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A comparison of anterior teeth color among Polish, Saudi and Taiwanese students of dentistry

Abstract

Introduction. Color of teeth is undoubtedly one of the most important factors considering patients' satisfaction with the quality of their restoration, especially in the anterior region of the mouth. Therefore, the determination of color is an integral part of esthetic dentistry and therefore it should be given the highest importance in dentistry in order to achieve the esthetic requirements of patients.

Aim. The aim of this study was to evaluate tooth color in 3 different ethnic groups and its relationship with gender and type of tooth using a clinical spectrophotometer.

Material and methods. A total of 90 dental students of the Medical University of Lublin was divided into three groups of 30 each according to participant's ethnicity, which was as follows: Polish, Saudi Arabian and Taiwanese. Then, different divisions were made according to gender as well as the type of teeth. The tooth color was identified by spectrophotometer. The data was statistically analyzed.

Results. For the Vita Classical shade guide, A3.5 shade was the most frequently chosen in Taiwanese and Saudi students' teeth. However, the most common shade observed for the anterior teeth of Polish students was A3. The most common shade among males was A3.5 and in females A3 was the most frequent shade. In all 360 central incisors, overall, the most common shades noticed were A2, D3 and C1. In all 360 lateral incisors, D3, A3 and A2 were the most frequent shades for this group of teeth. In all 360 canines, A3.5 and A3 were the most common shade with almost half of the number of canines in this study was measured with A3.5.

Conclusions. Based on the performed preliminary research, it was observed that Polish students tend to have brighter teeth than Saudis which in turn have even brighter teeth than Taiwanese students. It was also noted that men are more likely to have darker shade values than women. Central incisors have higher values of tooth color than lateral incisors and canines.

Keywords: tooth color, spectrophotometer, ethnicity, gender, anterior teeth.

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INTRODUCTION

The color of teeth is undoubtedly one of the most important factors considering patients' satisfaction with the quality of their restoration, especially in the anterior region of the mouth [1]. Therefore, the study of color is an integral part of esthetic dentistry and therefore it should be given the highest importance in dentistry in order to achieve the esthetic requirements of patients [2]. The definition of color was published by the Commission Internationale de l'Eclairage as "characteristic of the visual perception that can be described by attributes of hue, value and chroma" [3]. Hue describes the main color of an object, e.g. red, green, blue etc. Chroma, or saturation, describes the strength or degree of saturation of a particular hue and it tells about the intensity of color. The value of a color is determined by its brightness or darkness, which indicates whether the object reflects a high or low percentage of the incident light which shows as brightness or darkness of an object [4].

Dental shade-matching instruments were introduced into the market in order to reduce imperfections and inconsistencies of traditional shade-matching. The method of tooth color choice most widely used in dentistry is subjective, based on tooth guides [5,6]. Also, objective methods are available with spectrophotometers, digital devices or digital image analysis techniques [7]. Tooth guides usually comprise a series of shades that are compared with the tooth color until the one that appears to be the closest is found [8]. However, since it is a subjective procedure, the results can be affected by many factors including external light conditions, professional experience, age, surrounding color, the clothes and the make-up of the patient and the chromatic perception of the dentist [9]. Despite all these factors, the human eyes can still notice some very small differences in color. However, the ability to communicate the degree and the nature of these differences is lacking. Moreover, most of tooth guides in the market do not provide a complete representation of the color variation present in natural dentition [10]. Therefore, there was a need for some

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more accurate instruments for dental-color matching. Spectrophotometers are amongst the most accurate and useful instrument for overall color matching and color matching in dentistry [11]. They measure the amount of light energy reflected from an object at 1-25 nm interval along the visible spectrum [12,13]. The measurements obtained by spectrophotometers are frequently keyed to dental shade guides and converted to shade tab equivalent [14]. In comparison with observations by human eye or conventional techniques, it was found that spectrophotometers offered a 33% increase in accuracy and more objective match in 93.3% of cases [15].

AIM

Most authors have studied the color of natural dentition in a single population. However, only few studies show the objective distribution of natural tooth shades in different populations. The present study was conducted in order to evaluate the most frequent tooth colors among three distinct populations (Polish-Saudis-Taiwanese) of dentistry students.

MATERIAL AND METHODS

Ninety volunteers (40 females, 50 males) aged 19-32; all of them students (Polish, Saudi and Taiwanese) of the Dental Faculty (Medical University of Lublin, Poland) were recruited for this study. All the individuals received written information and signed an informed consent for participation. The teeth selected for color measurements were the maxillary right and left central incisors, lateral incisors and canines as well as the mandibular right and left central incisors, lateral incisors and canines. Only natural, unrestored teeth, without pathological discolorations, were included. Moreover, the exclusion criteria were the presence of intrinsic staining, severe attrition, heavy smoking, tobacco chewing and bleaching. Before the measurements were made, participants were seated in a sitting position. Then, every student was provided with a cup of water to rinse his or her mouth in order to obtain better reading results from the device.

Color recordings were performed using a SpectroShade spectrophotometer (MHT), according to the manufacturer's instructions. Each tooth was measured once, so that a total of 1080 teeth were measured at the end. Before measurements in every participant, an infection control work was done by disinfecting the whole device, especially the probe tip, in order to prevent the transmission of microbes and communicable disease between the volunteers. Afterwards, the device underwent calibration on its standard white and green reflection port, to set it blank 'zero' for starting a new measurement.

All measurements were performed under artificial light conditions, at the Department of Conservative Dentistry and Endodontics, Medical University of Lublin, Poland.

The subjected teeth were scanned via the device to measure 16 Vita Classical shades of each examined tooth. Thereafter, measurements were recorded on sample form which has a chart of the subjected teeth in this study. Data was collected and converted into a digital form using Microsoft Excel and statistical analysis was made. All 16 shades which had been documented, were categorized based on their frequencies in nationality, gender and group of teeth examined.

RESULTS

The present study revealed the color shade differences of the anterior teeth among three different ethnic groups in both genders.

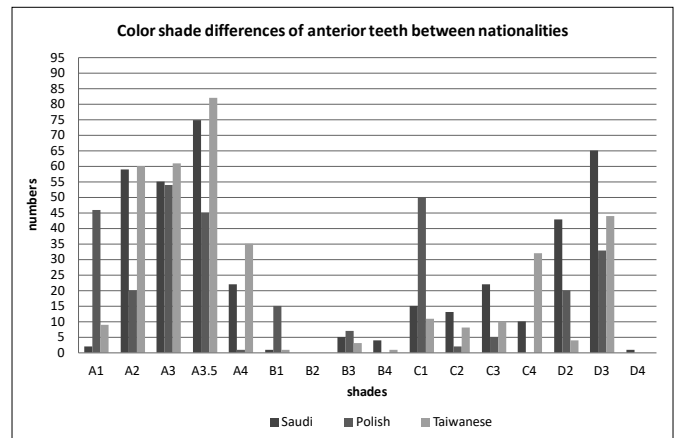


FIGURE 1. Color differences of anterior teeth between the nationalities.

For the Vita Classical shade guide, A3.5 shade was the most frequently chosen in Taiwanese and Saudi students' teeth with a number about 75 teeth in Saudis and 82 teeth in Taiwanese. However, the most common shade observed for the anterior teeth of Polish students was A3 with 54 teeth. A1, B1 and C1 shades are the most frequently seen in Polish students more than in Saudi and Taiwanese students. About 58 teeth in Saudis and 60 teeth in Taiwanese were scanned with shade A2 with comparison to 20 teeth in Poles. No teeth were observed with shade C4 in Polish students comparing to Taiwanese and Saudi students. Moreover, D4 was the least common shade among all shades and no teeth were seen with shade B2 in all subjects.

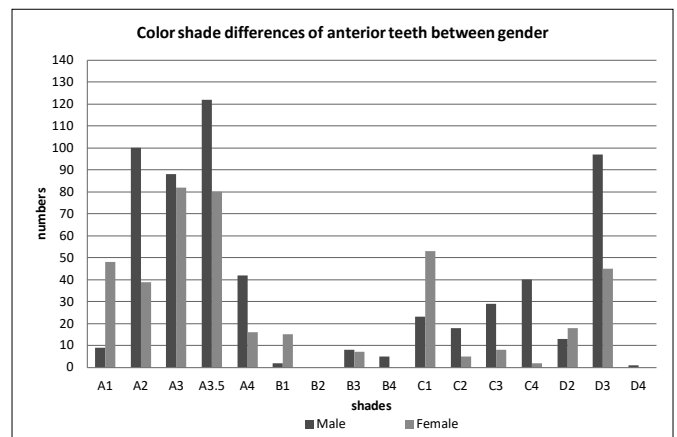


FIGURE 2. Color differences of anterior teeth according to genders.

The most common shade among males is A3.5 with 122 teeth. However, in females A3 was the most frequent shade with 82 teeth. The least common shade among males is D4 with 1 tooth. In contrast, C4 is the least common shade among females with only 2 teeth. No significant difference was found in shade A3 between females and males with 83 and 88 teeth respectively. There was a significant difference in the number of teeth with A1 (48 teeth among women and 9 teeth among men) and D3 (45 teeth of female students, and 92 teeth of males) between both genders (Figure 2).

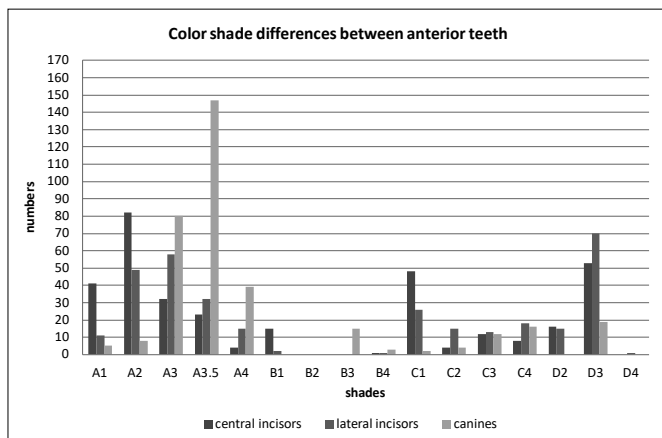


FIGURE 3. Color differences of anterior teeth central incisors-lateral incisors-canines.

In all 60 central incisors, overall, the most common shades seen were A2, D3 and C1, A2 with 81 teeth, D3 with 52 teeth and C1 with 49 teeth respectively. Only there were few central incisors that were scanned with shade A4, C2, C3 and C4. Moreover, the least frequent shade for central incisors was B4.

In all 360 lateral incisors, D3, A3 and A2 were the most frequent shades for this group of teeth. Seventy teeth were scanned with D3. In addition, A3 was the second most common observed shade with 58 teeth and finally A2 with 49 teeth.

In all 360 canines, A3.5 and A3 were the most common shades with almost half of the number of canines in this study were measured with A3.5 (145 teeth), A3 was also seen as the second most frequent shade for canines with 80 canines. However the least common shades for canines were A1, A2, B4, C1 and C2. Moreover, no canines were observed with B1 or D4 shades (Figure 3).

DISCUSSION

Color measurement of natural teeth is important for improving color reproduction and evaluating the color of natural teeth is performed either by visual shade guides or instrumental color analysis [16]. Due to the factors that can affect tooth color matching such as human physiological variables and surrounding illuminations [17], visual shade guides were not used in this study in order to obtain more accurate results. The tool used in this examination was spectrophotometer SpectroShade to match the natural teeth color of three distinct populations. Most of the authors have studied teeth color in different populations by means of the L, a and b coordinates but without reporting their results in nomenclature that is familiar to dentists such as shade tables of tooth guides [18,19]. Therefore, Vita Classical shade system was chosen because of its routine use by dental professionals. It is arranged by value scale into 4 categories the highest value group (shades B1, A1, B2, D2), high value group (shades A2, C1, C2, D3), medium value group (shades A3, D4, B3, A3.5), and low value group (shades B4, C3, A4, C4). Every value of an object indicates its brightness or darkness, e.g. tooth color with higher value has as brighter color. In the present study, a population sampling was made by choosing subjects who represent three regions of the world Asia (Taiwan), Middle East (Saudi Arabia) and Europe (Poland). The most frequent color among Polish students was A3 compared to A3.5 among Saudi and Taiwanese students. This suggests that Polish students have brighter teeth

than their Saudi and Taiwanese counterparts. Moreover, A1 and B1 which are among the group of highest value were also observed in Polish students. Shades like A2 and D3, which are among high value group, were also commonly seen in the teeth of Saudis more than in teeth of Taiwanese. The results from this study support the research hypothesis of the relationship of teeth color and race. However, to our knowledge, there have been no complete comparative reports regarding teeth color in different populations.

Shade values of teeth in relation to gender were also assessed. It is believed that gender is among the factors that influence tooth shade values. A study conducted by Esan et al. reports that men are more likely to have darker tooth shade values whereas women are more likely to show lighter tooth shade values [20]. Despite the fact that there were more male participants in our study, the statistical analysis demonstrates the highest values shades among females than in males. Shades among the highest values group such as B1 and A1 were more commonly seen in women. However, shades among low values shades group such as B4, C3, A4, C4 were commonly observed in male students. The findings of this study are in coherence with other authors [20].

Considering the role of age in tooth color, various studies have been conducted to show the relationship between shade values of teeth and age [21,22]. In a study conducted by Jhangiri et al. a significant association was found between the tooth color and age of patients. With advancing age, teeth tend to become darker in color [21]. A similar study carried out on Indian population reported that with increasing age, there was a tendency for the teeth to be of darker shades [20]. This is largely due to factors like secondary dentin formation after the age of 35 and enamel thinning because of tooth wear [23]. Therefore, the present study was conducted only on students of the university age 19-32 to exclude the age factor and results are obtained from natural teeth which are not affected by any physiological changes, like formation of secondary dentin, which gives the tooth appearance of low value color. Color difference can be also detected between spectrophotometer color coordinates of central incisors, lateral incisors, canines. The results of this study show a higher value of color for central incisors compared to lateral incisors and canines. Canines were darker than lateral incisors which in turn, were darker than central incisors, which is in agreement with other studies [24].

CONCLUSIONS

The results of the current research indicate the possible relationship between tooth color and race. Polish dentistry students tend to have brighter teeth than Saudis which in turn, shows also brighter teeth than Taiwanese students. It was also noted that men are more likely to have darker shade values than women. Central incisors have higher values of tooth color than lateral incisors and canines among examined subpopulation of dentistry students. But, because of a small population of nationality representatives, the interpretation of the results should be careful and data should be followed by a larger study group in a future.

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