Aesthetic and Social Impact of Malocclusion in the Anterior Segment on Young Adults- An Analytical Cross-Sectional Study

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ABSTRACT

Background: The objective of this study was to evaluate the social and aesthetic impact of malocclusion in the anterior segment on the young adults and the relationship between malocclusion and socio-economic characteristics. This study focused on the patient's perception of their malocclusion and how that perception affect their daily life on both a functional level and a social level.

Methods: In this analytical cross-sectional study of 312 young adults aged 16-28 years Oral Aesthetic Subjective Impact Scale (OASIS) was used to evaluate the self-perceived dental appearance using 7- point Likert scale. The Dental Aesthetic Index (DAI) criteria were used to assess the anterior occlusal variables (crowding, incisal spacing, median diastema, anterior maxillary overjet, and anterior open bite). Patients rated their dental aesthetic appearance using the aesthetic Component (AC) of the Index of Orthodontic Treatment Need (IOTN). Demographic characteristics included sex, family income, education, and occupation.

Results: Anterior crowding was 2.37 (95% CI: 1.403-4.032) times more likely to have a greater aesthetic impact on young adults ($P < 0.05$) than any other anterior occlusal characteristics.

Conclusions: Anterior crowding have a higher level of aesthetic concern than that of other occlusal characteristics among young adults.

KEYWORDS: Malocclusion, Aesthetic self-perception, OASIS, DAI, AC-IOTN

INTRODUCTION

It is well-established that an attractive smile is a key component of facial aesthetics, and deviations from a harmonious anterior segment can lead to self-consciousness and dissatisfaction.[1]

Studies have shown that young adults with malocclusion may experience reduced self-esteem, increase social anxiety, and decrease overall satisfaction with their appearance.[2,3] The appearance of the anterior segment, which is highly visible during social interactions, smiling, and speaking, may have a tremendous impact

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on how people see themselves and how others see them.

Furthermore, the social impact of malocclusion in the anterior segment among young adults extends beyond self-perception. Research has indicated that individuals with malocclusion may face social stigmatization, prejudice, and teasing due to their dental irregularities.[2,5] The presence of malocclusion can affect social interactions, including job interviews, and overall social acceptance.[1,2,4] The aesthetic and social implications of malocclusion in the anterior segment can thus have far-reaching effects on young adults' Psychosocial health, as well as life satisfaction.

Recognizing aesthetic and social-impact of malocclusion in the anterior segment, orthodontic interventions have become essential for young adults seeking to enhance their appearance and social confidence. Orthodontic treatments, such as braces or clear aligners, aim to correct dental mal-alignment and improve the aesthetics of the anterior segment. These interventions not only address functional concerns but also contribute to the psychological well-being and social integration of young adults.[2,3]

The study's goal was to evaluate how young people' aesthetic perceptions of malocclusion in the anterior region were affected. Also, to assess the relationship between anterior segment malocclusion and socio-economic characteristics by using the Oral Aesthetic Subjective Impact Scale (OASIS), Aesthetic Component of the Index of Orthodontic Treatment Need (AC-IOTN), and Dental Aesthetic Index (DAI) indices.

MATERIAL AND METHODS

This analytical cross-sectional study evaluated the aesthetic and social-impact of malocclusion in the frontal segment on young Indian adults. Participants were chosen from the general campus population (age range: 16 to 28 years old). Young individuals having orthodontic treatment or who had already finished it were not included. This study was approved by the institutional ethical committee (approval no. TMDCRC/ IEC/20-21/OD01). A brief information of the study was given to the participants and consent was obtained. Open Epi software v.3 was used to calculate the minimum sample size of 312 participants[6] with the power of the study at 80% and 95% confidence interval (CI).

Data collection

Assessment of self-perception of dental aesthetics

The participants were interviewed about socio-demographic factors, including family income, educational level, and occupation.[7]

The OASIS comprising of self-explanatory questionnaire which consisted of four questions based on the participants' perception of their dental appearance in the anterior region on a 7-point Likert scale.[8]

Examination methodology

The participants were shown 10 AC-IOTN.[9] coloured photographs which were graded 1-10 where, the most attractive dental configuration is represented by Grade 1, while the least attractive dental configuration is represented by Grade 10. Each participant was instructed to choose the one that represented their own dentition.

We obtained the mean AC-IOTN score for all the participants. The score obtained was further divided into higher and lower aesthetic concern in which score from Grade 1 to 5 were considered as higher aesthetic concern and Grades 6-10 as lower aesthetic concern.[10]

The participants were examined by an orthodontist using the World Health Organisation (WHO)-adopted DAI.[11]. It is a cross-cultural and a mathematical index. In this study, the anterior portion of the

malocclusion was evaluated separately using the DAI factors rather than the DAI being computed for analysis. This would give the association of individuals with self-perception of dental appearance.[12] The index comprises of 10 factors, out of which only those variables were included which were present in the anterior segment of malocclusion. Those variables were crowding, incisal spacing, median diastema, anterior maxillary overjet, anterior open bite (Table I).

Table I. DAI Variables

DAI Variables	Description	DAI Score
Crowding	Crowding occurs when the four incisors could no longer be held in place by the gap between the right and left canines.	0 = No Crowding
		1 = Crowding
Incisal Spacing	When the gap between the left and right canines was wider than what would be expected for correct incisor alignment.	0 = No Spacing
		1 = Spacing Present
Median Diastema	Measured from the proximal surface's point of greatest convexity.	< 1 mm = Absence of Diastema
		> 1 mm = Presence of Diastema
Anterior maxillary overjet	Based on the separation between the buccal surface of the matching mandibular incisor and the buccal border of the most projecting maxillary incisor.	≤ 0 mm = Decreased Overjet
		≥ 4 mm = Increased Overjet
Anterior open bite	Measured from the center of the incisal border of involved teeth.	0 mm = Absent
		1 mm = Present

Clinical data was acquired by oral examination. The examiner utilized wooden spatulas, sterilized clinical mirrors, digital calliper, and periodontal probes. Individuals were examined while seated in the dental chair, which was lit with both artificial light from the equipment and natural light from a window.

STATISTICAL ANALYSIS

The IBM Statistical Packages for Social Sciences (SPSS) software, version 21 (IBM Corp., Armonk, NY, Uk), was used to analyze all the data, which were input into Microsoft Excel (Microsoft Corp., Redmond, WA, USA). Descriptive statistical analysis was performed for demographic characteristics and questionnaire items. A bivariate logistic regression model was used to predict the relationship between anterior malocclusion and sociodemographic characteristics (independent variables) and aesthetic concern (dependent variable). The crude odds ratios (OR) and adjusted (OR) were calculated with a 95% CI, and statistical significance was set at P 0.05. The findings of the OASIS index were correlated with sociodemographic and malocclusion factors using the Pearson chi-square test. AC-IOTN and DAI assessments were calibrated and kappa values were evaluated for intra-examiner reliability.

RESULTS

The data were collected by 2 observers and a Kappa statistic was used to assess the level of agreement between the observers. Good agreement was found with k = 0.88.

The study population consisted of 312 young adults: 158 females (50.60%) and 154 males (49.40%) aged 18 to 28 years (mean: 21.76 years ± 1.89). The participants were classified according to occupation (professional: 34 %, non-professional: 66 %), education (high schooling: 17.00 %, low schooling: 83.00 %), and income (low: 42.30 %, high: 57.70%) (Table II).

Table II. Parental demographics of the participants.

Socio-economic variables		N (312)	Percentage (100 %)
OCCUPATION			
Professionals	Legislators	2	0.6
	Senior Officials & Managers	24	7.7
	Technicians and Associate Professionals	9	2.9
	Clerks	28	9.0
	Skilled Workers and Shop and Market Sales Workers	43	13.9

Non-professionals	Skilled Agricultural & Fishery Workers	63	20.2
	Craft & Related Trade Workers	22	7.1
	Plant & Machine Operators and Assemblers	50	16.0
	Elementary Occupation	44	14.2
	Unemployed	27	8.7
EDUCATION			
High-schooling	Profession or Honours	16	5.2
	Graduate	10	3.2
	Intermediate or diploma	27	8.7
Low-schooling	High school certificate	44	14.2
	Middle school certificate	69	22.1
	Primary school certificate	85	27.2
	Illiterate	61	19.7
INCOME			
Low-income	≤ 3,907	14	4.5
	3,908–11,707	36	11.6
	11,708–19,515	37	11.9
	19,516–29,199	45	14.5
High-income	29,200 –39,032	39	12.5
	39,033–78,062	74	23.9
	≥ 78,063	67	21.6

Out of the malocclusion conditions, crowding affected 66.70 %, incisal spacing 20.80 %, median diastema 31.40 %, overjet 40.40 %, and anterior open bite 8 % of the total sample. Furthermore, AC-IOTN found that 52.85% of the males and 47.15 % of the females had higher aesthetic concerns (Table III).

Table III. Social and demographic factors that influence the anterior segment's frequency distribution of aesthetic effect.

Variable	Category	N (%)	Lower esthetic concern Frequency (%)	Higher esthetic concern Frequency (%)
Sex	Male	154 (49.4)	80 (47.15)	74 (52.85)
	Female	158 (50.6)	92 (53.5)	66 (47.15)
Occupation	Professional	106 (34)	50 (29)	56 (40)
	Non-professional	206 (66)	122 (70.90)	84 (60)
Education	High-schooling	53 (17)	19 (11)	34 (24.30)
	Low - schooling	259 (830)	153 (88.90)	106 (75.70)
Income	Low-income	132 (42.30)	57 (33.10)	75 (53.60)
	High-income	180 (57.70)	115 (66.80)	65 (46.40)
Crowding	Absent	104 (33.30)	72 (41.90)	32 (22.90)
	Present	208 (66.70)	100 (58.10)	108 (77.10)
Incisal spacing	Absent	247 (79.20)	129 (75)	118 (84.30)
	Present	65 (20.80)	43 (25)	22 (15.70)
Median diastema	Absent	214 (68.60)	114 (66.30)	100 (71.40)
	Present	98 (31.40)	58 (33.70)	40 (28.60)
Overjet	Absent	186 (59.60)	103 (59.90)	83 (59.30)
	Present	126 (40.40)	69 (40.10)	57 (40.70)
Anterior open bite	Absent	287 (92)	160 (93)	127 (90.7)
	Present	25 (8)	12 (7)	13 (9.3)

The response to the questions about the comment on the appearance of their front teeth was 24.03% positive and 4.49% negative. 23.39% responded they were teased about the appearance of their teeth. When questioned if they avoid smiling due to the way their front teeth seem, 25.64% positive and 7.69% negative responses were recorded. Last but not least, when asked if they ever hide their mouth because of how their front teeth seem, 25.00% of the participants answered (Table IV).

TABLE IV. Distribution of the OASIS questionnaire to understand the self-perception on a 7-point Likert scale

Question	Response	N	Percent
Have you found that other people have commented on the appearance of your teeth?	Constantly yes	75	24.03
	Frequently yes	60	19.23
	Occasionally yes	52	16.67
	Neutral	44	14.10
	Constantly no	39	12.50
	Frequently no	28	8.98
	Occasionally no	14	4.49
	Total	312	100.0
Have you found that other people have teased you about the appearance of your teeth?	Constantly yes	73	23.39
	Frequently yes	64	20.53
	Occasionally yes	52	16.66
	Neutral	39	12.50
	Constantly no	34	10.89
	Frequently no	26	8.34
	Occasionally no	24	7.69
	Total	312	100.0
Do you try to avoid smiling because of the appearance of your front teeth?	Constantly yes	80	25.64
	Frequently yes	64	20.51
	Occasionally yes	53	16.99
	Neutral	34	10.90
	Constantly no	29	9.29
	Frequently no	28	8.98
	Occasionally no	24	7.69
	Total	312	100
Do you ever cover your mouth	Constantly yes	78	25.00
	Frequently yes	71	22.76

because of the appearance of your teeth?	Occasionally yes	53	16.99
	Neutral	44	14.10
	Constantly no	27	8.65
	Frequently no	26	8.34
	Occasionally no	13	4.16
	Total	312	100.0

Among the demographic and anterior malocclusion characteristics, there was a significant relation between high income (P= .037), education (P= .019) and crowding. Also, a significant relation was observed between high income (P= .041) and incisal spacing in the anterior segment (Table V).

Table V. Relation between sociodemographic and malocclusion characteristics.

	Sex		Occupation		Education		Income	
	χ^2	p value	χ^2	p value	χ^2	p value	χ^2	p value
Crowding	3.256	0.19	16.890	0.381	23.076	0.019*	21.345	0.037*
Incisal spacing	5.337	0.280	7.656	0.589	5.985	0.649	16.884	0.041*
Median diastema	6.211	0.214	5.510	0.789	5.847	0.614	7.574	0.372
Overjet	5.044	0.293	14.015	0.723	14.817	0.587	15.496	0.345
Anterior open bite	6.076	0.437	7.710	0.557	6.554	0.585	5.665	0.579

Pearson chi square test; *Level of significance at P≤0.05

The association between the higher aesthetic concern and malocclusion in the anterior region, demographic characteristics of parents (sex, education, income, and occupation) is presented in Table 6. With respect to the crude analysis (crude OR), low-schooling was 0.39 odds of higher aesthetic concern (P= 0.003), high income was 0.43 odds of higher aesthetic concern (P= 0.00), the presence of crowding showed 2.42 odds of higher aesthetic concern (P= 0.001) and increased incisal spacing was 0.55 odds of higher aesthetic concern (P=0.04). Crowding was 2.37 times (95% CI, 1.403-4.032) more likely to result in greater aesthetic concern, according to the adjusted analysis (adjusted OR), than high income, which had an odds ratio of 0.51 (95% CI, 0.295-0.876) (P=0.015).

There was significant relation between the sociodemographic, malocclusion characteristics and OASIS. Among sociodemographic characteristics, people with low education showed significant relation with Q1 and Q2 whereas, high income showed significant relation with Q3 and Q4. People with malocclusion in the anterior segment like crowding showed significant relation with all the questions, incisal spacing and increased overjet with Q3 and Q4, median diastema with Q2, Q3 and Q4, and anterior open bite with Q4 (Table VI).

TABLE VI. Association between the asthetic effect with malocclusion in the anterior segment and sociodemographic characterstics

	Q1		Q2		Q3		Q4	
	χ^2	p value	χ^2	p value	χ^2	p value	χ^2	p value
Sex	8.38	.13	6.57	.25	6.15	.29	6.43	.26
Occupation	15.82	.07	19.21	.52	9.26	.09	7.26	.20
Education	14.95	.011*	19.37	.002*	11.92	.06	10.38	.06
Income	3.27	.14	A4.35	.27	6.78	.018*	7.87	.011*
Crowding	14.05	.017*	14.33	.041*	12.69	.024*	16.07	.012*
Incisal spacing	2.64	.75	6.55	.25	7.90	.016*	13.06	.02*
Median diastema	7.46	.18	18.26	.003*	15.42	.04*	17.71	.003*
Overjet	13.86	.17	14.49	.15	24.51	.006*	22.94	.01*
Anterior Open bite	3.05	.69	3.16	.67	3.82	.57	19.40	.002*

DISCUSSION

Malocclusion is one of the most common dental problems in young adults; this multi-faceted condition can lead to psychological issues because of increasing concern about dental aesthetics in adults. Orthodontists must be aware of the dental appearance of young adults to assist them in achieving a radiant smile and psychological well-being. This study was conducted on young adults aged 16-28 years because this age group

people have found to be more emotionally unstable, socially aware and have a more realistic view of dentofacial aesthetics.[13] WHO- recognized cross-cultural DAI for this study was used as it not only combines both the objectives and subjective aesthetic aspects of occlusion but it is also simple and highly reliable index. Various authors have used DAI to check the severity of malocclusion.[14] In this study, only anterior DAI variables were used to diagnose the malocclusion and analyse the probable subjective aesthetic effect on young individuals.

One such study stated that the impact of oral health and dental aesthetics on psychological well-being is important, especially to females and they showed that female had a higher aesthetic concern with respect to social interaction and facial attractiveness than males.[15] The result of the present study showed that there was no significant difference between the aesthetic concern of males and females regarding the malocclusion in the anterior region. According to Shrisvastav et al.[16] crowding and spacing with increased overjet negatively affected a person's social well-being and oral health-related quality of life. However, it was found that crowding and incisal spacing have greater impact on young adults.

Young individuals from high-income families and low schooling were more likely to have greater aesthetic concern than those from low-income families and high schooling. However, According to a research by Piovesan et al.17, individuals with lower socioeconomic status were more likely than those with better status to assess their dental health as bad.

Olsen et al concluded that people with normal occlusion were evaluated as more attractive, more extrovert and very conscientious. Unesthetic anterior teeth can readily lead to dissatisfaction because they are more visible than posterior teeth.[18] According to Scapini et al.[19] malocclusion affects social relations like avoidance of showing their teeth, laughing and interaction with others. In this study, the correlation between the sociodemographic data and malocclusion with OASIS questionnaire showed that participants with crowding and lower education were teased and commented on the appearance of their teeth. Participants with crowding, high income, incisal spacing, median diastema and overjet avoided smiling and covered their teeth in public.

Although the self-perceived need for orthodontic treatment may be influenced by cultural or social environment, these findings may be applied to the broader adult population since young individuals at this point are still developing aesthetic self-perceptions.

Finally, we may discuss how the adult's aesthetic sense is influenced by specific anterior occlusal traits.

This psychosocial effect of malocclusion can better guide for early clinical diagnosis, which may minimize or even prevent the negative impact of malocclusion.

CONCLUSIONS

Malocclusion in the anterior region has a greater impact on young adults, both aesthetically and socially. Crowding in the anterior region had a greater impact on aesthetic concern in young adults than did other malocclusions evaluated, which affects self-perception.

We examined sociodemographic characteristics such as sex, level of education, income, and occupation and found that people with a high income had a greater aesthetic concern.

Based on the OASIS, we concluded that an unpleasant dental appearance may stigmatize an individual, hamper their professional success, and lower their self-esteem.

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