

## Comparative Evaluation of Shade Match by Using 3D Master and Vitapan Classical Shade Guides Among the Adult Jeddah Population

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### **Key Words:**

Cosmetic dentistry, Shade selection, Visual method, Vitapan classical, Vita 3D Tooth Guide Master.

### **Abstract:**

Shade matching is one of the important step in cosmetic dentistry which has to be performed by the clinician. Vitapan classical and 3D master shade guides are commonly used for color matching. For this reason, this study was aimed at comparison of two shade guides and analyzed frequency of agreement between three operators. Objective of the study was to evaluate the shade of maxillary right central incisor by comparing two shade guides by three observers. This clinical, analytical study was conducted in IbnSina National College for Medical studies, Jeddah. Total 70 participants were chosen randomly. For each participants, shade matching was carried out by 3 interns using two shade guides. SPSS version 21 was used to perform the statistical analysis. Chi-square was applied for qualitative variables to find the association. The level of significance was set at 0.05. Among the participants, the estimation of cross tabulation of frequency of agreement between Vitapan classical and 3D master shade guide. Vita classical showed better agreement with shade selection with 100% agreement was 46(65.71%) and 67% agreement was 24 (34.28%). Meanwhile, 100% agreement with 3D master was 38 (54.28% and 67% agreement was 32 (45.71%). Measurement of agreement was 0.0623 which was statistically significant. P value was set at 0.623.

### **1. Introduction**

Replacement of missing teeth in partially and completely edentulous patients are very challenging

task for the clinician, which involves fulfillment of function, esthetics and comfort. Among them esthetics plays important role in the success of the prosthetic treatment.<sup>1</sup>

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Natural tooth is polychromatic which represents complex characteristics. That is why, shade selection is very challenging procedure which should be performed by the clinician and not left to the technician.<sup>2,3,4</sup> Color matching with shade guides at the clinic is very arduous because of variable viewers interpretation and clinical environmental influences, such as lighting conditions, experience of the individual and fatigue of human eyes.<sup>5-6</sup> As a result, to achieve restoration with esthetic effect, color selection can be achieved by utilizing either one of visual or instrumental method.<sup>7-8</sup> Visual method of color analysis is the most common among the dental practitioners and it is universally accepted technique.<sup>5,8</sup> It is simple and cost effective and can expect good results.<sup>10-11</sup>

For achieving acceptable esthetics, shade guides plays very important role and it is elucidated as group of color tabs which represents hue, Chroma and value and used for shade selection of natural teeth.<sup>9-10</sup> Visual method has various advantages while shade matching. Patient can confirm the shade which is selected by the clinician. For this technique, both clinician and the patient should have good eye sight, experience of the clinician, color perception and eye fatigue. Additionally, environment of the clinic plays important role.<sup>12-13</sup>

Vitapan classical shade guide has A1 – D4 shade tabs which helps the clinician to determine tooth shade accurately. The arrangement of the shades in the Vitapan family of shades is as follows: A1 - A4 (reddish-brownish) B1 - B4 (reddish-yellowish) C1 - C4 (greyish shades) D2 - D4 (reddish-grey)<sup>14, 15</sup> Vita Tooth guide 3D Master contains 26 tabs which are arranged into 5 groups according to the value. The first group consists of two tabs, the second, third and fourth comprise seven each, whereas the fifth one has three tabs. Moreover, every shade tab has three markers ranging from 1 to 5, presenting the group and the level of value that decreases as the number increases.<sup>15, 16</sup>

There are more chances of disparity with shade matching by dentists and some of them unable to mimic accurate color selection if the procedure has to be repeated.<sup>17</sup> Consequently, the present study was planned to compare the frequency of agreement between 3 operators by using 2 shade guides.<sup>14, 16</sup>

## 2. Materials and Methods

This was clinical observational (analytical, cross sectional, descriptive) study was conducted in IbnSina National College for Medical studies, Jeddah and approved from the Institutional ethical committee and the approval number is IRRB-06-04082022. The following simple formula was used for calculating the adequate sample size in prevalence study (4);  $n = Z^2 P (1 - P) / d^2$  Where n is the sample size, Z is the statistic corresponding to level of confidence, P is expected prevalence<sup>18</sup> (that was obtained from similar studies or a pilot study conducted by other authors). Total of 70 participants were selected based on inclusion and exclusion criteria were as follows: All the participants were between the age group 20-50 years with equal sex distribution and should be completely dentulous and should have good oral hygiene and should not have malformed anterior teeth and defects in the anterior teeth and should not have undergone orthodontic or endodontic treatment, crown or bridge or implant prosthesis in the anterior region and should not have undergone bleaching procedures for the teeth (Figure 1).

**Demographic data:** Participants in this study were between the ages of 20-50 years with equal sex distribution and all of them were educated and majority of them were students (Figure 2).

### Determination of tooth shade by using two shade guides:

All the procedures were explained to the participants and consent was taken from all the participants before starting data collection for this study. Three interns were chosen as operators based on their experience and not having any color deficiencies. Maxillary right central incisor tooth was selected for shade selection for all the participants.

Source of light plays major role in the shade selection and color analysis was performed with incandescent and fluorescent light. Shade guides used in this study were: Vitapan classical shade guide (Vita Lumin Vacuum, Germany) (Figure 3) and VITA Toothguide 3D-Master shade guide (Vita Zahnfabrik, Bad Sackingen, Germany) (Figure 4).

Following precautions were taken to avoid any errors while shade matching. Tooth shade selection was performed in daylight. Walls of the clinic was put up

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with neutral color. Participants were draped with neutral color and lip stick was removed.<sup>19</sup> Above precautions were taken to avoid any errors. All three interns selected the shade under different light conditions and confirmed with natural daylight for all 70 participants using both shade guides. Color determination was done in middle third portion of maxillary right central incisor tooth, which was slightly moistened to avoid brightening (Figure 5 and Figure 6).<sup>21-23</sup>

## Statistical Analysis

(Statistical Package for Social Sciences) version 21. (IBM SPASS statistics [IBM corp. released 2011] was used to perform the statistical analysis. Data was entered in the excel spreadsheet. Descriptive statistics of the explanatory and outcome variables were calculated by mean, standard deviation for quantitative variables, frequency and proportions for qualitative variables. Inferential statistics like Chi-square test was applied for qualitative variables to find the association. The level of significance is set at 0.05.

## 3. Results

This study was proposed to assess the comparison of shade match between Vitapan classical and Vita Tooth Guide 3D Master system among the adult Jeddah population by three operators.

**Table 1** exemplify that the estimation of distribution of the subjects based on gender. Among the participants, 35 (50.0%) participants were female, 35 (50.0%) participants were male and total number of participants were 70 (100.0%). **Table 2** illustrates the estimation of the mean age distribution of the subjects. Among the participants, minimum age of them were 20 whereas maximum ages were 50 and mean values were 26.11 and stand deviation were 6.80. **Table 3** emphasize the estimation of the distribution of the subjects based on age groups. Among the participants of this study, 46 (65.72%) of the participants were 20 to 30 years. 16 (22.86%) were belonging to 31 to 40 years age group and 41 to 50 years age group were 8 (11.42%) in number.

**Table 4** shows the estimation of cross tabulation of frequency of agreement between Vitapan and 3Dmaster shade guide. Vita classical showed better agreement with shade selection with 100% agreement was 46(65.71%) and 67% agreement was 24 (34.28%).

Meanwhile, 100% agreement with 3D master was 38 (54.28% and 67% agreement was 32 (45.71%). Measurement of agreement was 0.0623 which was statistically significant. P value was set at 0.623.

## 4. Discussion

At present, lot of importance is given by the patients as well as for esthetic restoration. For obtaining satisfactory results with the restoration and ceramic crown and bridge, precise shade selection is very important<sup>24, 25</sup>. It is a tremendous task to select accurate shade even for the experienced clinician. One of the most common failure in cosmetic dentistry is due to inaccurate shade selection and miscommunication with the dental technician or inability of the technician to reproduce it.<sup>26-27</sup>

That is why, this current study was planned to select the shade by two commonly used shade guides and calculate the frequency of agreement among three operators. Shade matching was performed on maxillary right central incisor for likeness.as well as due to position in the esthetic region.<sup>28</sup> Vita classical and Vita Tooth Guide 3D Masters were used for this study. They are the most commonly used shade guide among the practitioners. According to Li<sup>29</sup> et. al., and Zenthofer<sup>30</sup> et al., 3D master shade guide is more efficient for the chair side shade selection, because, the shade tabs were evenly spaced in the color spectrum.

In this study, frequency of agreement was better with vita classical shade guide than Vita Tooth Guide 3D Master. 100% agreement was 65.71% (46) for the vita classical shade guide, whereas 67% agreement was found to be 34.28% (24). However, 100% agreement was comparatively less with Vita Tooth Guide 3D Master which was 54.28% (38) and 67% agreement was 45.71% (32) which was found to be statistically significant. P value was set at 0.623. In contrary, Trupti<sup>21</sup> et al., in their study found that, VITA Tooth guide 3D-Master showed more variable values in comparison with Vita lumen shade guide. Another study by Amit V Naik<sup>31</sup> et al. stated that, 3D Master was better than Vitapan classical shade guide when compared the interoperator variability.

Position of the shade tabs over the tooth while performing shade selection is very important. In this study, shade tab was placed below the tooth, with the incisal edge towards the tooth's incisal edge. This is in

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accordance with the study by Pitel ML.,<sup>32</sup> Same procedure was followed for this study while shade matching. In contrary, study by Fondriest J<sup>33</sup> suggested not to place the shade tabs on the side of the tooth leads to inappropriate shade selection. According to McLaren, et al.,<sup>34</sup> environment of shade selection is very important and asserted that teeth should be hydrated, otherwise teeth might appear bright because of dehydration. In this study, all the precautions were taken to maintain good environment for the shade selection.

Study by Hammad<sup>35</sup> in 2003 stated that, the Prosthodontists exhibited better ability for shade selection compared to general practitioners. For the current study, three male interns were selected as observers and two Prosthodontists as supervisors, they guided all the operators for the shade matching for all the participants. Another study by Jaju.et.al<sup>36</sup> and Ristic, et.al.<sup>37</sup> stated that performance of the shade selection might be based on the clinical experience and knowledge. However, Clary, et.al.<sup>38</sup> and Joshi and Acharya J<sup>39</sup> reported that, gender variability is not observed in their study. Miyaji wala<sup>40</sup> et al. in their study stated that, the frequency of agreement was same when compared visual method and by using spectrophotometer for shade selection. That shows, visual method of shade matching is reliable for the esthetic dental procedures.

## 5. Conclusion

Within the limitations of the study, the following conclusions were drawn: Frequency of agreement was better with Vitapan classical shade guide compared to Vita Tooth guide 3D-Master. It is advisable to carry out shade matching for the cosmetic dental procedures by blending visual, instrumental and digital methods to get precise shade. It is recommended to include shade matching in the curriculum and importance has to be given for methods of shade selection.

## Limitations of the Study

**The present study had few limitations.**

1. Limited sample size: For this study sample size was 70 patients who visited dental OPD of Ibn Sina College for Medical studies, Jeddah and restricted to the Makkah region of Saudi Arabia and it is recommended to do further studies with a larger sample size.

2. Selection of the patients for the study: It was strenuous job to select the participants for this study. Because, most of them were periodontally compromised and additionally had caries in the anterior teeth.

## Recommendations

Everyday changes are happening in Dentistry and it is advisable for the clinician to update with the innovations. Hence, it is advisable to conduct courses and workshops pertaining to shade matching. So that all the general practitioner's will get benefited. It is recommended to include shade matching in the curriculum.

## Authors Contribution Statement

Dr. Karunakar Shetty planned and designed the study and was also the principal investigator and primary author of the manuscript. He also guided the operators in collecting data and coordinated with the statistician for the analysis of the data. Rashed, Alsaedi, Surayji, Alhamali and Azzam gathered the data, helped in analysis of these data and necessary inputs are given towards the designing of manuscript. All authors discussed the methodology and results and contributed to the final manuscript.

## CONFLICT OF INTEREST

Conflict of interest declared none.

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## Figures and Tables

**Figure 1: Inclusion and exclusion criteria:**

Inclusion criteria	Exclusion criteria
All the participants were 20-50 years old. Equal sex distribution. Completely dentulous. Should have good oral hygiene.	All the participants Should not have: Malformed anterior teeth. Defects in the anterior teeth. Undergone orthodontic treatment. Undergone endodontic treatment. Undergone bleaching procedures.

**Figure 2: Demographic data:**

1.	Gender	Male	35
		Female	35
2.	Age	20-30 years	52

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		31-40 years	10
		41-50 years	08
3.	Education	High school graduate or less	18
		Graduate	42
		Post graduate	10
4.	Occupation	Students and interns	42
		Teachers and professors	10
		Business man	09
		Housewife	09

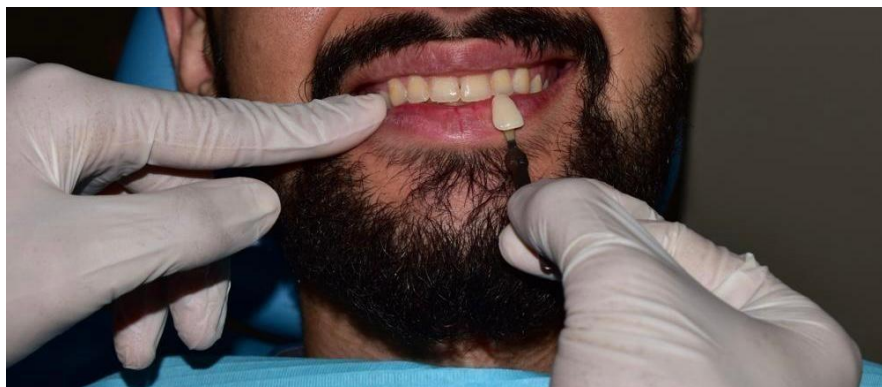
**Figure 3:** displays Vita shade guide.



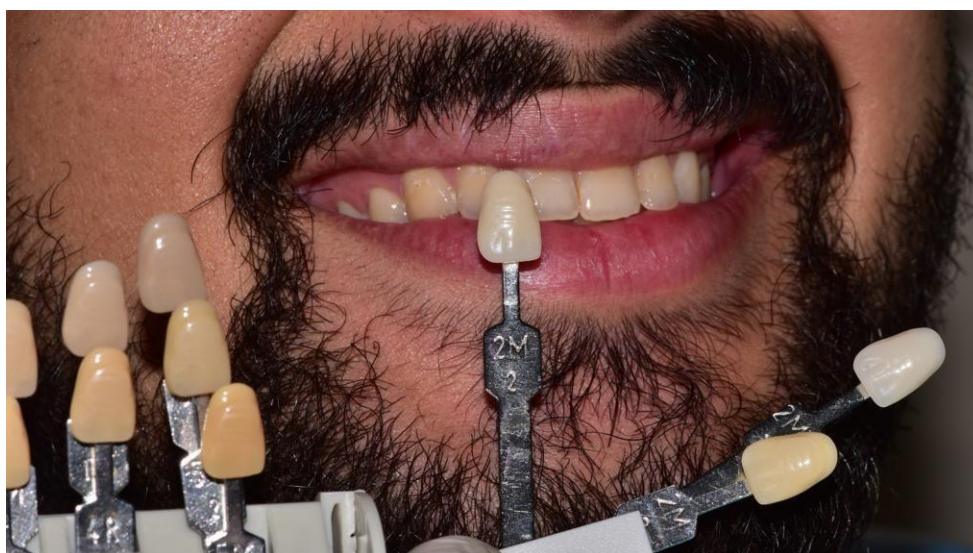
**Figure 4:** Displays 3D Tooth Guide Master



**Figure 5:** Shade selection by using Vitapan classical shade guide.



**Figure 6:** Shade selection by using 3D Tooth Guide Master.



**Results Tables:**

Gender	Frequency	Percent
Females	35	50.0
Males	35	50.0
<b>Total</b>	<b>70</b>	<b>100.0</b>

**Table 1:** Distribution of the subjects based on gender.

	N	Minimum	Maximum	Mean	S.D
Age	70	20.0	50.0	26.11	<b>6.80</b>

**Table 2:** Mean age distribution of the subjects.



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Age Groups	Frequency	Percent
20 to 30 yrs.	46	65.72
31 to 40 yrs.	16	22.86
41 to 50 yrs.	8	11.42
Total	70	100.0

**Table 3:** Distribution of the subjects based on age groups.

Frequency of agreement- vita pan		Frequency of agreement- 3D Master Shade		Total
		67.00	100.00	
67.00	Count	10	14	24
	%	14.3%	20.0%	34.3%
100.00	Count	22	24	46
	%	31.4%	34.3%	65.7%
Total	Count	32	38	70
	%	45.7%	54.3%	100.0%
Measure of agreement- -0.057				
P value- 0.623				

**Table 4:** Frequency of agreement with two shade guides.