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A COMPARATIVE CLINICAL STUDY ON VARIATION IN SHADES OF ANTERIOR TEETH BY USING SPECTROPHOTOMETER IN THE POPULATION OF GHAZIABAD: AN IN-VIVO STUDY

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ABSTRACT A descriptive analysis study on variation in shades of anterior teeth by using spectrophotometer and VITAPAN Classical shade guide in population of Ghaziabad in which 500 subjects were chosen randomly when they came to various department for their respective treatment. 3 different operators overviewed the shade variation in the population of 500 subjects using VITAPAN shade guide and spectrophotometer VITA Easyshade V was employed for digital tooth shade matching and recordings were taken from the middle third of the facial surface of natural maxillary anteriors. Shade evaluation by VITAPAN Classical shade guide and Spectrophotometer VITA Easyshade V among central incisors showed that the highest percentage of shade in the Central incisor was A2 shade, B1 shade, B2 shade and A1 shade. In lateral incisor, the highest percentage of shade was A2 shade, B2 shade, A1 shade and B1 shade whereas the highest percentage of shade in the Canine was A2 shade, B1 shade and B2 Shade. With the study we can conclude that The spectrophotometer VITA Easyshade V provided more reliable color matching results than traditional visual inspection, due to its immunity to individual bias and high repeatability and , the most prevalent tooth shades were A2, accounting for 41.43% of the population, followed by B2 at 15.5%, and A3 at 13.66%, according to the mean values obtained.

KEYWORDS :

INTRODUCTION

In recent years, aesthetic dentistry has become more prevalent because of increasing demand from patients and the development of new techniques and materials that improve the clinician's ability to provide aesthetic treatment. In the field of dentistry, Prosthodontist is probably the best person to identify the quality of smile. Further he/she is able to change the quality of treatment with the recently available innovative techniques and to plan restorations accordingly. In prosthodontics, shade selection is an important procedure to provide patients with an aesthetic restoration that harmoniously blends to the patients existing dentition. Hence, to reproduce a natural tooth color and respond to the expectations of patients, accurate evaluation of the natural tooth color is necessary so that it is reflected in the prosthesis.[1]

The study of color is a fundamental part of aesthetic dentistry. The oldest color system was created by Albert H. Munsell in 1905. Consists from three attributes—hue (H), value or lightness (V) and chroma (C), denoted as H/V/C. An adequate definition for color is the one published in 2001 by the Commission Internationale de l'Eclairage (C.I.E.): "Characteristic of the visual perception that can be described by the attributes of hue, value and chroma". Hue is the first dimension of color, and is related to perceived light wavelengths. It is the characteristic that di□erentiates color from each other. Value is probably the most important dimension in terms of dentistry. A color value is defined by the amount of black and whitewithin the scale, which is related to lightness/darkness, and chroma represents the degree of saturation of a color.[2]

Differences in tooth color exist among people, among the teeth in the same person and within the same tooth. Some studies demonstrated, when maxillary anterior were measured in vivo using a colorimeter, the general conclusion was that their color was not uniform. The other findings were as follows: (1) Base of teeth color was presented by its middle third; (2) teeth in women were lighter, less chromatic, and less reddish-colored than men's; (3) aging produced darker and more reddish teeth; (4) cuspid teeth were darker than central incisors (CIs) or lateral incisors (LIs), and (5) CIs had the highest lightness. With the aim to maximize shade matching results, a thorough understanding of appearance attributes of natural teeth is required along with new shade guides and shade taking instruments. Based on Paul et al., the spectrophotometric shade analysis and communication can be used efficiently for porcelain-fused-to-metal restorations.[6]

Devices calculate the tooth color by measuring the amount and spectral composition of light reflected on the surface of the tooth. They usually express the results in the CIE L*a*b* system, as well as in one or more of the conventional shade guide systems. CIE L*a*b* is one of the standard color models used to describe all visible colors, using 3 basic coordinates. L* represents the lightness of the color, a* represents green (negative a*) to red (positive a*) colors, and b* represents the blue (negative b*) to yellow (positive b*) color range. Spectrophotometers estimate the color by measuring the intensity of the reflected light in all visible wavelengths, while colorimeters measure the intensity of the reflected light filtered by red, green, and blue filters (simulating RGB absorbance). This color notation system is widely used in dental research for both in vivo and in vitro color measurements.[12]

Subjective choice of natural tooth color may be made more systematic and ordered by performing a visual comparison with the most frequent shade tabs according to age and gender group. Knowledge of the objective distribution of natural tooth shades according to age group and gender may be a useful method in shade selection, particularly for inexperienced operators.

The prospective of the study was to check for colour matching in a particular society which would have made it easier for the clinician who use Vita shade guide as a instrument of precision. With the advent of spectrophotometer hue, value and chroma was also determined. It also negated the inter-operator variability.

MATERIALAND METHODS

A study was conducted with 500 subjects aged 18-30 from Ghaziabad, who visited the college for various dental treatments. Before shade selection it was ensured that the teeth to be examined should be permanent and adjacent teeth should also be present. The study focused on the central incisor, lateral incisor, and canine teeth, which were selected after oral prophylaxis. Discolored teeth, teeth with restorations, endodontically treated teeth, extrinsic stains, non-vital or fractured teeth, and those with crowns or veneers were excluded. The study was approved by the Institutional Ethical Committee, and informed consent was obtained from all participants. To ensure consistency in shade selection, three di erent operators were chosen to record the shades using the VITA Easyshade V spectrophotometer and VITAPAN Classical shade guide. All procedures were performed between 12:00 pm and 3:00 pm on a bright sunny day, with subjects seated in the same dental chair. In order to obtain the most accurate shade using VITAPAN shade guide, three di erent operators were ropedin. The obtained shade readings were tabulated and compared using Chi-square statistical analysis to ensure the reliability of the methods used.

Figure 1: VITAPAN Classical Shade guide

Figure 2: Anterior Shade Selection by using Vita Classical Shade Tab

Figure 3: Spectrophotometer VITA Easyshade V

Figure 4: Shade Selection by using Spectrophotometer VITA Easyshade V

Statistical Analysis

The data for the present study was entered in the Microsoft Excel 2007 and analyzed using the SPSS statistical software 23.0 Version. The descriptive statistics included frequency and percentage. The chi-square test will be used for the categorical variables. A multivariate logistic regression model will be performed for subgroup analysis. All results are presented as odds ratio (OR) and 95% confidence intervals (CIs). The level of the significance for the present study was fixed at 5%

RESULTS

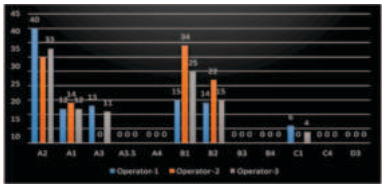
40% of subjects had A2 shade, 12% had A1 shade, 13% had A3 shade, 15% had B1 shade, and 14% had B2 shade when evaluated by Operator-1. Operator-2 found 30% with A2, 14% with A1, 0% with A3, 34% with B1, and 22% with B2 shade. Operator-3 observed 37% with A2, 12% with A1, 11% with A3, 25% with B1, 15% with B2, and 4% with C1 shade in central incisors. A2 shade was the most common followed by B1, B2, and A1 shade.

Operator evaluations of Lateral incisors showed varying shade distributions: Operator-1 found 59% A2, 9% A1, 3% A3, 4% B1, and 18% B2. Operator-2 found 64% A2, 12% A1, 0% A3, 8% B1, and 16% B2. Operator-3 found 61% A2, 12% A1, 6% A3, 11% B1, and 10% B2. The most common shades were A2, B2, A1, and B1 in Lateral incisors.

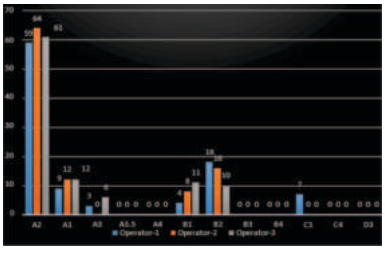
Operator-1 found that 42% of Canines had A2 shade, 0% had A1 shade, 2% had A3 shade, 19% had B1 shade, 19% had B2 shade, and 6% had B3 shade. Operator-2 found 44% had A2 shade, 0% had A1 shade, 2% had A3 shade, 16% had B1 shade, 15% had B2 shade, and 8% had B3 shade. Operator-3 found 46% had A2 shade, 0% had A1 shade, 2% had A3 shade, 18% had B1 shade, 16% had B2 shade, and 6% had B3 shade. A2, B1, and B2 shades were most common in Canines.

34.3% of subjects had A2 Shade in Central incisor, 12.66% had A1, 8% had A3, 24.66% had B1, and 17% had B2 shade. In Lateral Incisors, 61.33% had A2 Shade, 11% had A1, 3% had A3, 7.66% had B1, 14.66% had B2, and 2.33% had C1 shade. Canine showed 44% A2 Shade, 0% A1, 2% A3, 17.65% B1, and 16.66% B2. Statistically significant shade differences were found using Chi-Square test.

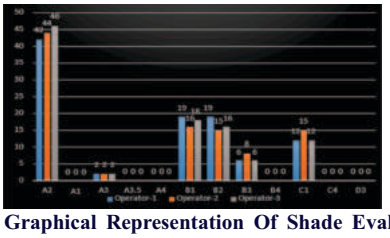
In the study, different tooth shades were analyzed among males and females in Central Incisors, Lateral Incisors, and Canines. Among the Central Incisors, the A2shade was more prevalent among females (38%) compared to males (30%), while the A1 shade was more common among males (20%) than females (16%). In Lateral Incisors, the A2 shade was also more common among females (38%) compared to males (28%), with the A1 shade being more prevalent in males (24%) than females (16%). The Canines showed a similar pattern, with the A2 shade being more prevalent among females (42%) compared to males (36%). The study also found a statistically significant difference in shades between the different types of teeth when analyzed using the Chi Square test.



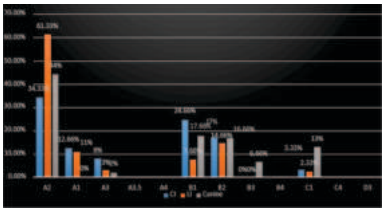
Graph 1 : Graphical Representation Of Shade Evaluation By Vitapan Classical Shade Guide In Central Incisor Among Three Operators



Graph 2 : Graphical Representation Of Shade Evaluation By Vitapan Classical Shade Guide In Lateral Incisor Among Three Operators

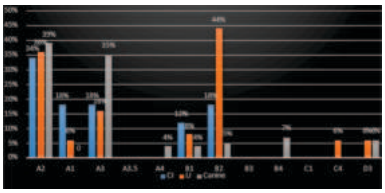


Graph 3 : Graphical Representation Of Shade Evaluation By Vitapan Classical Shade Guide In Canine Among Three Operators



Graph 4 : Graphical Representation Of Intergroup Comparison

Between Central Incisor, Lateral Incisor, Canine By Using Vitapan Classical Shade Guide



Graph 5 : Graphical Representation Of Shade Evaluation In Central Incisor, Lateral Incisor, Canine By Using Spectrophotometer

DISCUSSION

Studies have found that shade guides do not accurately represent the wide range of tooth colors in the general population, leading to imprecise matches with shade tabs. Dental shade tab thickness impacts translucency and light reflection, affecting color perception. Clinical expertise and training are important for accurate shade matching. Additionally, tab colors can vary between guides from the same manufacturer. It is essential for aesthetically pleasing dental restorations to consider these factors in shade selection.

In the study primary shade evaluation was done using CLASSICAL VITAPAN SHADE GUIDE , Operator-1 found that 40% of subjects had A2 shade, 12% had A1, 13% had A3, 15% had B1, and 14% had B2. Operator-2 found 30% with A2, 14% with A1, 0% with A3, 34% with B1, and 22% with B2. Operator-3 found 37% with A2, 12% with A1, 11% with A3, 25% with B1, 15% with B2, and 4% with C1. The highest shade percentages were A2, B1, B2, and A1 in central incisors.

Operator evaluations of Lateral incisors showed varying percentages of A2, A1, A3, B1, and B2 shades. Operator-1 found 59% A2, 9% A1, 3% A3, 4% B1, and 18% B2. Operator-2 found 64% A2, 12% A1, 0% A3, 8% B1, and 16% B2. Operator-3 found 61% A2, 12% A1, 6% A3, 11% B1, and 10% B2. A2 shade was the most common.

In Canines, Operator-1 found 42% with A2, 0% with A1, 2% with A3, 19% with B1, 19% with B2, and 6% with B3 shade. Operator-2 found 44% with A2, 0% with A1, 2% with A3, 16% with B1, 15% with B2, and 8% with B3 shade. Operator-3 found 46% with A2, 0% with A1, 2% with A3, 18% with B1, 16% with B2, and 6% with B3 shade. A2, B1, and B2 were the most common shades.

Intergroup comparison using VITAPAN Classical shade guide found varying shade distributions in Central incisor, Lateral incisor, and Canines. Central incisor showed 34.3% A2, 12.66% A1, 8% A3, 24.66% B1, 17% B2. Lateral Incisors had 61.33% A2, 11% A1, 3% A3, 7.66% B1, 14.66% B2, and 2.33% C1. Canines exhibited 44% A2, 0% A1, 2% A3, 17.65% B1, 16.66% B2. Statistical analysis showed significant differences in shades .Spectrophotometer demonstrated the highest agreement between consecutive readings.Shade evaluation was done using Spectrophotometer VITA Easyshade V on Central Incisors, Lateral Incisors, and Canines. Among Central Incisors, A2 shade was found in 38% of females and 30% of males, A1 shade in 16% of females and 20% of males, A3 shade in 16% of females and 20% of males, and B2 shade in 18% of both genders.

Among Lateral Incisors, A2 shade was found in 38% of females and 28% of males, A1 shade in 16% of females and 24% of males, A3 shade in 16% of both genders, and B2 shade in 18% of females and 6% of males. Among Canines, A2 shade was found in 42% of females and 36% of males, A3 shade in 32% of females and 38% of males, and B2 shade in 6% of females and 4% of males. The difference in shades was statistically significant, with spectrophotometry showing higher reproducibility compared to visual assessment.

CONCLUSION

Tooth color is determined by various factors like light, transparency, and human perception. Dentists traditionally use subjective shade guides, but objective techniques like spectrophotometers offer more accuracy in the CIE L*a*b* color space. Spectrophotometers provide consistent results and are not influenced by personal biases, unlike visual assessments. In a study using VITA Easyshade V, A2 was the most common tooth shade at 41.43%.

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