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Research Article

# Pattern of Tooth Shade Provided for Removable Partial Dentures at the University of Benin Teaching Hospital

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## Abstract

**Objective:** To assess the pattern of tooth shade for removable partial denture prostheses.

**Method:** This was a retrospective study of patients who received removable partial denture over a 6 years period. The shade of the prosthetic teeth that was provided and tooth replaced were the data of interest retrieved for the study. Shade assessment was carried out by means of visual shade assessment. The Vita shade guide was the instrument used for the shade assessment. Shade for the missing tooth/teeth was done by assessing either the contralateral tooth or adjacent tooth where applicable. The data obtained was analysed using IBM SPSS version 21.0. Descriptive statistics in form of frequency, cross tabulation as well as chi square were used to analyse the data.

**Results:** The teeth most frequently replaced were the incisors accounting for 78.9%. Most (67.8%) of the teeth replaced were in the maxillary arch. The most prevalent prosthetic tooth shade provided for the patients was A3 accounting for 54.2%. The shade A2 reduced with increasing age, with subjects' ≤ 20 years accounting for 62.1%, while shade A3 and A4 increased with increasing age, this was statistically significant with p=0.0001. The females had higher (57.6%) shade of A2 compared to the males who had higher (51.2% and 56.3%) shades of A3 and A4 respectively, this was found to be statistically significant with p=0.025.

**Conclusion:** The tooth shades were found to vary with age and sex, with the lighter shades found among the younger age groups and the female gender

**Keywords: Tooth shade; Removable partial denture; Missing teeth**

## Introduction

Proper shade selection has a positive impact on patient's perception of aesthetics and acceptance of their dentures [1]. The ultimate objective of aesthetics is to create a beautiful smile [2]. Selection of tooth shade is dependent on factors such as light under which the shade is viewed, clinical skill of the operator and the shade guide system used [3,4]. The most important factor in patients' assessment of their treatment is the shade of the restoration [5]. Tooth shade is measured by various methods including a virtual assessment using a shade guide or instrumental measurement. This tooth shade selection is arbitrary based on the clinician's experience and may not be objective [6]. Recently, colorimeters, spectrophotometers and image analysis techniques have been introduced and said to have the advantage of being more objective [7]. According to Munsell colour order system, there are three dimensions of colour; the hue, value and chroma. The hue is defined as the colour of an object, and is represented as A, B, C or D on the commonly used vita classic shade guide. The value shows the amount of light that makes black and white image of the observed object while the chroma is the saturation, intensity and strength of the hue Studies have shown that some factors affect tooth shade and they include age, gender and skin colour [8,9]. The value of tooth shade reduces (darker) as age increases [10] and females tend to have lighter shades compared to males [11].

Proper shade selection has been shown to positively impact on patients' perception of aesthetics and improve acceptance of a prosthesis [12]. The selection of artificial teeth colour is quite tasking and Otuyemi et al. [13] defined dental aesthetics as 'the cosmetic effect produced by a dental prosthesis which affect the desirable beauty, attractiveness, character and dignity of an individual. Studies have assessed the pattern of removable partial denture [14-16] with paucity of studies assessing the pattern of tooth shade of the replaced teeth. Furthermore, removable partial denture teeth are usually supplied as stock teeth of different shades, assessing the pattern of tooth shade for removable partial denture will guide in the acquisition of stock teeth for removable partial denture. Therefore, this study aims to assess the pattern of tooth shade selected for removable partial denture prostheses.

## Methodology

This was an analytic retrospective study of patients who received removable partial denture over a 6 years period. The age, gender, shade of the prosthetic teeth that was provided and tooth replaced were the data of interest retrieved for the study. Shade assessment in the study centre is usually determined t by means of visual shade assessment with the Vita shade guide being the instrument used for shade assessment. Shade for the missing tooth/teeth is done by assessing either the contralateral tooth or adjacent tooth where applicable. The data obtained for this study was analysed using IBM SPSS version 21.0 (Chicago, IL, USA) and Microsoft Excel 2010. Descriptive statistics in the form of frequency and cross tabulation was done. Chi-square

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test was used to determine association between categorical variables with the level of statistical significance will be set at 95% confidence interval.

## Results

A total of 825 patient records were retrieved however, 793 (96.1%) had the data of interest and were used for the study. There was a higher proportion of females (51.5%) compared to males with a male female ratio of 1:1.06. (Table 1). The age of the patients who received removable partial dentures ranged from 8years to 99years with a mean age of 43.66 ± 17.87 years. The age group most represented was the 21-40 years (42.1%) and the least was ≤ 20 years (7.3%). The teeth most frequently replaced were the incisors accounting for 78.9% while 12.0% replaced mixed teeth type constituting both anterior and posterior teeth. Most (67.8%) of the teeth replaced were in the maxillary arch with 8.7% involving both arches (Table 2). The most prevalent prosthetic tooth shade provided for the patients was A3 accounting for 54.2% (Figure 1). Only one hue (A) was observed in this study. There was a decrease in value with increasing age with the younger age groups having lighter shade value and this was statistically significant (Table 3). Table 4 showed that females had lighter shade value (57.6%) compared to the males who had darker shade value (56.3%) and this was statistically significant (p=0.025). With the A3 shade being the most prevalent shade, of the teeth replaced, the molar teeth were found to be most prevalent accounting for 67.3% and was found to be statistically significant (p<0.0001) (Table 5).

**Table 1**: Demographic characteristics of the participant.

| Characteristics | Frequency (n) | Percentage (%) |
|---|---|---|
| Gender<br>Male | 385 | 48.5 |
| Female | 408 | 51.5 |
| Age (years) ≤20 | 58 | 7.3 |
| 21-40 | 334 | 42.1 |
| 41-60 | 233 | 29.4 |
| >60 | 168 | 21.2 |
| Total | 793 | 100.0 |

**Table 2**: Characteristics of the replaced missing teeth.

| Characteristics | Frequency (n) | Percentage (%) |
|---|---|---|
| Replaced teeth<br>Incisor | 626 | 78.9 |
| Canine | 7 | 0.9 |
| Premolar | 10 | 1.3 |
| Molar | 55 | 6.9 |
| Mixed teeth type | 95 | 12.0 |
| Arch Maxillary | 538 | 67.8 |
| Mandibular | 186 | 23.5 |
| Both arches | 69 | 8.7 |
| Total | 793 | 100.0 |

**Table 3**: Association between age group and tooth shade.

| Age group (years) | A2 (n/%) | A3 (n/%) | A4 (n/%) | Total (n/%) |
|---|---|---|---|---|
| <20 | 36 (62.1) | 21 (36.2) | 1 (1.7) | 58 (100.0) |
| 21-40 | 154 (46.1) | 157 (47.0) | 23 (6.9) | 334 (100.0) |
| 41-60 | 69 (29.6) | 144 (61.8) | 20 (8.6) | 233 (100.0) |
| >60 | 24 (14.3) | 108 (64.3) | 36 (21.4) | 168 (100.0) |

P<0.0001

**Table 4**: Association between gender and tooth shade.

| Tooth shade | Male (n/%) | Female (n/%) | Total (n/%) |
|---|---|---|---|
| A2 | 120 (42.4) | 163 (57.6) | 283 (100.0) |
| A3 | 220 (51.2) | 210 (48.8) | 430 (100.0) |
| A4 | 45 (56.3) | 35 (43.8) | 80 (100.0) |
| Total | 385 (48.5) | 408 (51.5) | 793 (100.0) |

P=0.025

Table 6 depicts that the A3 shade was prevalent in the lower arch (69.9%) compared to the upper and this was found to be statistically significant (p<0.0001).

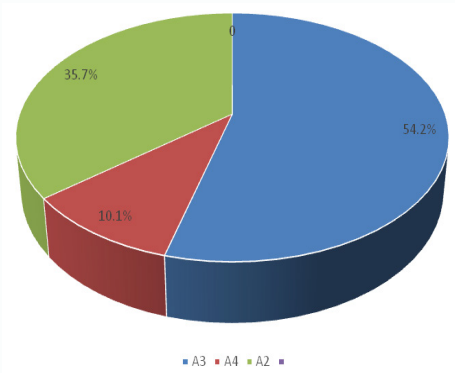


**Figure 1**: Distribution of prosthetic tooth shade.

**Table 5**: Association between tooth shade and replaced teeth.

| Replaced teeth | A2 (n/%) | A3 (n/%) | A4 (n/%) | Total (n/%) |
|---|---|---|---|---|
| Incisor | 246 (39.3) | 326 (51.1) | 54 (8.6) | 626 100.0) |
| Canine | 3 (42.9) | 3 (42.9) | 1 (14.3) | 7 (100.0) |
| Premolar | 3 (30.0) | 3 (30.0) | 4 (40.0) | 10 (100.0) |
| Molar | 13 (23.6) | 37 (67.3) | 5 (9.1) | 55 (100.0) |
| Mixed teeth type | 18 (18.9) | 61 (64.2) | 16 (16.8) | 95 (100.0) |
| Total | 283 (35.7) | 430 (54.2) | 80 (10.1) | 793 (100.0) |

P<0.0001

**Table 6**: Association between tooth shade and arch.

| Arch | A2 (n/%) | A3 (n/%) | A4 (n/%) | Total (n/%) |
|---|---|---|---|---|
| Upper | 228 (42.4) | 258 (48.0) | 52 (9.7) | 538 (100.0) |
| Lower | 42 (22.6) | 130 (69.9) | 14 (7.5) | 186 (100.0) |
| Both arches | 13 (18.8) | 42 (609) | 14 (203) | 69 (100.0) |
| Total | 283 (35.7) | 430 (54.2) | 80 (10.1) | 793 (100.0) |

P<0.0001

## Discussion

Tooth shade and colour form the basis for a person's perception of beauty and personality and is one of the steps undertaken in providing dental prosthesis for a patient. An attractive smile breeds aesthetics and confidence in one's personality. Hence, shade selection forms an important aspect in providing removable prosthesis for missing tooth/teeth in patients. Females have often had a quest for beauty. Restoring a beautiful smile and personality is not left out as reflected in this study where there appears to be a female preponderance. The same predisposition was observed in previous studies [17-19], where it reported that women visit professionals and are more susceptible to exodontial and rehabilitation [20]. Males tend to avoid dental clinics as a culture and also probably due to economic situation [21]. The mean age recorded in this study is similar to that reported in a study by [22,23]. The third and fourth decades of life are known to be peak age for utilisation of oral health services are the 21-40 years age [24,25], it is therefore not surprising that this same age group appears to be the dominant group in this study, a finding similar to a previous report [26]. There is a need therefore for this age group to be included in oral health planning and organization. The teeth most frequently replaced in this study were the incisors, this may be due to their prominence in the maxillary arch making them more prone to trauma with possible attendant tooth loss [26]. Furthermore, the incisors are the most visible teeth during speaking and smiling hence, necessitating their being replaced when extracted or missing. They

may also contribute to improve an individual's confidence and self-esteem when present or replaced. The most frequently replaced teeth were in the maxillary arch. This may be attributed to the prominence of the maxillary arch with its increased vulnerability to trauma and tooth loss. Furthermore, it is fixed to the skull and this makes it rigid which makes it different from the mandible that is mobile and not as susceptible to trauma compared to the mandible [27]. Shade A3 was observed to the most prevalent shade among the participants and this fell into the high value group defined by Paravina. This agrees with the report of an earlier study, however it contradicts that of a previous study where A2 was found to be the dominant shade [28]. The molar teeth were the most prevalent teeth replaced and there was statistically significant association between the tooth type and tooth shade with the molar teeth being mainly shade A3. This may be an indication that the thickness of enamel on molars is lesser as regions where the thickness of the enamel is smaller tend to be darker, as the colour conferred by the dentin is less subject to enamel modulation, and thus it is more easily perceived [28]. The A3 shade was more prevalent in the lower arch compared to the upper arch and this was statistically significant. This may be because teeth on the lower arch seem smaller than teeth on the upper arch with probably less enamel thickness. It has been reported that that there is a uniform distribution of tooth colour when visual shade matching is done compared to that determined using the instrumental shade matching, this may have been the reason why only one hue was observed in this study. A decrease in shade value was observed with increasing age, with the younger age groups having lighter shade value and this was found to be statistically significant. This report is comparable to that of previous studies. This is may be because teeth tend to get darker with age, largely due to the deposition of secondary dentin which increases with age. Thus, resulting in lower value as the age increases. Previous studies have shown that females had lighter shades of teeth compared to e males and this was corroborated by findings in this study, and it was found to be statistically significant. This may be associated with the delicate features of the female gender. Also, the natural tooth shade of females tends to be less saturated compared to males.

## Conclusion

The tooth shades were found to vary with age and sex, with the lighter shades found among the younger age groups and the female gender.

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