal consistency was considered acceptable. Cronbach's alpha was 0.74 for PIDAQ (subscale alphas ranged from 0.82 to 0.90). The correlation for components of DAI was between 0.94 and 0.98.

Subjects' perception scores of the PIDAQ scale and subscales (Table 2) were analyzed according to the grades of malocclusion severity based on the DAI scores. The overall and subscale PIDAQ scores showed no significant difference among groups based on DAI scores (P >0.05).

Table 3 shows bivariate correlation between all continuous variables. No significant correlation was found between DAI scores and total or subscale PIDAQ scores (P > 0.05). Multiple linear regression analysis (Table 4) showed that the independent variable (DAI score) had no significant effects on patients' perceptions of the psychosocial impacts of dental esthetics (p > 0.05). Age, gender and academic level included in the regression models as control variables had no significant effects on patients' perceptions of the psychosocial impacts of dental esthetics.

The PIDAQ scale and subscales showed R^2 values (R^2 = 0.03 - 0.05) indicating that the model accounted for 3% to 5% of the variance in perception scores.

Table 1 Clinical Characteristics of Subjects as Assessed Using the DAI and PIDAQ

Variable	Possible Range of Total Scores	N	Min – Max	Mean (SD)
DAI	≥13	96	15-47	24.23 (6.25)
Grade 1	13-25	58	15-25	20.16 (2.83)
Grade 2	26-30	26	26-30	28.08 (1.35)
Grade 3	31-35	8	31-35	32.25 (1.49)
Grade 4	≥36	4	39-47	42.25 (3.59)
PIDAQ	0-69	96	10-67	42.53 (11.03)
Dental Self-Confidence			1-24	15.22 (5.04)
Social impact			0-32	12.29 (7.75)
Psychological impact			0-22	11.20 (5.18)
Aesthetic concern			0-12	3.81 (3.01)

Table 2 Comparison of Means and Standard Deviations of PIDAQ Scale and Subscales According to DAI Grades of Malocclusion

	DAI				
Scale/Subscale	Grade 1	Grade 2	Grade 3	Grade 4	P*
PIDAQ scale	42.00 (11.15)	45.54 (10.88)	41.75 (9.38)	32.25 (8.54)	>0.05
Dental self-confidence subscale	14.76 (5.00)	15.77 (5.09)	15.25 (5.57)	18.25 (4.57)	>0.05
Social impact subscale	12.03 (7.65)	13.81 (8.22)	11.75 (7.72)	7.25 (5.50)	>0.05
Psychological impact subscale	11.41 (5.26)	11.42 (4.97)	11.50 (4.50)	6.00 (5.83)	>0.05
Aesthetic concern subscale	3.78 (2.99)	4.54 (3.11)	3.25 (2.55)	0.75 (1.50)	>0.05

* Analysis of variance test

Table 3 Analysis of Correlation Between PIDAQ scale /subscale variables and DAI score

Variables	DAI score	PIDAQ	DSC	SI	PI	AC
DAI score	1	-0.053	0.113	-0.030	-0.121	-0.098
PIDAQ	-0.053	1	-0.437**	0.905**	0.799**	0.692**
DSC	0.113	-0.437**	1	-0.615**	-0.624**	-0.621**
SI	-0.030	0.905**	-0.615**	1	0.662**	0.633**
PI	-0.121	0.799**	-0.624**	0.662**	1	0.550**
AC	-0.098	0.692**	-0.621**	0.633**	0.550**	1

** Significant at $P < 0.01$; PIDAQ = overall PIDAQ scale; DSC = dental self-confidence subscale; SI = social impact subscale; PI = psychological impact subscale; AC = aesthetic concern subscale

Table 4 Multiple Linear Regression for the Association of PIDAQ and Independent Variables

Regression parameters	Independent variables	PIDAQ	DSC	SI	PI	AC
Beta coefficient	Age (y)	-0.092	0.126	-0.150	-0.054	-0.073
	Gender	0.052	-0.053	0.020	0.090	0.071
	Academic level	-0.108	-0.093	-0.036	-0.009	-0.132
	DAI score	-0.076	0.105	-0.044	-0.126	-0.124
R^2		0.04	0.03	0.03	0.03	0.05
P		>0.05	>0.05	>0.05	>0.05	>0,05

PIDAQ, overall PIDAQ scale; DSC indicates dental self-confidence subscale; SI, social impact subscale; PI, Psychological impact subscale; AC, aesthetic concern subscale

4. Discussion

This study reveals that severity of malocclusion as measured by DAI has no significant effect on psychosocial impact of self-perceived dental aesthetics among Nigerian adolescents (Table 2).

Taylor et al. [21] showed a poor correlation between malocclusion and oral health related quality of life among 11–14 year old adolescents in the United States. Figueroa et al. [22] found a low direct correlation between the severity and psychosocial impact of malocclusion. In contrast, A systematic review of six cross-sectional studies [23] found a high level of evidence that severe malocclusions, especially in the aesthetic zone (anterior crowding, midline diastema, increased overjet), have negative effects on OHRQOL in children and adolescents, predominantly in the dimensions of emotional and social wellbeing [24-26].

There are several possible reasons for differences between our study and previous studies. First, the weak association between malocclusion severity and psychosocial impact of malocclusions in our sample (Table 2) may be due to the low prevalence of severe and handicapping malocclusions 4.2% (n = 4) in our sample, because severe malocclusion has been reported to have a greater aesthetic and psychosocial impact [23-26] (Table 1). Secondly it is possible that the sample populations studied could have had different age groups with different perception towards aesthetics and quality of life. In addition, different cultures, traditions, and social norms across populations may influence the perception of aesthetics differently in each society. Furthermore, a high incidence of severe malocclusions in some population groups may make malocclusion perceived as normal [27]. The differences in results could also be due to the differences in orthodontic indices used in the different surveys. Some epidemiological indices of orthodontic treatment needs, including the DAI, have an aesthetic component based on clinical criteria such as occlusal and functional features that may not accurately represent patients' perceptions of their dental aesthetics. Because psychosocial impact of malocclusion is strongly influenced by personal expectations and sociocultural factors, malocclusions may not always be negatively self-perceived.

Studies have shown PIDAQ as a reliable and effective method for measuring the psychosocial impact of malocclusion [28]. Pearson's correlation coefficient showed a satisfactory association among PIDAQ scale and subscales (Table 3), suggesting that these indices do share some common traits in psychosocial impacts of malocclusion. However, the weakest correlation was found between PIDAQ scale / subscales and DAI (Table 3). Previous studies have shown that DAI had weak associations with psychosocial impact of malocclusion [29].

The present study shows no significant difference in patients' perceptions of the psychosocial impacts of dental esthetics due to gender, age or academic level (Table 4). This finding on gender influence is like results from other populations [30,31], but differs from other studies that found that gender was an independent predictor of psychosocial impact of malocclusion, with more of the impact experienced by females [32,33]. This could be attributed to females being more appreciative of the social significance of aesthetics more than male counterparts.

Age did not have a significant effect on the psychosocial impact of the malocclusions of our study participants which is comparable to a study carried out among Spanish adolescents [34]. However, it differs from another study where age was found to play a role in the psychosocial impact that malocclusions had on the study participants [13]. Although not statistically significant, a negative association was observed between age and impact on quality of life due to malocclusion in the present study (Table 4), the impact of malocclusion decreases as age increases. This may be the

result of 'response shift' with age, in which there is reduction in the impact of a malocclusion, when an individual lives longer with a malocclusion, due to the likelihood that they will adjust to the limitations it places upon their activities [35]. Academic level had a negative association in the regression analysis with reduction in the impact of malocclusion as academic level increases, though not statistically significant. This may be due to increased self-esteem with increasing education (Table 4).

The internal consistency of the PIDAQ in this study was good (Cronbach's coefficient, 0.74). However, the present study has some limitations that may limit the generalization of its results. The participants in this study were 13-19- year-old patients seeking dental or orthodontic treatment at a university clinic in a large urban city in Nigeria. The results from this study therefore cannot be generalized to the entire adolescent population who may have varying levels of malocclusion and orthodontic treatment needs and experiencing different impacts on their daily activities [36]. We therefore recommend that future studies should be based on a representative sample of adolescents in order to investigate the effect of cultural and societal norms on psychosocial impact of malocclusion.

5. Conclusion

This study has shown that severity of malocclusion has no significant association with perceived psychosocial impact of dental aesthetics. It also found that gender, age or academic level were not independent predictors of psychosocial impact of malocclusion. Therefore, evaluation of orthodontic treatment need using an approach that combines normative and psychosocial perception of occlusion is recommended in order to complement clinical findings with patients' perception.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors hereby declares that there's no conflict of interest and that we all agreed that the paper be published.

Statement of ethical approval

Ethical approval was obtained from the Health Research and Ethics Committee of the Lagos State University Teaching Hospital (LREC. 06/10/813).

Statement of informed consent

Following detailed explanation of the aims and objectives of the study, a written informed consent was taken from subjects 18 years and above as well as parents/guardians of the selected subjects below the age of 18 years who were willing to participate in the research. Written assent was similarly taken from the subjects below 18 years of age.

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