

# An investigation of social judgments made by young adults towards appearance of dental fluorosis

SR Nagashree, MR Shankar Aradhya, M Arunadevi

Department of Public Health  
Dentistry, V. S. Dental College  
and Hospital, Bangalore, India

## ABSTRACT

**Background:** Smile is a crucial factor in creating a good first impression. However conditions like dental fluorosis hamper the esthetics of teeth. This study was conducted to find out whether young adults attribute socially relevant characteristics to people with dental fluorosis.

**Materials and Methods:** A total of 150 young adults were presented with images of individuals with different severity levels of dental fluorosis along with images of normal tooth appearance on a computer screen. They had to attribute various socially relevant characteristics to these images. Images were digitally manipulated to simulate dental fluorosis. Images were displayed on a computer screen and Visual Basic Software was used to record the participants' responses as well as the time taken to respond. The time taken to respond or response latency indicates the response strength.

**Statistical analysis:** A chi-square test was used to test the association between the dental appearances and the socially relevant characteristics. A Mann-Whitney test was used to compare the time taken to respond.

**Results:** As the severity of fluorosis increases, participants attribute less and less of positive characteristics. Attribution of negative characteristics also increases with the severity of dental fluorosis. For images with moderate and severe fluorosis, respondents took more time to accept positive characteristics and less time to reject positive characteristic. This means that the participants felt strongly when rejecting positive characteristics in these images.

**Conclusion:** Social judgments are made by young adults when viewing digitally manipulated images of different levels of fluorosis.

**Key words:** Appearance, dental fluorosis, digitally manipulated images, social judgments

Received : 01-06-10  
Review completed : 31-10-11  
Accepted : 02-03-12

The first impression is the best impression. Smile is one of the most vital elements in creating a good first impression. However, it is hard to smile if a person is conscious about unappealing teeth.<sup>[1]</sup> Dental fluorosis is one such condition where the appearance of a person's teeth is affected.

Appearance of dental fluorosis is perceived as embarrassing by laypersons.<sup>[2]</sup> Concerns for stains on teeth have been expressed by persons with moderate and severe fluorosis.<sup>[3]</sup>

This is of particular importance in youngsters, as they tend to attach more importance to appearance.

To date majority of research has focused on the esthetic impact of dental fluorosis.<sup>[4-8]</sup> However dental appearance may influence social interactions and contribute to social selection.<sup>[9]</sup> Attributions of characteristics that go beyond the esthetic are significantly influenced by altered tooth appearance.

The wider social impact of dental fluorosis has not been studied in India where fluorosis was prevalent in 12.1% of 12-year-old children and 11.8% of 15-year-old children.<sup>[10]</sup> The present study aims to investigate if socially relevant traits are attributed to people with dental fluorosis by displaying images on a computer screen.

## MATERIALS AND METHODS

Young adults aged 18--25 years were recruited from two educational institutions in Bangalore city. Both educational

### Address for correspondence:

Dr. Nagashree SR  
E-mail: nagashree.savanur@gmail.com

Access this article online	
Quick Response Code:	Website: www.ijdr.in
	DOI: 10.4103/0970-9290.104946

institutions had students of similar social and educational background. Study subjects were presented with computer-generated images of individuals with different severity levels of dental fluorosis along with images with normal tooth appearance on a computer screen. Similar computer-generated images have been used to measure the esthetic impact of dental fluorosis by some investigators.<sup>[11, 12]</sup>

They had to attribute various socially relevant characteristics to these images. All the photographs used in the study were of individuals unknown to the participants. After taking consent from the institutional authorities, experiments were conducted in the computer section of their respective institutions. Participants were blinded to the fact that the study concerned dental fluorosis. The subjects were not students of dental, medical and paramedical sciences.

The study employed 12 photographic images of smiling faces of young adults with their teeth exposed. Images of full face were used instead of images of teeth only, to closely resemble the situation in a typical social interaction. The images were obtained from six adult volunteers (3 male and 3 female).

Photographs of one male and one female volunteer were used as target photographs. Target images were digitally manipulated to simulate mild, moderate, and severe fluorosis according to Dean's classification of dental fluorosis. The reference was the color plates provided in the "Oral Health Surveys – Basic Methods."<sup>[13]</sup> The manipulation was done using the Adobe Photoshop software. The target images were imported to Adobe Photoshop and zoomed in to concentrate on the teeth in the images. Later, mild fluorosis was simulated using white color with a "pen tool" upon the facial surfaces of the teeth in the images. Similarly, brown color with a "pen tool" was used to create impressions of moderate and severe fluorosis in facial teeth surfaces of the target images. Thus, six manipulated target images were obtained (three target images consisting of a female face and three target images of a male face).

The images of the same two individuals were digitally manipulated to simulate mild, moderate and severe fluorosis. This eliminates the variability associated with factors like facial features and attractiveness. Digitally manipulated photographs (six images) along with normal photographs of the same volunteers were used as target images (eight images). These images varied only in appearance of teeth whereas all other features remained same.

The remaining four photographs were used as filler stimuli. These photographs were taken under identical conditions as the target photographs were taken. Filler photographs were included to prevent overemphasis on the target faces and thus avoiding subjects to deliberately look for variations. Hence responses to filler photographs were not subjected to analysis.

Participants were asked to assess 10 characteristics (5 positive and 5 negative). These characteristics were polar opposites of one another. The characteristics which represented polar opposites of five themes were careful–careless, clean–dirty, happy–unhappy, sociable–unsociable, and intelligent–unintelligent.

Target images and filler images were displayed on a computer screen in a random order. Followed by each image, a question about one of the characters would appear on the computer screen. For example: "Do you think this person is careless?" The participants had to click on the "yes" or "no" key thereby attributing that characteristic to the image that was displayed. It took about 30 minutes to complete the test by each participant.

Visual Basic software was used to display the images and also record the responses made by the participants. This software makes it possible to record whether the participant pressed "yes" or "no" key, as well as the time taken to make the decision. The response latency or the time taken to respond gives us the strength of the participants' response.

Response latency provides an implicit measure of attitude strength.<sup>[14,15]</sup> In this technique, unknown to the participant, the time taken to respond is also recorded as an implicit measure. Quicker responses are held to indicate greater attitude strength. Similar techniques have been widely used in the field of psychology to measure strength of attitudes.

### Statistical analysis

The study comprised a binary response (whether or not the characteristic applied to the face), and the time taken to respond (decisional response latency). A chi-square test was used to test the association between the dental appearances and the questioned characteristics. The Mann–Whitney test was used to compare the time taken to respond to a positive and negative end of the same characteristic. The level of significance was fixed as  $< 0.01$ .

## RESULTS

Out of the 150 students, 72 were male and 78 were female. Each participant's responses were measured for 160 image presentations, out of which, 80 related to target images and 80 filler images. The responses to filler images were not subject to analysis.

It can be seen that, as the severity of fluorosis increases, participants attribute less and less of positive characteristics [Table 1]. Attribution of negative characteristics also increases with the severity of dental fluorosis. The chi-square test [Table 2] indicates that there is a significant association between the dental appearance of different levels of fluorosis and the attribution of characteristics.

**Table 1: Number of “yes” and “no” responses to all the positive and negative characteristics for different dental appearances**

Response	Characteristic	Normal		Mild fluorosis		Moderate fluorosis		Severe fluorosis	
		N	%	N	%	N	%	N	%
Yes	Positive	1219	81.27	936	62.40	550	36.67	414	27.60
	Negative	284	18.93	599	39.93	961	64.07	1015	67.67
No	Positive	281	18.73	564	37.60	950	63.33	1086	72.40
	Negative	1216	81.07	901	60.07	539	35.93	485	32.33

**Table 2: Chi-square test to test the association between the dental appearances and the questioned characteristics**

Answer		Value	df	P value
Yes	Pearson Chi-square	1263.985 <sup>a</sup>	63	.000
	Likelihood Ratio	1353.927	63	.000
	Linear-by- Linear association	10.920	1	.001
	N of valid cases	5978		
No	Pearson Chi-square	1302.732 <sup>b</sup>	63	.000
	Likelihood Ratio	1506.970	63	.000
	Linear-by- Linear association	10.943	1	.001
	N of valid cases	6022		

<sup>a</sup> =  $P < 0.0001$ , <sup>b</sup> =  $P < 0.0001$ , both <sup>a</sup> and <sup>b</sup> statistically significant.

Less time was taken to give “yes” response and more time was taken to give “no” response when attributing positive characteristics to images with no dental fluorosis [Table 3]. The difference in the time taken was found to be significant. Similarly less time was taken to attribute positive characteristic to mild fluorosis compared to the time taken to reject positive characteristic. However this difference was not significant.

For images with moderate and severe fluorosis, respondents took more time to accept positive characteristics and less time to reject positive characteristic. The difference was found to be statistically significant. Similarly, respondents took lesser time to accept negative characteristics in different levels of fluorosis but more time to reject negative characteristics.

This means that the participants felt strongly when accepting negative characteristics and rejecting positive characteristics in images of different levels of fluorosis.

## DISCUSSION

The present study aimed to investigate if socially relevant judgments are made by young adults when viewing images of different levels of dental fluorosis. The highlights of this study are that images of full face were used instead of images of teeth only. This closely resembles the situation in a typical social interaction. Comparisons were made between digitally manipulated images of the same individual hence eliminating the variability associated with factors like facial features and attractiveness.

The use of unaltered filler images prevents the participants from deliberately searching for variations in target images.

The method of response latency used in the present study is similar to that used in the study by Williams *et al.*<sup>[15]</sup> Response latency allows the measurement of attitude more accurately because the participant is unaware that the time taken to respond is being measured.

In the present study, as the severity of fluorosis increases, participants attribute less and less of positive characteristics. Attribution of negative characteristics also increases with the severity of dental fluorosis. This is similar to the findings of Williams *et al.*<sup>[15]</sup>

A total of 63.3% of respondents in the present study attributed negative characteristics to images of moderate fluorosis and 72.4% of respondents attributed negative characteristics to images of severe fluorosis. Comparable inclinations of responses are reported by Mwaniki *et al.*,<sup>[16]</sup> where 60.4–84.3% of respondents thought that people with dental fluorosis had unfavorable personality.

Regarding the time taken to respond, the present study shows that less time is taken to accept positive characters in images of normal and mild fluorosis compared to the time taken to accept negative characteristics in these images.

Shortest time was taken to reject positive characteristics in images of moderate and severe fluorosis. In contrast, longest time was taken in rejecting negative characteristics in images of moderate and severe fluorosis. This indicates that participants attribute positive characteristics to normal appearance and mild fluorosis more strongly, even though mild fluorosis is viewed less favorably compared to normal appearance.

The limitations of the present study are that the participants were students and hence not representative of the population in general. Some confounding factors in the present study may be age, gender, and cultural background of the participants. Since culture plays a role in shaping a person’s perception about physical appearance, a study involving a wider array of cultures would be more beneficial.

## CONCLUSION

Images of dental fluorosis were associated with negative characteristics. Attribution of negative characteristics

**Table 3: Time taken in milliseconds to respond for the questions on different levels of dental fluorosis**

		Median values							
		Normal enamel	P*	Mild fluorosis	P*	Moderate fluorosis	P*	Severe fluorosis	P*
Positive	Yes	1200	<0.01	1213	0.632	1394	<0.01	1427	<0.01
	No	1575		1372		1073		1038	
Negative	Yes	1531	<0.01	1437	<0.01	1258	<0.01	1184	<0.01
	No	1013		1238		1486		1548	

\*Mann-Whitney test.

increased as the level of fluorosis increased. The time taken to respond indicated that judgments made by the participants were stronger against moderate and severe fluorosis compared to their judgments against mild fluorosis. Social judgments are made by young adults when viewing digitally manipulated images of different levels of fluorosis.

## REFERENCES

1. Ellwood RP, O'Mullane D. Enamel opacities and dental esthetics. *J Public Health Dent* 1995;55:171-6.
2. Riordan PJ. Perceptions of dental fluorosis. *J Dent Res* 1993;72:1268-74.
3. Chikte UM, Louw AJ, Stander I. Perceptions of fluorosis in Northern Cape communities. *SADJ* 2001;56:528-32.
4. Clark DC, Hann HJ, Williamson MF, Berkowitz J. Aesthetic concerns of children and parents in relation to different classifications of the Tooth Surface Index of Fluorosis. *Community Dent Oral Epidemiol* 1993;21:360-4.
5. Clark DC. Evaluation of aesthetics for the different classifications of the Tooth Surface Index of Fluorosis. *Community Dent Oral Epidemiol* 1995;23:80-3.
6. Hawley GM, Ellwood RP, Davies RM. Dental caries, fluorosis and the cosmetic implications of different TF scores in 14-year-old adolescents. *Community Dent Health* 1996;13:189-92.
7. McKnight CB, Levy SM, Cooper SE, Jakobsen JR. A pilot study of esthetic perceptions of dental fluorosis vs. selected other dental conditions. *ASDC J Dent Child* 1998;65:233-8, 229.
8. Levy SM, Warren JJ, Jakobsen JR. Follow-up study of dental students' esthetic perceptions of mild dental fluorosis. *Community Dent Oral Epidemiol* 2002;30:24-8.
9. Feng XP, Newton JT, Robinson PG. The impact of dental appearance on perceptions of personal characteristics among Chinese people in the United Kingdom. *Int Dent J* 2001;51:282-6.
10. Bali RK, Mathur VB, Talwar PP, Chanana HB. National Oral Health Survey and Fluoride Mapping. New Delhi: Dental Council of India; 2004.
11. McKnight CB, Levy SM, Cooper SE, Jakobsen JR, Warren JJ. A pilot study of dental students' esthetic perceptions of computer-generated mild dental fluorosis compared to other conditions. *J Public Health Dent* 1999;59:18-23.
12. Edwards M, Macpherson LM, Simmons DR, Harper Gilmour W, Stephen KW. An assessment of teenagers' perceptions of dental fluorosis, using digital simulation and web-based testing. *Community Dent Oral Epidemiol* 2005;33:298-306.
13. Oral Health Surveys: Basic Methods. 4th ed. Geneva: World Health Organization; 1999.
14. Greenwald AG, McGhee DE, Schwartz JL. Measuring individual differences in implicit cognition: The implicit association test. *J Pers Soc Psychol* 1998;74:1464-80.
15. Williams DM, Chestnutt IG, Bennett PD, Hood K, Lowe R, Heard P. Attitudes to fluorosis and dental caries by a response latency method. *Community Dent Oral Epidemiol* 2006;34:153-9.
16. Mwaniki DL, Courtney JM, Gaylor JD. Endemic fluorosis: An analysis of needs and possibilities based on case studies in Kenya. *Soc Sci Med* 1994;39:807-13.

**How to cite this article:** Nagashree SR, Shankar Aradhya MR, Arunadevi M. An investigation of social judgments made by young adults toward appearance of dental fluorosis. *Indian J Dent Res* 2012;23:443-6.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.