



A CORRELATIVE STUDY BETWEEN THE MOST PREVALENT TOOTH SHADE, GINGIVAL SHADE AND SKIN SHADE AMONGST INDIAN POPULATION

Dentistry

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ABSTRACT

Aim: Shade selection is a critical step of any esthetic restoration. Most of the studies on shade matching till date have been conducted on the Caucasian race. There is limited scientific information of the most prevalent tooth shade and gingival shade that actually exists in the Indian population. **Objective:** To find out the most prevalent tooth shade, gingival shade, skin shade amongst the Indian population by using tooth shade guide, gingival shade guide, skin shade guide systems and correlate these with the above parameters. The information generated from this study will be important to guide the manufacturing companies to produce standard shade guides for the Indian population. **Material and methods:** A total of 5000 individuals with equal number of male and female patients participated in this observational study. A Vita-Lumin shade guide was used to examine either the maxillary right or left central incisor, one of which had to be restoration and caries free for study inclusion. Heat cure acrylic shade guide from Pyrax was used to examine the gingival shade. L'Oreal True Illusion compact make up shade guide was used for skin shade matching. Shade selection was done in natural day light between (10 a.m and 1 p.m). Data were subjected to statistical analysis. **Results:** The statistical analysis of the data revealed a significant correlation between tooth color, skin color and gingival color. Lighter shaded teeth, veined gingival shade and medium skin shade is the most prevalent amongst Indian population. **Conclusion:** Within the limitations of the study, tooth color, gingival color and skin color were significantly correlated.

KEYWORDS

Shade selection; tooth shade; gingival color; skin color

INTRODUCTION

Esthetic appearance plays an essential role in patient's acceptance of an artificial prosthesis. In today's beauty conscious society, the demand for esthetic dentistry has increased by leaps and bounds. Tooth shade is one of the most significant factors affecting esthetics. According to **Jahangiri et al (2002)** tooth colour has considerable influence on esthetics and it is important for satisfactory social rehabilitation of denture wearers.¹ Tooth colour can vary in different age groups and from race to race. The natural tooth colour can be of white, light yellow, gray, yellow gray, brown to yellow brown in shades.

The soft tissues surrounding prosthetic restorations are as important as the appearance, form and colour of the prosthetic teeth. Prosthodontists have always faced the challenge of harmonizing tooth shade with facial appearance in fully edentulous patient.² The selection of colour for the edentulous patient is more difficult because the natural teeth are no longer present to act as a guide. It has also been suggested that the hue of artificial teeth should harmonize with the patient's complexion (**Boucher et al, 1975; Winkler, 1979**).^{3,4} It is a general misconception in people that white bright teeth are more attractive than yellow teeth. Dentists are aware of the fact that tooth shade varies with skin colour, age and gender. Though the measurement of tooth colour is possible via a number of methods including spectrophotometry, colorimetry and computer analysis of digital images, the routine manner of determining the colour of natural teeth for the purpose of providing an artificial substitute has been through the use of a shade guide. Demographic pattern, geographic distribution and genetics have a profound impact on skin colour, tooth or gingiva.

Most of the studies for shade matching in dentistry have been conducted on Caucasian or Anglo-American race who are whiter in complexion. The use of such shade guides in this continent made for the Caucasian race has proven frustrating and inadequate. It is not only important to have good dental esthetics, but also to have good gingival esthetics. **Dummett (1967)**⁵ concluded that the colour of the healthy gingiva is variable, ranging from a pale pink to a deep bluish purple. No major study has been conducted to determine tooth shade or gingival shade in this continent. This study was undertaken to find out the most prevalent tooth, skin and gingival shade for Indian population which may be helpful for the manufacturing companies to produce the most prevalent shades for this continent and hence to provide the patients with

restorations of appropriate shades, hence imparting better esthetics.

MATERIALS AND METHODS

The study was conducted on 5000 subjects belonging to different age groups with equal number of males and females visiting the department and its suburban population. Healthy individuals between 18-80 yrs of age of both sexes with full complement of maxillary anterior teeth were selected. Subjects with complete coverage restorations on the tooth to be examined, external surface staining, tooth abnormalities, with active orthodontic appliances and subjects with albinism, vitiligo, chemical skin toning, gingivitis or hyper pigmented gingiva were excluded from the study. As the anterior teeth belong to the esthetic zone, one of the maxillary central incisors was examined.

Vitapan Classical shade guide was used to examine the teeth. Vitapan classical shade guide has 16 tabs arranged in 4 groups depending on hue (A-D). Each is further divided in an increasing order of chroma (1-4) for selection of hue and chroma respectively. For selection of value, shades were divided into 4 categories based on the reported values of the Vitapan shade guide: the highest value group (shades A₁B₁A₂B₂), high value group (shades C₁D₂A₃D₄) medium value group (shades B₃B₄C₂D₃) and low value group (A_{3.5}C₃A₄C₄).

Skin tones were examined using some standardised commercial [L'Oreal (Paris, France) True Illusion Compact] shade guide. Skin tones were divided into 4 categories. The light shade groups of the [L'Oreal True Illusion Compact make-up guide] corresponded to the fair skin group, the medium shades corresponded to the medium skin group, the deep shades corresponded to the dark skin group according to the manufacturer's recommendation. The same categorization was followed by **Jahangiri et al (2002)**.

Gingival shade was matched using the heat cure acrylic shade guide from Pyrax. Gingival shades were divided into 6 categories: veined, light veined, pink, special pink, light pink and translucent pink. For the purpose of examination each subject was seated in an upright position on a chair under daylight against a neutral background between 10 AM and 1 PM.⁶

A rapid shade comparison was done to avoid fatigue of cone cells in the retina of the investigator. The subject was positioned 10 inches away from the examiner with the mouth at the examiner's eye level. The patient was draped with neutral colored cloth. Female patients were

asked to remove lip stick, facial makeup and any heavy jewellery prior to examination. Tooth to be examined was cleaned and debris was removed with cotton. Care was taken to ensure that the tooth was not dehydrated.

An individual shade tab was positioned adjacent to the maxillary central incisor and the examiner concentrated only on the middle 1/3rd of the facial surface to determine the correct shade(Fig:1)⁷. 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 5 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.

Gingival shades were matched using the heat cure acrylic resin shade guide (Pyrex) by matching the color of the attached gingiva (Fig:2). The same procedure was followed as it was done for tooth shade matching as described earlier. Skin shades were matched by using L'Oreal True Illusion Compact makeup shade guide(Fig:3). The different shades of makeup taken are golden beige, rose beige, beige beige, rose vanilla, canella cinnamon and golden sand. The golden beige and rose beige shade groups of commercial compacts corresponded to the fair skin group. The beige beige and rose vanilla corresponded to the medium skin group. The canella cinnamon and golden sand corresponded to the dark skin group according to the manufacturer's recommendation. This is the same procedure followed by Jahangiri et al (2002) and Oluwale D et al(2010).^{1,2}

RESULTS & OBSERVATIONS

Data collected from 5000 subjects is shown in Table 1-6. The data obtained was subjected to statistical analysis which was performed with the help of Epi InfoTM 3.5.3. In the tables below descriptive statistical analysis was performed to calculate the means with corresponding standard deviations (s.d.). Test of proportion was used to find the Standard Normal Deviate (Z) to compare the different proportions and Chi-square (χ^2) test was performed to find the associations. Lighter shaded teeth are the most prevalent in Indian population irrespective of gender (Table 1). Veined is the most prevalent gingival shade in the Indian population (Table 2). Medium is the most prevalent skin shade in the Indian population (Table 3).

Table 4 shows that there is a significant association between skin shade and tooth shade. Lighter teeth shades are high for medium skin shade. Darker tooth shade is high for dark skin shade. A significant association was also found between gingival shade and skin shade in Table 5. Veined, light pink, light veined and pink gingival shades were significantly higher for medium skin shade. Translucent pink and special pink gingival shade was high for dark skinned people. It is evident from Table 6 that there is a significant association between gingival shade and tooth shade. Veined, light veined and pink gingival shades were high for lighter tooth shade. Light pink was high for medium tooth shade and special pink was high for dark tooth shade.

Table-1: Most prevalent tooth shade amongst the subjects

Gender	Tooth Shade								Total
	Highest	High	Medium	Low	No	%	No	%	
Male	1372	27.4	563	11.3	329	6.6	236	4.7	2500
Female	1334	26.7	540	10.8	371	7.4	255	5.1	2500
Total	2706	54.1	1103	22.1	700	14.0	491	9.8	5000

Table-2: Most prevalent gingival shade amongst the subjects

Gender	Gingival Shade										Total
	Veined	Light pink	Translucent pink	Light veined	Pink	Special pink	No	%	No	%	
Male	950	19.0	180	3.6	358	7.2	538	10.8	388	7.8	2500
Female	872	17.4	196	3.9	327	6.5	602	12.0	404	8.1	2500
Total	1822	36.4	376	7.5	685	13.7	1140	22.8	792	15.8	5000

Table-3: Most prevalent skin shade amongst the subjects

Gender	Skin Shade						Total
	Fair	Medium	Dark	No	%	No	
Male	171	3.4	1549	31.0	780	15.6	2500
Female	164	3.3	1572	31.4	764	15.3	2500
Total	335	6.7	3121	62.4	1544	30.9	5000

Table-4: Comparison of skin shade and tooth shade

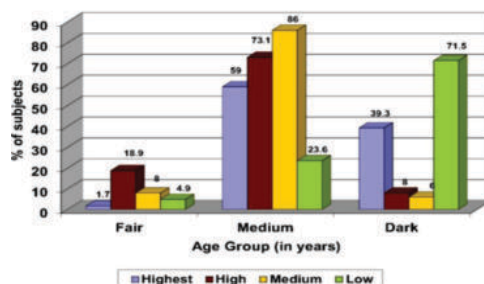
Skin Shade	Tooth shade								Total
	Highest	High	Medium	Low	No	%	No	%	
Fair	46	1.7	209	18.9	56	8.0	24	4.9	335
Medium	1597	59.0	806	73.1	602	86.0	116	23.6	3121
Dark	1063	39.3	88	8.0	42	6.0	351	71.5	1544
Total	2706	100	1103	100	700	100	491	100	5000

Table-5: Comparison of skin shade and gingival shade

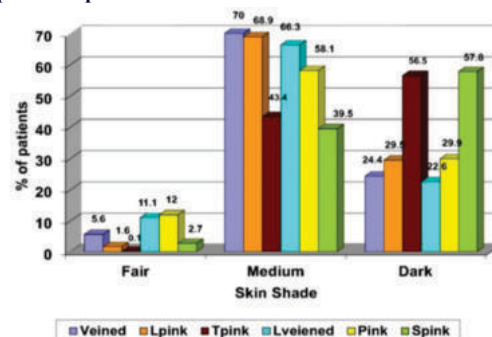
Skin Shade	Gingival Shade										Total
	Veined	Light pink	Translucent pink	Light veined	Pink	Special pink	No	%	No	%	
Fair	102	5.6	5	1.8	1	0.1	126	11.1	95	12.0	335
Medium	1276	70.0	259	68.9	297	43.4	756	66.3	460	58.1	1544
Dark	444	24.4	111	29.5	387	56.5	258	22.6	237	29.9	5000
Total	1822	100	376	100	685	100	1140	100	792	100	5000

Table-6: Comparison of tooth shade and gingival shade

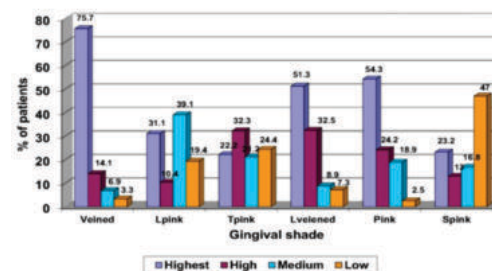
Tooth shade	Gingival Shade										Total
	Veined	Light pink	Translucent pink	Light veined	Pink	Special pink	No	%	No	%	
Highest	1379	75.7	117	31.1	152	22.2	585	51.3	430	54.3	2706
High	256	14.1	39	10.4	221	32.3	371	32.5	192	24.2	1103
Medium	126	6.9	147	39.1	145	21.2	101	8.9	150	18.9	700
Low	61	3.3	73	19.4	167	24.4	83	7.3	20	2.5	491
Total	1822	100	376	100	685	100	1140	100	792	100	5000



Graph 1: Comparison of skin shade and tooth shade



Graph 2: Comparison of skin shade and gingival shade



Graph 3: Comparison of tooth shade and gingival shade

DISCUSSION

The purpose of the current study was to evaluate the most prevalent tooth shade, gingival shade and skin shade amongst the Indian population and to find out whether any correlation exists among the parameters or otherwise. From the results of the statistical analysis, it can be summarized that there is a significant association between tooth shade, gingival shade and skin shade. From the result of the present study, it can be concluded that highest group of tooth shade is most prevalent followed by high group. These findings are also similar to the study done by Herekar et al (2010) where they concluded that the most prevalent shade in the population of Belgaum is in the range of A₂ and A₃.⁸ In this present study visual shade selection was done. Visual assessment of the shade and translucency is the method most frequently applied in dentistry. Studies have shown that this often used method is difficult to apply with accuracy and often yields inconsistent results. Instrumental measurements may be complicated by setup difficulty and heat produced by the instrument in repeated measurements could cause discomfort to the subject or failure of the instrument to maintain its calibration. The quality and quantity of the

light source and environment in which the teeth shades are being visually matched are important. Although day light is thought to be ideal light source but the intensity of daylight can fluctuate in different time of the day. In the present study shade matching was done under day light from 10am to 1pm when the sky was clear and the intensity or temperature was almost consistent. Since it was an epidemiological study on a huge population group it was not possible to use a colour corrected or temperature corrected light source. The most common method for selecting a shade is a commercially available porcelain shade guide. The shade guide used in this present study i.e Vitapan classical shade guide is mainly based on hue and chroma of teeth whereas Vitapan 3D Master shade guide is based on value which is the most important characteristic for shade matching. Vitapan Classical shade guide is one of the most commonly used shade guide among the dentists and technicians and hence was considered in this study. The results showed that veined is the most prevalent gingival shade followed by light veined irrespective of age and gender. However from the results it was confirmed that medium is the most prevalent skin shade in Indian population followed by dark and fair. In the present study tooth shade and skin shade of the subjects were compared. The test showed that there was significant association between skin shade and tooth shade. Highest and high tooth shade were significantly high in medium skin shade. About 39.3% of dark skin shade people had highest tooth shade. Low tooth shade was significantly higher for dark skin shade. In this study skin shade and gingival shade was compared. Test results showed that veined, light pink, light veined and pink gingival shade were significantly higher for medium skin shade group. Translucent pink and special pink gingival shade were significantly high for dark skinned people. Studies on shade matching are mainly done on Caucasian or Anglo-American race but shades can be varied in different ethno-racial groups. Taking the limitations into considerations, this study was an effort to find out the most prevalent shades in Indian population. From the results of the study it can be analysed that most of the teeth shades belong to highest to high groups or shades which are lighter. According to Vitapan Classical shade guide these shades are A₁, B₁, A₂, B₂, C₁, D₂, A₃, D₄. Most of the gingival shades ranged from veined to light veined group. Heat cure acrylic shades may be manufactured with more number of prevalent shades existing in this race.

Amongst Indian population, variation of skin shades lie mostly on medium to dark and people with medium skin shades have teeth which are lighter in shades.

So, tooth shade guides for this subcontinent can be manufactured with more number of lighter shade tabs (highest to high group of shades according to Vitapan Classical shade guide).

Limitations of the study:

1. Colour corrected light with appropriate colour temperature was not used in this study.
2. The shade guide used in the present study is Vitapan Classical shade guide. The shade tabs in this shade guide is based on values of teeth and did not have all shades or cover all the colour space occupied by natural teeth.
3. In this study, only maxillary central incisors were observed but teeth shade can vary from anterior to posterior.
4. In this present study visual assessment of shade selection has been done whereas instrumental measurements could have been more accurate.

CONCLUSION

Within the limitations of the study it can be concluded that:

- There is a significant association between tooth color, skin color and gingival color.
- Lighter shaded teeth are the most prevalent in Indian population
- Veined is the most prevalent gingival shade.
- Medium is the most prevalent skin shade in Indian population.



Fig 1: Tooth shade matching using tooth shade guide



Fig 2: Gingival shade matching using heat cure acrylic shade guide



Fig 3: Skin shade matching using make up shade guide

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