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Comparison of Dental Esthetic Perceptions of Young Adolescents and Their Parents

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Abstract

Objective—To compare dental esthetic perceptions of adolescents at age 13 with those of parents and to assess associations with dental fluorosis.

Methods—As part of the Iowa Fluoride Study, 550 adolescents aged 13 underwent dental examinations for fluorosis on maxillary anterior teeth using the Fluorosis Risk Index. Adolescents and parents completed questionnaires concerning satisfaction with the adolescents' dental appearance. McNemar and Bowker tests of symmetry were used for comparisons of esthetics ratings between parents and adolescents. Comparison of satisfaction between fluorosis and non-fluorosis subjects was made using Cochran-Armitage Trend and Fisher's Exact tests.

Results—Excluding subjects with orthodontic treatment, 376 adolescents were included and 26% of them had definitive fluorosis, mostly at a mild level. Fifteen percent of adolescents were dissatisfied with dental appearance, and concerns were mainly about the tooth color (45%) and alignment (35%). Adolescents were less satisfied with overall dental appearance ($P < 0.001$) and color ($P = 0.048$) and more concerned about tooth shape ($P = 0.002$) than were their parents. Fluorosis status (yes/no) was not significantly associated with adolescents' satisfaction or areas of concern ($p > 0.05$). Parents of subjects with fluorosis were more dissatisfied with dental appearance ($P = 0.014$) and color ($P < 0.001$) than other parents. The number of maxillary anterior zones exhibiting fluorosis was negatively associated with both adolescent ($P = 0.03$) and parent ($P = 0.002$) satisfaction.

Conclusion—Adolescents generally had less satisfaction with dental appearance and color and they were more concerned with tooth shape than parents. For both parents and adolescents, decreased satisfaction was associated with the number of zones with definitive fluorosis.

Keywords

Dental Esthetics; Perception; Fluorosis

Introduction

Clinical measures traditionally were the only methods used to assess the prevalence and severity of oral conditions affecting oral health and appearance. Such indices for fluorosis, including Dean's Index (1), the Thylstrup Fejerskov Index for fluorosis (2), The Tooth Surface Index of Fluorosis (3) and the Fluorosis Risk Index (4) provide reliable and valid methods for assessment of fluorosis in descriptive and analytical epidemiologic studies. However, they do not consider individuals' perceptions of dental appearance and the possible impact of fluorosis on psychosocial well-being, which based on the comprehensive definition of health, is also important (5). Since the 1990s, there has been more study of esthetic perceptions and psychological indicators of oral health, and they have been shown to be powerful indicators of perceived need for dental care (6).

Dental fluorosis is an oral condition that can affect dental esthetics and consequently satisfaction with appearance. According to the 1999–2004 National Health and Nutrition Examination Survey (NHANES), 23% of the U.S. population was affected by dental fluorosis, mostly among adolescents aged 12–15 (40.7%) (7). Since less than 3% of the U.S. population had moderate or severe fluorosis (7), dental fluorosis is usually not considered to be a public health issue in the U.S. However, several studies have shown that concerns about the esthetic impact of dental fluorosis can be discernible to lay people, including adolescents who often are quite concerned with their appearance (8–10).

Adolescence is a transformational phase moving from dependent child to autonomous adult. In addition to physical changes, alterations in attitude and self-perception take place, but adolescents' capacity to cope and adapt with these changes often declines during this period (11). Peer groups play a major role in adolescents' emotional stability and adolescents may place high value on physical attractiveness under peer influence (11, 12). To adolescents, perceived attractiveness is more important in peers' popularity than is educational success (13). Despite the tendency to act independently, adolescents' oral health perceptions and behaviors are still considerably influenced by familial characteristics and their parents (14, 15).

Concerning esthetic perceptions and the possible impact of fluorosis, several studies have assessed satisfaction, esthetic perceptions and psycho-social impacts of fluorosis, as reviewed recently by Chankanka et al (16). Studies assessing parents' and children's/ adolescents' dental esthetic perceptions are of interest, because these two groups' perceptions may be different and even in conflict with each other, which may influence their decision to seek dental care and what they expect from dentists. However, only a few studies have compared such groups' perceptions.

In 1992, Clark et al (17) conducted an early study to evaluate how school-aged children and their parents in British Columbia, Canada perceived possible esthetic problems related to fluorosis using the Tooth Surface Index of Fluorosis (TSIF). Among 1,057 children and their parents, there was agreement for over 60% of pairs on the esthetic rating of children's front teeth. However, in children with TSIF scores of one or more, parents were more concerned with the color of children's teeth than were children. Another study in British Columbia by Shulman et al (18) compared the esthetic perceptions of children's tooth color of 2,495 children with those of their parents and dentists. They found that children were 1.7 and 3.7 times as likely to show dissatisfaction with their tooth color compared to parents and dentists, respectively. Nevertheless, fluorosis was not the main cause of concerns for any of these groups.

In 1997, Wondwossen et al. (19) evaluated how Ethiopian children and their parents perceived different Thylstrup Fejerskov (TF) scores. Photos of maxillary central incisors

with randomly ordered TF scores were shown to 12–15 year old children and their parents and they filled out questionnaires about the presented teeth. This study concluded that children's perceptions of various TF scores generally were similar to parents'; neither implied "esthetic and social problems" for less severe fluorosis cases (TF score <5). However, at higher scores, parents were more negative about dental appearance of fluorosis cases than were children ($P<0.001$) and more strongly admitted that severe fluorosis would cause embarrassment. A more recent study by Do et al in 2002–3 (20) investigated the impact of fluorosis on Australian children's oral health-related quality of life reported by children and their parents. Children with mild fluorosis were less likely to report oral symptoms and functional limitations compared to children with no fluorosis ($P<0.05$). There were no significant differences among parents' perceptions for children with various TF scores. However, parents of children with mild fluorosis were less likely to report impaired oral health-related quality of life for their children. They concluded that mild fluorosis enhances both parental and child oral health-related quality of life.

Given the impact of parents' and adolescents' opinions about dental appearance on treatment demand, and the different results shown by previous investigations, the purpose of this study was to compare dental esthetics perceptions of 13 year old adolescents with those of their parents. We also compared both parental and adolescent esthetic satisfaction between fluorosis and non-fluorosis groups. Finally, the associations of predictor variables with adolescent and parental levels of satisfaction with overall dental appearance were evaluated separately.

Methods

This cross-sectional study was part of the ongoing Iowa Fluoride Study (IFS) in which subjects were recruited at birth from postpartum wards of 8 hospitals in eastern Iowa. When subjects were about 13 years old, they were assessed for dental caries, fluorosis and occlusal characteristics. On the same day, they were also asked to complete an esthetic questionnaire concerning their satisfaction with the appearance of their teeth. An accompanying parent also completed a similar esthetic questionnaire concerning satisfaction with their adolescent's dental appearance. Demographic information, including mother's race, parents' educational level and family incomes, collected in 2007 was also available for analysis.

For all procedures, University of Iowa Institutional Review Board (IRB) approval was secured, parents provided consent and adolescents provided assent.

From 698 IFS subjects who underwent dental exams at age five, 550 subjects came back for permanent dentition examinations at age 13 in 2005–2009 (79% retention rate over 8 years). However, subjects with active orthodontic treatment were excluded from this analysis ($N=174$), because a full fluorosis evaluation was not possible and orthodontic treatment generally would change subjects' satisfaction with dental appearance. A total of 376 parent-adolescent pairs of esthetic questionnaires were available for analysis.

The dental esthetics questionnaires were designed based on previous investigations by Clark et al., McKnight et al. and Levy et al. (21–25). The questionnaires asked adolescents and parents to separately rate their satisfaction with the overall dental appearance and overall color of the adolescent's teeth on a scale of 1 to 4 (very satisfied, somewhat satisfied, somewhat dissatisfied and very dissatisfied) and to report aspects of concern, which were selected from a list: shape, color, alignment, spacing, crowding and color irregularities. More detailed descriptions of the esthetics assessments at age 9 and 11 have been previously reported (25–27). Building on the framework of the earlier assessment, more detail was added to aspects of concern, since some parents reported confusion over the brief dental

terminology. Parents and adolescents were asked to mark all reasons that applied to their concerns, and to explain anything that they listed as “other”. If concerns about shape were indicated, we asked if the reason was the teeth being: jagged/chipped, pointed, irregular shape, or other. For color concerns, we asked if teeth had: brown hues, yellow hues, gray hues or other. For alignment, we asked if teeth were: rotated, front teeth flared (buck teeth), abnormal bite, or other. If spacing was listed as a concern, we asked if it was due to: abnormally large space, adult tooth missing, or other. For crowding concerns, we asked if it was due to: extra teeth, overlapping, or other. For color irregularities, we asked if there were: white spots, yellow spots, brown spots, white lines, yellow lines, brown lines, speckled/spotty/streaky/irregular/blotchy appearance, or other. When adolescents or parents showed difficulties in understanding the questions or response options, a research assistant guided them through the questionnaire.

Trained and calibrated dentist examiners conducted dental examinations using portable equipment and halogen headlights (25). Fluorosis was recorded using the FRI (4) on the occlusal table of molars and premolars and the incisal edge of anterior teeth, as well as the incisal third, middle third and cervical third of the buccal surfaces of all permanent teeth. According to the FRI protocol, any zone with pitting, staining, or deformity (FRI=3) or half or more of any zone exhibiting white striations (FRI=2) was defined as a zone with definitive fluorosis. Although all teeth were scored using the FRI, only scoring of the maxillary incisors and canines (4 zones × 6 teeth = 24 zones total) was used for these analyses. Any subject with definitive fluorosis (maximum FRI score= 2 or 3) on any of these 24 zones was defined as a fluorosis case. Subjects with no visible fluorosis on all of the 24 zones (FRI=0) or only with white striations on less than half of each zone (FRI=1) were defined as non-cases. In addition, all zones with FRI scores of 2 or 3 were counted to obtain the total number of surface zones on maxillary anterior teeth affected by fluorosis. Inter-examiner reliability for subject-level fluorosis of the maxillary incisors and canines was good, with 85% agreement and a kappa of 0.67 for fluorosis case definition. In addition, a clinical examination was carried out to evaluate anterior/posterior crossbite, 4mm overjet or open bite and number of missing teeth.

Comparisons of esthetics ratings between parents and adolescents used McNemar (2×2 tables) and Bowker (4×4 tables) tests of symmetry. These symmetry tests ignore all paired responses that are the same, and assess the overall direction of the ratings that are different. Comparison of esthetic satisfaction between definitive fluorosis cases (maximum FRI score= 2 or 3) and non-cases (maximum FRI score= 0 or 1) used Cochran-Armitage Trend tests for 4-level rating of satisfaction and Fisher’s Exact tests for dichotomous responses of concern (yes/no). The associations between overall esthetic satisfaction (both parental and adolescent) and predictor variables were assessed using ordinal logistic regression analysis. Subjects with no response for income or parental education were excluded from the regression analyses using those factors. Demographic variables with P-values less than 0.1 at the univariable level and all clinical variables including, number of missing teeth, number of fluorosis zones on maxillary anterior teeth and occlusal characteristics, were selected for inclusion in the multivariable regression model-building. Then, the score criterion method was used to select parsimonious multivariable regression models, retaining all variables significant at the 0.05 level. In addition, all two-way interactions of significant variables in the final models were checked. Statistical analyses were performed using SAS version 9.2 (28). P-values less than 0.05 were considered statistically significant.

Results

The adolescent subjects in the study (n=376) were predominantly white (97% of mothers) and 55% were males. In addition, 65% of mothers and 50% of fathers had at least a college

degree, and only 15% of families reported an income under \$40,000 per year in 2007 (Table 1). Seventy-four percent of subjects had no definitive fluorosis. Among the 97 subjects (26%) with definitive fluorosis, only 4 subjects (1%) had pitting or staining (FRI=3).

Table 2 shows comparison of dental esthetic perceptions between adolescents with and without definitive fluorosis. It also presents parents' perception by fluorosis status of their adolescents. Adolescents were generally satisfied with the overall appearance of their teeth, but 12% expressed that they were somewhat dissatisfied, and another 3% were very dissatisfied. Adolescents were mainly concerned about the color of their teeth (45%) and alignment (35%), followed by color irregularities (27%) and crowding (26%). Most were satisfied with the overall color of their teeth, but 15% were somewhat dissatisfied and 3% were very dissatisfied. Fluorosis was not significantly associated with adolescents' overall esthetic satisfaction, satisfaction with tooth color, or areas of concern, except for "other" areas of concern. The 12 subjects expressing "other" concerns gave 10 different reasons: loose tooth, tooth high up, incomplete eruption of canines, still having a baby tooth, cavities, gingivitis, teeth grinding, gum recession, tooth size and needing to brush better. These 12 subjects also all had fluorosis, but since the areas of concern are so diverse, the significance of the association is uncertain.

Parents were also generally satisfied with the overall appearance of their adolescent's teeth, but 11% were somewhat and 3% were very dissatisfied (Table 2). Parents were also most concerned about color (43%) and alignment (37%), followed by crowding (23%) and color irregularities (22%). Parents of adolescents with maxillary incisor/canine fluorosis were more dissatisfied with overall appearance ($P=0.014$) and overall color ($P<0.001$) (compared to parents of those without fluorosis), and also indicated more concern about color ($P=0.005$) and color irregularities ($P<0.001$).

Comparing the esthetic perceptions in adolescent-parent pairs (Table 3), the majority of adolescents showed the same level of satisfaction and concern as their parents. However, in discordant pairs adolescents were significantly less satisfied with overall appearance ($P<0.001$) and color ($P=0.048$) and also more concerned about tooth shape ($P=0.002$).

Associations of level of satisfaction with overall dental appearance (outcome variable) with predictor variables were explored further through ordinal logistic regression. Univariable analyses for adolescents and parents are presented in Table 4. Proportional odds models assume that the odds ratios (O.R.) are the same for any unit level increase in esthetic satisfaction (i.e., very dissatisfied to somewhat dissatisfied or somewhat satisfied to very satisfied). Thus the O.R. represents the odds of being at the next higher satisfaction level for every unit increase in the independent variable. For binary variables (gender, anterior crossbite, posterior crossbite, 4 mm overjet, and open bite), the odds ratios represent the likelihood of being at the next-higher satisfaction level for subjects with the stated characteristic, compared to subjects in the reference group. For instance, for subjects with anterior crossbite, the odds of parents being slightly more satisfied (by 1 level) relative to parents of subjects without anterior crossbite is 0.27. Odds ratios for incremental variables (father's and mother's educational level, family income) and quantitative variables (number of missing teeth and number of fluorosis zones) similarly represent the odds of being slightly more satisfied (by 1 level) for level of education, income, number of missing teeth or number of fluorosis zones, relative to subjects in the next lower level or number. For example, for one unit increase in family income, the odds of parents being more satisfied (by 1 level) is 1.26. The proportional odds assumption was met for all the models presented in Tables 4 and 5 ($P>0.05$).

Having P-values less than 0.1 at the univariable level, adolescent gender, parent's educational level, and family income were selected to be included in the multivariable logistic regression, along with number of fluorosis zones, number of missing teeth, anterior and posterior crossbite, 4mm overjet and open bite for prediction of adolescent and parent satisfaction. For adolescent satisfaction, total number of fluorosis zones and number of missing teeth were the only variables that remained significant and chosen for the parsimonious model ($P < 0.05$). However, for the parent satisfaction, income, number of fluorosis zones, number of missing teeth, anterior crossbite and 4 mm overjet remained significant and were selected for the parsimonious model (Table 5). There were no significant two-way interactions between the variables in the final model (all P-values > 0.05).

Discussion

This study found that adolescents generally expressed satisfaction with their tooth appearance, as shown by the results in Table 2. Only 15% and 18% were dissatisfied with overall appearance and color of teeth, respectively. Color and alignment of teeth were the most prevalent reasons for concern by adolescents. Subjects with definitive fluorosis (highest FRI score of 2 or 3) on the anterior teeth were not significantly different from those without fluorosis (FRI=0, 1) in displaying satisfaction with tooth appearance and color. In addition, fluorosis was not associated with increased concerns about tooth color and color irregularities among adolescents. Since more than 96% of fluorosis cases in this study had only mild/moderate fluorosis (FRI=2), it can be inferred that mild/moderate fluorosis did not have a negative impact on adolescents' dental esthetic satisfaction. This finding agrees with previous investigations by Shulman et al. (18), Martinez-Mier et al. (29) and Meneghim et al. (30) and Do et al. (20). However, for further assessment of relationships between fluorosis and perceptions, the binary variable of fluorosis status was replaced by number of zones with FRI scores of 2 and 3 on maxillary anterior teeth in logistic regression. This more powerful approach helped to detect a statistically significant association of fluorosis and adolescent level of satisfaction with dental appearance at both univariable (OR=0.91, $P=0.03$) and multivariable levels (OR=0.92, $P=0.04$). The results indicate that when fluorosis is mostly mild or moderate, the number of affected zones may provide a more useful measure for describing the strength of association between fluorosis status and esthetic perceptions.

Fluorosis status (yes/no) was significantly associated with lower parental satisfaction, suggesting that parents whose adolescent had fluorosis were more likely to display decreased satisfaction with their adolescent's tooth appearance and color. In addition, they were more likely to be concerned with tooth color and color irregularities than were other parents (Table 2). Consistent with our previous studies (25–27), parents were more concerned with esthetic problems in the presence of fluorosis; however, several studies also have reported that fluorosis at the mild level seen commonly in North America is not a cause of concern in parents (9, 18, 20, 29). Apart from family income and socio-cultural norms affecting parents'/children's perceptions of dental fluorosis, children's age is also influential on parental satisfaction and can result in different results among various studies. Based on the Cannon et al. study (26) that also analyzed the Iowa Fluoride Study data, parents' sensitivity to children's tooth shape and color increased while children were growing from 9 to 11 years old. Furthermore, they paid more attention to children's permanent dentition than primary/mixed dentition. Follow-up analysis is currently underway to investigate the longitudinal changes in perceptions for both parents and subjects during adolescence.

Examining factors associated with satisfaction of overall dental appearance showed that the number of fluorosis zones, anterior crossbite and number of missing teeth were negatively

associated with adolescents' satisfaction level in univariable ordinal logistic regression. However, having all three factors in the adolescent multivariable regression model resulted in a non-significant effect for anterior crossbite. Since the number of missing teeth was more strongly associated with adolescents' satisfaction level at both the univariable and multivariable levels, anterior crossbite was removed from the final adolescent model (Table 5). Lower parental satisfaction was associated with lower family income, number of missing teeth, number of zones with fluorosis, anterior crossbite and 4 mm overjet. These findings suggest that parents were more sensitive to deviation from clinical standards of dental occlusion, thus their dental esthetic perceptions corresponded closely to normative needs and clinical judgments. Although adolescents were more tolerant of fluorosis and malocclusion than were parents, adolescents expressed less satisfaction with appearance and color of their teeth and were more critical of tooth shape than were parents. Additional studies are needed to provide a clearer picture comparing esthetic-related factors associated with parents' and adolescents' perceptions.

Changes during adolescence can contribute to the differences in judgment between adolescents and their parents. In other words, higher dissatisfaction of adolescents with appearance, color and shape of teeth compared to parents might be more reflective of psychological changes and social factors influencing esthetic perceptions, particularly during this phase of life besides clinical impairment of dental esthetics. However, one should also consider that the way adolescents perceive oral conditions depends on the socio-cultural norms, degree of severity and how frequently the oral condition is observed in their community. For instance, Wondwossen et al. (19) found that the Ethiopian children and their parents living in Wonji-Shoa, where prevalence of fluorosis at the Thylstrup and Fejerskov (TF) score of 2 was about 72% and 37% of children showed severe fluorosis, were able to differentiate various levels of fluorosis from non-affected teeth. On the other hand, clinical judgment and self-assessment are two distinct determinants of oral health that should both be used for identification of treatment needs. Clinical judgment should not overshadow the importance of patient/family perceptions and the weak association between them does not invalidate the subjective indicators (31).

The study had some limitations including that subjects were generally from a limited geographic area, with parents who were mostly Caucasian and generally well-educated and of high SES. Thus, they are not representative of the entire population and any generalizations should be made with caution. In addition, they have been participating in Iowa Fluoride Study since the early 1990s. Those still participating in the study may appreciate the importance of oral health more than others. Thus, the impact of dental fluorosis and other oral conditions on dental esthetic perceptions may be overestimated. The retention rate of 79% over 8 years was fairly high. Nevertheless, exclusion of a significant number of subjects due to orthodontic treatment limited the power of the study. Finally, having parents complete the questionnaires when their children were ages 9 and 11 may have made parents more aware of their children's dental esthetics, so the findings of this study should not be considered conclusive. Future studies to compensate for these limitations and to formally utilize oral health-related quality of life (OHRQoL) instruments are recommended to assess the impact of oral conditions on daily functions and psychological well-being.

Conclusions

- Adolescents generally had less satisfaction with overall appearance and tooth color and were more concerned with tooth shape than their parents were.
- Binary fluorosis status was negatively associated with parent esthetic satisfaction, but not significantly associated with adolescent satisfaction. However, the number

of surface zones on maxillary anterior teeth affected by fluorosis was negatively associated with both parental and adolescent level of satisfaction, even though most fluorosis was mild.

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Table 1

Characteristics of the Subjects and Families (N=376).

Characteristics	Percentage	
Adolescent's gender	55	
Male	45	
Female		
Mother's race	97	
White (non-Hispanic)	0.8	
Black	0.5	
Asian	1	
White (Hispanic)		
Educational level (2007)	<u>Mother</u>	<u>Father</u>
No Response	1	10
Some High School	1	2
H.S. diploma/G.E.D	13	23
Some college	20	15
2-year college degree	20	15
4-year college degree	27	20
Graduate/professional degree	18	15
Family income (2007)	15	
No response	3	
<\$20,000	12	
\$20,000-\$39,999	16	
\$40,000-\$59,999	18	
\$60,000-\$79,999	36	
\$80,000 or more		
Parent filling out questionnaire	89	
Mother	10	
Father	0.5	
Unknown		
Max. FRI score on maxillary incisors/canines	74	
FRI=0,1	25	
FRI=2	1	
FRI=3		
Number of surface zones with fluorosis	74	
0	19	
1-4	7	
5-24		
Number of missing teeth	64	
0	27	
1-4	9	
5-13		
Anterior crossbite	7	
Posterior crossbite	7	
4mm overjet	6	
Open bite	4	

Table 2
Adolescents' and Parents' Esthetic Perceptions by Maxillary Incisor/Canine Fluorosis Status (N=376)

Item	Response	Adolescent Responses			Parent Responses		
		Total %	Adolescent Fluorosis Status %No (n=278) %Yes (n=98)	P-Value*	Total %	Adolescent Fluorosis Status %No (n=278) %Yes (n=98)	P-Value**
Overall appearance [†]	Very satisfied	22	24 14		39	43 30	
	Somewhat satisfied	63	60 70	0.15	46	45 48	0.014
	Somewhat dissatisfied	12	13 11		11	8 20	
	Very dissatisfied	3	3 4		3	4 2	
Concerns ^{††}							
Shape	Yes	19	20 19	0.89	12	10 15	0.21
Color	Yes	45	45 44	0.82	43	38 55	0.005
Alignment	Yes	35	34 38	0.47	37	35 43	0.15
Spacing	Yes	18	16 22	0.17	15	16 14	0.87
Crowding	Yes	26	24 32	0.14	23	23 20	0.58
Color irregularities	Yes	27	27 29	0.70	22	15 42	<0.001
Other	Yes	3	4 0	0.042	5	4 7	0.16
Overall color [†]	Very satisfied	24	27 18		34	37 24	
	Somewhat satisfied	58	55 65	0.52	52	52 51	<0.001
	Somewhat dissatisfied	15	15 14		13	10 22	
	Very dissatisfied	3	3 2		1	1 2	

[†] P-value from Cochran-Armitage Trend Test.

^{††} P-value from Fisher's Exact Test.

* P-values show comparison of adolescents' esthetic perceptions by their fluorosis status.

** P-values show comparison of parents' esthetic perceptions by their adolescents' fluorosis status.

Table 3

Comparison of Esthetic Perceptions in Adolescent-Parent Pairs (N=376)

Item	Percentage of Adolescent –Parent Pairs			P-Value *
	Parents Less Satisfied	Same	Adolescents Less Satisfied	
Overall appearance	16%	51%	33%	<0.001
Overall color	19%	50%	31%	0.048
Concern:	Parents More Concerned	Same	Adolescents More Concerned	P-Value †
Shape	7%	77%	15%	0.002
Color	20%	57%	22%	0.53
Alignment	15%	73%	13%	0.43
Spacing	10%	78%	12%	0.33
Crowding	9%	79%	12%	0.18
Color irregularities	12%	72%	16%	0.08
Other	4%	93%	2%	0.34

* P-value from Bowker's test of symmetry. The 4×4 tables of adolescent vs. parent responses have been condensed to "Improved", "Same" and "Declined" for simplicity of presentation. The Bowker's test employs all data in the off-diagonal cells of the 4×4 original tables.

† P-value from McNemar's test of symmetry

Univariable Ordinal Logistic Regressions Predicting Adolescent and Parent Satisfaction with Overall Dental Appearance (Outcome variable)

Table 4

Variable	N	Reference Group	Adolescent Satisfaction		Parent Satisfaction	
			O.R.*	P-Value	O.R.*	P-Value
Parent gender	374	Dad			1.14	0.68
Adolescent gender	376	Male	1.01	0.98	1.43	0.07
Mother's educational level	371	Incremental (1-6)	1.16	0.07	1.11	0.16
Father's educational Level	338	Incremental (2-6)	1.10	0.18	1.10	0.17
Family income	319	Incremental (1-5)	1.06	0.55	1.26	0.009
Number of fluorosis zones	376	Incremental (0-24)	0.91	0.03	0.88	0.002
Number of missing teeth	376	Incremental (0-13)	0.88	0.007	0.88	0.004
Anterior crossbite	376	None	0.40	0.03	0.27	<0.001
Posterior crossbite	376	None	0.68	0.34	0.36	0.007
4mm overjet	376	None	0.65	0.33	0.42	0.04
Open bite	376	None	1.03	0.97	0.46	0.13

* Odds Ratio for higher satisfaction level.

Table 5

Multivariable Ordinal Logistic Regression Predicting Satisfaction with Overall Dental Appearance (Outcome variable)

	Adjusted O.R. *	95% CI	Wald χ^2	P-value
Final model predicting adolescent satisfaction level	0.92	0.85–0.99	4.06	0.04
Number of fluorosis zones	0.89	0.81–0.97	6.57	0.02
Number of missing teeth				
Final model predicting parent satisfaction level	1.31	1.11–1.55	9.99	0.002
Family income	0.88	0.81–0.95	9.66	0.002
Number of fluorosis zones	0.90	0.83–0.98	5.77	0.02
Number of missing teeth	0.30	0.13–0.67	8.71	0.004
Anterior crossbite	0.37	0.16–0.85	5.44	0.02
4mm overjet				

* Odds Ratio of the final model for higher satisfaction level.