A study of relationship between skin color and tooth shade value in Population of Udaipur, Rajasthan
Vivek Sharma; Vikas Punia; Meenakshi Khandelwal; Sandhya Punia; Rao Lakshmana B

Abstract
Background and Objective: The importance of esthetics in dentistry has shown marked increase owing to new interest and public awareness. Selection of color of teeth for patients when all records of form, color and size have been lost requires knowledge and understanding of a number of physical and biological factors directly related to the patient. This study was aimed at determining the possible relationship between skin color and tooth shade in population of Udaipur, Rajasthan. Methodology: A total of 240 individuals aged above 19 years participated in this study. A Vitapan classical shade guide was used to examine either the maxillary right or left central incisor in natural daylight. Tooth shades were divided into 4 categories according to value and skin tones were divided into 3 categories (fair, medium and dark) using of Revlon makeup shades as a guide. Categorical modeling with chi-square analysis was used to analyze the data. Results: Significant tooth shade differences was discovered among the subjects with skin colors (P<0.001). Persons with medium-to-dark skin tones were more likely to have teeth with higher values (lighter), whereas individuals with lighter skin tones tended to have teeth with lower values (darker). Conclusion: Within the limitation of study, tooth shade value and skin colour were inversely related.
Key words: Shade selection; Tooth shade; Skin colour

Introduction
A smile is the most visible record of a Dentist’s care. The significance of tooth shade in one’s perception of smile attractiveness cannot be underestimated. In today’s beauty conscious society, the demand for esthetic dentistry has increased a lot in last few years. Tooth shade is one of the most significant factors affecting esthetics (1).

It is general misconception in people that white bright teeth are more attractive than yellow teeth. But we as dentists are aware of the fact that teeth shade vary with skin colour, age and gender(2,3). Tooth color has a strong correlation with age, generally becoming darker and yellower with time(4-7). As the age advances the pulp chamber which are large during young age becomes smaller as a result of deposition of secondary dentin, making tooth more opaque. Many studies have shown that women have lighter and less yellow teeth than men(7-9).

The color of the facial skin serves as the basic guides to tooth shade. The face is the frame into which the picture (the teeth) will fit. Therefore the shade of the teeth should harmonize with the color of the skin of the face(2).

In past various studies and surveys were conducted investigating the relationship of skin color to tooth shade(4,7-11). Some of these found inverse relationship between skin color and tooth shade while others found no relationship. These varying results can be attributed to the differences in ethnic origin of population studied. This study was aimed at determining whether a relationship existed between skin color and tooth shades in population of Udaipur, Rajasthan.

Materials and Methods
This study was conducted to investigate the relationship between tooth shade value and skin colour in population of Udaipur, Rajasthan, India. A total of 240 subjects belonging to different age groups, of equal sex distribution visiting at Darshan Dental College and Hospital, Udaipur were selected.

In this study subjects above 19 years with a full complement of maxillary and mandibular anterior teeth without any endodontic therapy or restorations, developmental defects and disease were selected, to determine the skin colour and shade of teeth.

Subjects who had history of bleaching procedures, intrinsic, extrinsic or tetracycline staining, xerostomia, radiation therapy, smoking or abnormalities in tooth development were excluded. Female subjects were specially asked not to wear any makeup, lipstick or lip gloss.

A rapid shade comparison was done to avoid fatigue of cones in the retina of the investigator in natural daylight is used for the shade selection.

Determination of skin color
Skin tones were divided into 3 categories: Shade 1: fair, Shade 2: medium and Shade 3: dark, with use of Revlon Foundation makeup shade guide (fig 1). The vanilla, shell and nude shade groups of the Revlon compacts corresponded to the fair skin group, the natural beige, medium beige and cool
beige shades of the compact corresponded to the medium skin group, and the golden beige, rich ginger shades of the compact corresponded to the dark skin group. Shades beyond the deeper shades of the compact were categorized in the dark skin group.

**Determination of shade of teeth**

In the present study the Vitapan Classical shade guide (fig 2) was used to record tooth shades. The manufacturer’s recommendations for the shade guide were followed for shade selection procedure.

1. The subject was positioned upright with the mouth at the clinician’s eye level and the clinician’s position at an arm’s length form the subject, and the patient is draped with gray color cloth.

2. Clinicians were screened for color vision deficiency with Ishihara test for color blindness and no color vision deficiencies were found.

3. The shade tabs were positioned adjacent to the maxillary central incisor and the clinicians concentrated only on the middle 1/3 rd of the facial surface to determine the correct shade. Shade tabs were rapidly scanned from the darker shades by the procedure of elimination to determine the best possible match within a time limit of 10 seconds. The shade tabs were also viewed from different angles and both the tooth and the shade guide tabs were maintained in a moist condition.

**Figure-1 Revlon Foundation Shade Guide**

<table>
<thead>
<tr>
<th>Shade</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fair</td>
<td>84</td>
<td>35</td>
</tr>
<tr>
<td>Medium</td>
<td>81</td>
<td>33.75</td>
</tr>
<tr>
<td>Dark</td>
<td>75</td>
<td>31.25</td>
</tr>
<tr>
<td>Total</td>
<td>240</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table-I Frequency of Skin Shades**

**Classification**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest</td>
<td>52</td>
<td>21.67</td>
</tr>
<tr>
<td>High</td>
<td>48</td>
<td>20</td>
</tr>
<tr>
<td>Medium</td>
<td>86</td>
<td>35.83</td>
</tr>
<tr>
<td>Low</td>
<td>54</td>
<td>22.5</td>
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<tr>
<td>Total</td>
<td>240</td>
<td>100</td>
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</tbody>
</table>

**Table-II Tooth Shade Classification**

<table>
<thead>
<tr>
<th>Skin Shade</th>
<th>Tooth shade</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fair</td>
<td>Highest</td>
<td>6</td>
<td>21.67</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>10</td>
<td>33.33</td>
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<tr>
<td></td>
<td>Medium</td>
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<td>41.67</td>
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<td>Low</td>
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<td>73.68</td>
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<tr>
<td>Total</td>
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</tbody>
</table>

**Table- III Comparison of skin tone and tooth shade value (lightness) among 240 study participants**

**Discussion**

The importance of esthetics in dentistry has shown marked increase owing to new interest and
public awareness. Tooth color is one of the important factors affecting esthetics. Color is complex and encompasses both subjective and objective phenomenon. The most popular method for describing color is the Munsell system(3,11-13). It has been widely used in dentistry. The three attributes of color in this system are hue, value and chroma. Hue is defined as the particular variety of a color, shade or tint produced by a specific wavelength of light acting on the retina. Chroma is defined as the intensity of a hue that is amount of color saturating per unit area of an object. Value is defined as the relative lightness or darkness of a color or the brightness of an object. Value is considered to be of greater importance.

For tooth shade selection, tooth shade guides offer a series of standards simulating the natural teeth. Presently various tooth shade guides and devices are available, but these are useful in patients with healthy natural teeth that can be used for comparison with the guide. Selection of color of teeth for patients when all records of form, color and size have been lost requires knowledge and understanding of a number of physical and biological factors directly related to the patient. Various preextraction records may provide information regarding form and shape of teeth but not the shade of the teeth(3,13,14).

The color of the facial skin serves as basic guide to tooth shade. Specifically it is suggested that the value of the teeth must correspond to darkness or lightness of the facial skin tone. In past various researchers had performed studies finding a relationship of tooth shade with skin color(4,7,9-11). There is limited scientific information on the relationship between tooth shade and skin color with reference to Indian population. Therefore this observational study was taken up to find relationship between skin color and tooth shade in people of Udaipur, Rajasthan.

The perception of tooth color is a complex phenomenon and may be influenced by a number of factors, type of incident light, reflection and absorption of light by the tooth, adaptation state of the observer and the context in which the tooth is viewed(15). In the present study the Vitapan Classical shade guide was selected because of its routine use by dental professionals. The tooth shades were matched in standardized and uniform conditions, following manufacturer’s instructions. Shades were divided into 4 categories based on the reported values of the Vitapan Classical shade guide: the highest value group (shades A1, B1, A2, B2); high value group (shades C1, D2, A3, D4); medium value group (shades B3, B4, C2, D3); and low value group (shades A3.5, C3, A4, C4)(16).

On statistical analysis it was found that there was significant correlation between fair skin color and tooth shades with low value; between dark skin color and tooth shades with highest value and between medium skin color and tooth shades with medium value (p<0.001) (Table III).

This study found an association between skin color and tooth shade. Persons with medium and dark skin were more likely to have teeth in high value category than persons with fair skin color. These results are similar to the findings of Jahangiri et al(4) who found inverse relationship between tooth shade and skin color in their study on multiracial population.

The results of present study may serve as an aid to a dentist selecting artificial teeth for an edentulous patient in the development of natural-looking prostheses.

Conclusion

The results of this observational study suggest that there is a significant relationship between tooth shade and skin color. Persons with fair skin color were more likely to have tooth shades with low values (darker) and medium-to-dark skin color with lighter skin tones tended to have teeth with higher values (lighter), regardless of age.

Based on the relationships skin color may be a useful guide for the selection of tooth shade in removable and full-mouth reconstructions achieve a more natural appearance, especially among the elderly and persons with darker skin tones.

Authors Affiliations: 1.Dr.Vivek Sharma, MDS, Reader, 2. Dr. Vikas Punia, MDS, Sr Lecturer, 3. Dr.Meenakshi Khandelwal, MDS, Reader, Dept of Prosthodontics. 4. Dr.Sandhya Punia, MDS, Sr Lecturer, Dept of Conservative & Endodontics. Darshan Dental College Hospital Loyara, Udaipur, 5.Dr.Rao Lakshmana,B, MDS, Prof, Dept of Prosthodontics, Rama Dental College & Hospital, Kanpur, India

References


Source of Support: Nil, Conflict of Interest: None Declared

Address for Correspondence
Dr. Vivek Sharma, MDS,
Department of Prosthodontics,
Darshan Dental College & Hospital,
Loyara, Udaipur, 313001 (India).
E mail: drvivek76@gmail.com