

Knowledge, Attitude And Practices (KAP) Survey Of Shade Selection For Indirect Veneers

Research Article

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Abstract

The success of any tooth colored restoration is directly related to the accuracy of chair side shade selection. Patients are currently demanding esthetic replacement that must match their existing dentition, and are more concerned about the shade match of their restorations rather than quality of restoration. Consequently chair side shade selection has become a very important step even for experienced dental practitioners, in the overall treatment of the patient. Both the methods carry merits and demerits one from each other. However, due to relative simplicity and low cost, the visual method is still the most commonly used method. The aim of this KAP survey was to study the level of awareness among the students, general dentists and specialists toward shade selection for indirect veneers. A total of 23 questions containing questionnaires was made and distributed by google forms. A snowball sampling was followed for this study. In this survey, a total of 250 responses have been collected, among the questions that were asked, majority of them told age, gender and appointment timing play a very important role in shade selection. Shade determination is more rapidly evolving toward a more objective standard. The clinical importance of a proper shade selection in esthetic dentistry cannot be overlooked.

Keywords: Shade Selection; Veneers; KAP Survey; Anterior Teeth; Restorations.

Introduction

The success of any anterior tooth colored restoration is directly related to the accuracy of chair side shade selection [1-3]. Patients are currently demanding esthetic replacement that must match their existing dentition, and are more concerned about the shade match of their restorations rather than quality of the restoration [4-7]. Consequently, chair side shade selection has become a very important step for experienced dental practitioners, in the overall treatment of the patient [8, 9]. Shade selection can be done by visual and instrumental methods. Both the methods carry merits and demerits over each other. However, due to relative simplicity and low cost, the visual method is still the most commonly used method [10-18].

One of the main concerns in the visual method is its highly

subjective nature, different individuals can have different shade presentations for the same object [12, 19-21]. Researchers have explained these differences on the basis of scientific principles and artistic qualities of human vision [13, 22]. Both the factors come into play whenever a shade selection is carried out. To ensure accuracy, various shade selection protocols are important so that visual shade selections can be carried out with accuracy and repeatability [23, 24]. However, those protocols are either not known or are not fully understood by the majority of the dental community including undergraduate students, postgraduate and specialists [25, 26].

Previously our team has a rich experience in working on various research projects across multiple disciplines [27-41]. Now the growing trend in this area motivated us to pursue this project. The aim of the present study was to determine the knowledge,

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attitude and practices about the principles and protocols of the shade selection.

Materials And Method

This cross sectional survey was conducted during April to May 2020 including students and practitioners. Response was obtained from 250 participants. Ethical permission to carry out the study was obtained from Saveetha University Scientific review board. Snowball sampling method was used to distribute the questionnaire among the participants. The questionnaire consisted of 22 questions which included gender, age and specialty. The questionnaire had 22 questions in which 11 questions based on knowledge, 5 based on attitude, 6 questions based on practice were created. 250 responses were assessed and the output was represented in a pie chart for each and every question.

Ethical Approval

Ethical permission and approval for the project was obtained from the institutional review board of Saveetha Institute Of Medical And Technical Sciences, Chennai, India on date 25/04/2020 [SDC/SIHEC/2020/DIASDATA/0619-0320].

Eligibility Criteria

Specialists, general practitioners and dental students from all over India.

Data Collection

This cross sectional survey was conducted during April to May 2020. The questionnaire was shared online via google forms and responses were obtained from 250 participants. The data for 23

questions was compiled and represented in pie charts obtained from the google forms.

Sample Size

Total number of online questionnaires shared was 280. Out of which 23 did not take up the survey and 7 were incomplete forms which were excluded from the study. Hence, the total number of the participants were 250.

Results

We received 250 responses from the participants and among 250 responses, 49.6% consisted of females and 50.4% consisted of male. 65.6% of the participants were under the age group 20-30 years. Majority of the participants were MDS(78.0%)(Table 1).

Responses of participants on what is essential during shade selection, Majority of the participants from MDS responded individual observer (36.80%), majority of the participants from BDS responded with knowledge (11.60%). The association was analysed using Chi square test and was found to be statistically no significant difference. (p>0.05) (Table 2 and Figure 1). Responses of participants on what they think plays a major role in shade selection selection, Majority of the participants from MDS responded hue(38.40%), majority of the participants from BDS responded with hue(11.60%). The association was analysed using Chi square test and was found to be statistically no significant difference. (p>0.05) (Table 3 and Figure 2). Responses of participants on variables affects the perception of color, Majority of the participants from MDS responded tooth, including textures and layers (28.00%), majority of the participants from BDS responded tooth, including textures and layers(9.20%). The association was analysed using Chi square test and was found to be

Table 1. Showing demographic data of participants with number of responses in percentage. Out of which females were 49.6%, the age group of 20-30 yes were 65.9% and MDS were 78.0%.

Demographic variables	Categories	No. of respondents	Percentage %
Gender	Female	124	49.6
	Male	126	50.4
Age (years)	20-30 years	164	65.6
	31-40 years	69	27.6
	41-50 years	17	6.8
Qualification	MDS	195	78
	BDS	55	22

Table 2. Shows the distribution of responses of participants on what is essential during shade selection, showing statistically significant between the variables.(p<0.05).

Qualification	In your opinion, which of the following is essential during shade selection ?				P value
	Knowledge	Talent	Skill	Individual observer	
MDS	65	15	23	92	0.014
BDS	29	7	5	14	
Total	94	22	28	106	

Figure 1: Bar chart showing the association between qualification of the participants and responses for what is essential during shade selection. X axis represents essential during shade selection and Y axis represents the number of responses from participants. The association between MDS(green) and BDS(red) among the different variables was found to be statistically significant with a Chi square value of 10.583 and p value of 0.014(p<0.05)(Chi square test).

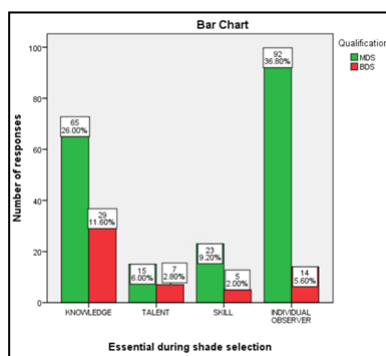
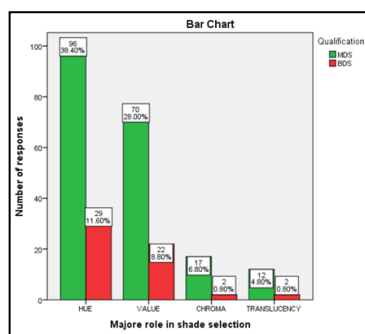


Table 3. Shows the distribution of responses of participants on what they think plays a major role in shade selection selection, showing statistically no significant difference between the variables.(p>0.05).

Qualification	Which among these do you think plays a major role in shade selection?				P value
	Hue	Value	Chroma	Translucency	
MDS	96	70	17	12	0.523
BDS	29	22	2	2	
Total	125	92	19	14	

Figure 2: Bar chart showing the association between qualification of the participants and responses for what plays a major role in shade selection. X axis represents a major role in shade selection and the Y axis represents the number of responses from the participants. The association between MDS(green) and BDS(red) among the different variables was found to be statistically insignificant with a Chi square value of 2.224 and p value of 0.523(p>0.05)(Chi square test).



statistically no significant difference. (p>0.05) (Table 4 and Figure 3). Responses of participants on the ideal amount of light that is required for shade selection, Majority of the participants from MDS responded 1500 lux (32.00%), majority of the participants from BDS responded 1500 lux (11.60%). The association was analysed using Chi square test and was found to be statistically no significant difference. (p>0.05) (Table 5 and Figure 4). Responses of participants on the ideal time required for shade selection, Majority of the participants from MDS responded 5-10 seconds(40.40%), majority of the participants from BDS responded 5-10 seconds(9.20%). The association was analysed using Chi square test and was found to be statistically no significant difference. (p>0.05) (Table 6 and Figure 5). Responses of participants on what they think on shade selection at the beginning of an appointment is better than doing it later, Majority of the participants from MDS responded yes(70.80%), majority of the participants from BDS responded yes(16.80%). The association was analysed using Chi square test and was found to be statistically significant. (p<0.05) (Table 7 and Figure 6). Responses of

participants on age and gender of the patients play an important role is shade selection, Majority of the participants from MDS responded yes (73.60%), majority of the participants from BDS responded yes (17.60%). The association was analysed using Chi square test and was found to be statistically significant (p<0.05) (Table 8 and Figure 7). Responses of participants on Who according to you is more concerned about esthetics, Majority of the participants from MDS responded to younger females (72.00%), majority of the participants from BDS responded to young females(18.80%). The association was analysed using Chi square test and was found to be statistically not significant. (p>0.05) (Table 9 and Figure 8). Responses of participants on what is the most common complaint patients have regarding anterior teeth restoration, Majority of the participants from MDS responded to esthetic correction(42.00%), majority of the participants from BDS responded to esthetic correction(15.20%). The association was analysed using Chi square test and was found to be statistically not significant. (p>0.05) (Table 10 and Figure 9). Responses of participants on whether they take patients' opinion while do-

Table 4. Shows the distribution of responses of participants on variable affects the perception of color, showing statistically no significant difference between the variables.($p>0.05$).

Qualification	Which variable affects the perception of color, the most?				P value
	Light source	Tooth, including textures and layers	Environment	Receiver(eye)	
MDS	67	70	10	48	0.49
BDS	13	23	4	15	
Total	80	93	14	63	

Figure 3: Bar chart showing the association between qualification of the participants and responses for what variable affects the perception of color the most in shade selection. X axis represents the variable affects the perception of color and y axis represents the number of responses from the participants. The association between MDS(green) and BDS(red) among the different variables was found to be statistically insignificant with a Chi square value of 2.418 and p value of 0.490($p>0.05$) (Chi square test)

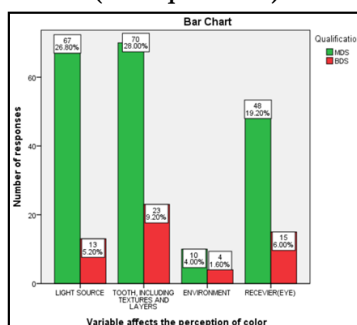
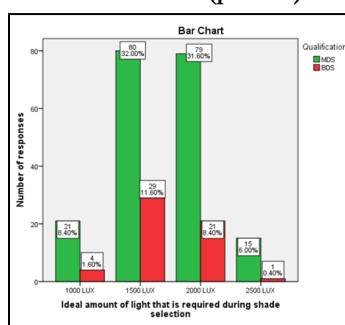


Table 5. shows the distribution of responses of participants on the ideal amount of light that is required for shade selection, showing statistically no significant difference between the variables.($p>0.05$).

Qualification	What is the ideal amount of light that is required during shade selection?				P value
	1000 lux	1500 lux	2000 lux	2500 lux	
MDS	21	80	79	15	0.236
BDS	4	29	21	1	
Total	25	109	100	16	

Figure 4: Bar chart showing the association between qualification of the participants and responses for what is the ideal amount of light required during shade selection. X axis represents the ideal amount of light that is required during shade selection and y axis represents the number of responses from the participants. The association between MDS(green) and BDS(red) among the different variables was found to be statistically insignificant with a Chi square value of 4.243 and p value of 0.236($p>0.05$).



ing shade selection, Majority of the participants from MDS responded to yes(71.20%), majority of the participants from BDS responded to yes(16.80%). The association was analysed using Chi square test and was found to be statistically not significant. ($p>0.05$) (Table 11 and Figure 10).

Discussion

Our institution is passionate about high quality evidence based

research and has excelled in various fields [42-52].

The present study has provided information on knowledge about the principle of tooth shade selection in dental students, practitioners and specialists. Color is one of the most important determinants of esthetic dentistry considering various factors such as type and intensity of the light source, time of day and year, patients clothes, age and gender [53]. Eye color, skin color and other factors usually influence and make it difficult during shade match-

Table 6. Shows the distribution of responses of participants on the ideal time required for shade selection, showing statistically no significant difference between the variables.(p>0.05).

Qualification	What is the ideal time required for shade selection?				P value
	Within 5 seconds	5-10 seconds	10-15 seconds	15-20 seconds	
MDS	73	101	16	5	0.43
BDS	17	34	4	0	
Total	90	135	20	5	

Figure 5: Bar chart showing the association between qualification of the participants and responses for ideal time required for shade selection. X axis represents the ideal time required for shade selection and y axis represents the number of responses from the participants. The association between MDS(green) and BDS(red) among the different variables was found to be statistically insignificant with a Chi square value of 2.763 and p value of 0.430(p>0.05)(Chi square test).

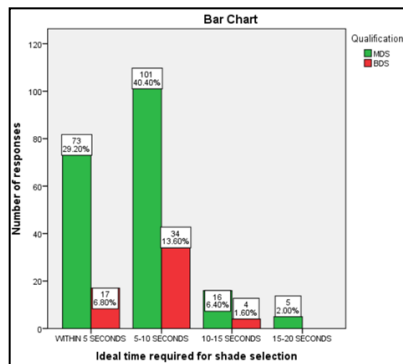
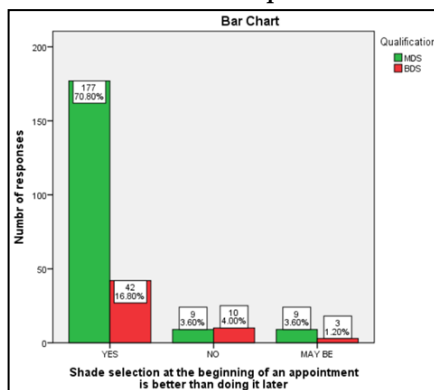


Table 7. shows the distribution of responses of participants on what they think on shade selection at the beginning of an appointment is better than doing it later, showing statistically significant difference between the variables.(p<0.05).

Qualification	Do you think shade selection at the beginning of an appointment is better than doing it later			P value
	Yes	No	May be	
MDS	177	9	9	0.003
BDS	42	10	3	
Total	219	19	12	

Figure 6: Bar chart showing the association between qualification of the participants and responses for what they think on shade selection at the beginning of an appointment is better than doing it later. X axis represents the shade selection at the beginning of an appointment is better than doing it later and y axis represents the number of responses from the participants. The association between MDS(green) and BDS(red) among the different variables was found to be statistically significant with a Chi square value of 11.468 and p value of 0.003(p<0.05)(Chi square test).



ing [54]. Even though light is one of the most important factors [55] it is the most commonly overlooked one. Furthermore, color imparted by different skin complexions is another factor that will have an effect on the shades of natural teeth [56, 57].

Among the questions that were asked, the majority of them told age, gender, appointment time and patient opinion plays an important role in shade selection. Tooth shade selection has been re-

garded as a challenging procedure even for the experienced clinician. Like several previous studies, the present study also showed that the majority of the participants also used visual methods to perform the procedure even knowing the inaccuracies of this method [12, 58-60]. The deficiencies can be controlled by utilizing the instruments method, which provides an objective and scientifically accurate shade reading [26]. However, high tech gadgets such as colorimeters and spectrometers are expensive and difficult

Table 8. shows the distribution of responses of participants on age and gender of the patients play an important role is shade selection, showing statistically significant difference between the variables.($p < 0.05$).

Qualification	Do you think the age and gender of the patients play an important role in shade selection?			P value
	Yes	No	May be	
MDS	184	7	4	0.001
BDS	44	10	1	
Total	228	17	5	

Figure 7: Bar chart showing the association between qualification of the participants and responses for what they think on age and gender of patients play a role in shade selection, X axis represents the age and gender of patients play an important role in shade selection and y axis represents the number of responses from the participants. The association between MDS(green) and BDS(red) among the different variables was found to be statistically significant with a Chi square value of 14.633 and p value of 0.001($p < 0.05$)(Chi square test).

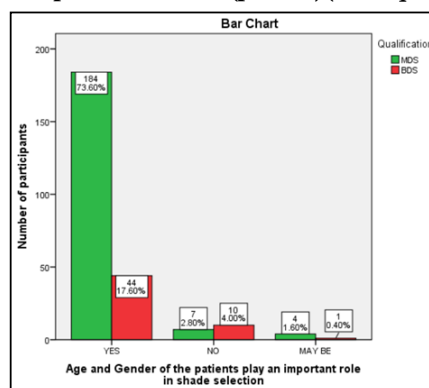
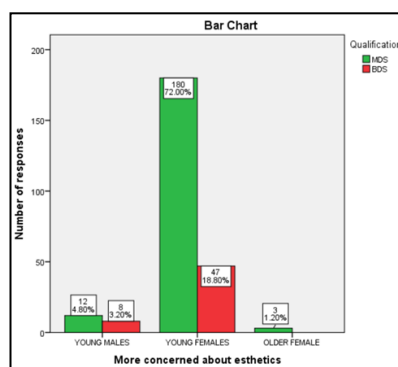


Table 9. Shows the distribution of responses of participants on Who according to you is more concerned about esthetics, showing statistically no significant difference between the variables.($p > 0.05$).

Qualification	Who according to you is more concerned about esthetics ?			P value
	Young males	Young females	Older female	
MDS	12	180	3	0.089
BDS	8	47	0	
Total	20	227	3	

Figure 8: Bar chart showing the association between qualification of the participants and responses for Who according to you is more concerned about esthetics, X axis represents more concern about esthetics and y axis represents the number of responses from the participants. The association between MDS(green) and BDS(red) among the different variables was found to be statistically insignificant with a Chi square value of 4.844 and p value of 0.089($p > 0.05$)(Chi square test).



to operate in the clinical setting, the reason that the visual method remains the most commonly used for shade selection world wide [61].

Teeth tend to dry out towards the end of dental procedure or when rubber dam is applied. Therefore, it has been recommended

to select shades prior tooth preparation [62]. This is especially true for porcelain fused to metal restorations. However, due to the requirement of preparation of a tooth colored die for the newer ceramic systems, shade has to be selected both before and after tooth preparation if all porcelain restorations are being planned. Northern daylight is considered a standard for judging

Table 10. Shows the distribution of responses of participants on what is the most common complaint patients have regarding anterior teeth restoration, showing statistically no significant difference between the variables.($p>0.05$).

Qualification	In your opinion, what is the most common complaint patients have regarding anterior teeth restoration?				P value
	Esthetic corrections	Fractured tooth	Dental caries	Failed restorations	
MDS	105	78	4	8	0.109
BDS	38	17	0	0	
Total	143	95	4	8	

Figure 9: Bar chart showing the association between qualification of the participants and responses for what is the most common complaint patients have regarding anterior teeth restoration, X axis represents most common complaint patients have regarding anterior teeth restoration and y axis represents the number of responses from the participants. The association between MDS(green) and BDS(red) among the different variables was found to be statistically insignificant with a Chi square value of 6.061 and p value of 0.109($p>0.05$)(Chi square test)

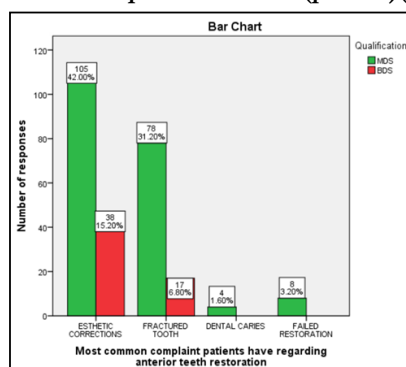
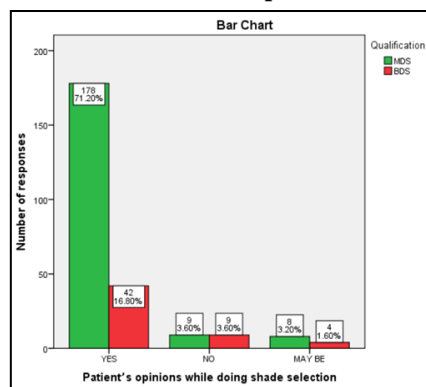


Table 11. Shows the distribution of responses of participants on whether they take patients' opinion while doing shade selection, showing statistically significant between the variables.($p>0.05$).

Qualification	Do you take patient's opinions while doing shade selection ?			P value
	Yes	No	Maybe	
MDS	178	9	8	0.006
BDS	42	9	4	
Total	220	18	12	

Figure 10: Bar chart showing the association between qualification of the participants and responses for do they take patients' opinion during shade selection, X axis represents patients' opinion during shade selection and y axis represents the number of responses from the participants. Green color depicts responses from MDS and red color depicts responses from BDS. The association between MDS(green) and BDS(red) among the different variables was found to be statistically significant with Chi square value of 10.207 and a p value of 0.006($p<0.05$)(Chi square test).



good light [63]. However, in everyday dental practice one cannot rely on sunlight for shade selection, hence color corrected fluorescent light with a CRI of 90 or above are recommended for dental operators [64, 65]. The use of incandescent bulbs and dental unit lights is not recommended because of greater amount

of yellow light emittance. Majority of the participants seemed to understand the importance of good lighting. Colored structures or surfaces around the such as adjacent teeth, gingival, lips, face skin, clothing of the patient and operative walls, can influence the perceived tooth color possibly through the phenomenon of

contract [66-68]. Therefore, it has been recommended to ask the female patients to remove any lipstick before selecting a tooth shade.

Teeth should be cleaned of all debris and stains before shade selection is carried out. A significant difference was found in participants regarding shade selection. The center field of vision is regarded as most color sensitive and color perception because there is a large collection of color sensitive cones in the center of the retina, surrounded by rods which can perceive only brightness. For this reason, researchers have recommended viewing the patient at the eye level so that the central part of the retina is used in shade selection [69].

Wagenar et al, have stated that whenever an object such as a tooth is viewed for longer than 10 seconds, the color vision capability of the eyes decreases rapidly and the perceived color does not remain stable. In order to overcome any inaccuracies arising from eye fatigue, it has been recommended to get a second operator for the patient whenever shade selections are made [70, 71]. Most of the participants in the current study take 5-10 seconds for the shade selection. Teeth are known to possess a graduation of color from the cervical to the incisal area. According to Schwabacher et al and o' brien et al, 1994 the cervical color is modified by scattered light from the gingiva whereas the incisal color is most often translucent and is affected by its background [72]. Therefore, shade selected separately for different regions of the tooth surface and recorded on a shade distribution chart. The Vitapan classical shade guide is regarded as the most commonly used and known among the shade guides in dentistry, many other ceramic systems have been based on this guide [73, 74].

Conclusion

Shade determination is more rapidly evolving toward a more objective standard. The clinical importance of a proper shade selection in esthetic dentistry cannot be overlooked until an appropriate shade is selected, all other aspects of the restoration will not produce the best final result. Determining an accurate shade match is one of the most vital steps in esthetic restorative dentistry, it has always possessed a great challenge in esthetic dentistry. Dentists have little or no training in vision physiology or color science as comprehensive color training has continued to be a missing part in the dental school curriculum. In an era of growing interest in cosmetic dentistry, there is a need for adequate training and communication for better and more satisfactory results of shade matching. Based on the result obtained from the current study, we would like to conclude that more attention should be focused on improving the knowledge of color science and its application in esthetic dentistry as the color and appearance of teeth are a complex phenomenon, with many factors. Hence, for a good esthetic outcome to be achieved, the dentist should consider all possible entities which influence shade selection

Limitations

Within the limitations of this study, this cross sectional descriptive study shows a thorough knowledge and awareness among the specialists about shade selection and inadequate knowledge among general dentists. Therefore, establishing awareness among general dentists regarding shade selection for indirect veneers es-

pecially for anterior teeth is compulsory.

Future Scope

This study can be conducted in a larger number of populations. The questions can be focused on the effect of resin cement on final shade, type of instruments for shade selection in future studies.

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