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Studying the Necessity for Presenting the Science of Determining the Tooth shade Course in Educational Curriculum in Dentistry Faculties Based on the Evaluation of the Amount of Knowledge and Performance of General Dentists

Mohammad Shooriabi¹, Abdolreza Gilavand^{2*} and Mehrnaz Yazan³

¹Assistant Professor, Department of Oral Medicine, School of Dentistry, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

^{2*}Employed Expert on Faculty Appointments, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

³General Dentists, School of Dentistry, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

ABSTRACT

Because in tooth restoration dentists have faced with the problem of shade selection and its matching with natural tooth and also because of the important role of correct shade selection in successful treatment, the purpose of this study is to investigate the necessity for presenting the science of determining the tooth shade course in educational curriculum in dentistry faculties based on the evaluation of the amount of knowledge and performance of general dentists. Data in this study are descriptive, analytical and they were collected through random questionnaires distribution among 84 dentists (56 male, 28 female) in private clinics of Ahvaz. The questionnaire consisted of two parts of demographic information and basic principles of shade selection. Data were analyzed by SPSS21 software. In this study 52 dentists (61.9%) offered dental restorative-esthetic services and prosthesis to their clients. Only 40.6% of them consulted others about the selection of shade. 57% of dentists used the natural light of day for the choice of shade. 15% of dentists preferred to select shade in an environment with gray walls, cabinets and levels and only 10% of them used devices such as the spectrophotometer and colorimeter. 24 dentists said that about 30% of their patients are not satisfied with the shade chosen for the restoration of their teeth. According to the study findings as well as dentists' tendency to participate in retraining courses in this area, it is recommended that the science of determining the tooth shade course be included in the educational curriculum of general dentistry.

Keywords: Tooth shade; Dentists; Educational Curriculum; Ahvaz

INTRODUCTION

Because of a series of attractions, dentistry is the main choice of volunteers for entrance to university and higher education institutions [1-3]. Even studies have shown that because after the graduation dental students do not have job concerns, they are in better mental condition [4].

Art and science are interwoven in dentistry. It is ideal that the restored tooth be similar to the natural tooth in terms of location, shape and shade whilst being replaced or restored [5]. The shade match between restorative substance and natural tooth is one of the main objectives of restorative and cosmetic dentistry. The patients and their associates

can easily recognize the difference if there is no proper shade match, and, hence, they get unsatisfied with shade choice. To select an appropriate shade, the dentist compares the shades available in the Standard Shade Guide with the shade of the natural teeth and selects the one that looks more like the natural shade of patient's teeth [6]. Devices like shadeimeter and spectrophotometer have been provided for dentists to help them select the shade of tooth [7, 8]; however, visual shade selection is more common amongst dentist due to the high costs and problems of the aforementioned devices [6]. Therefore, dentists should know different techniques and principles of visual shade selection approach to be able to select a proper shade. In visual approach, dentists can enhance their dentistry performance by understanding the variables that affect shade perception such as the source of light, its surrounding environment and features as well as the personal traits of the patients [9]. Light is an important factor in matching and selecting a proper shade in dentistry office [8]. When light hits an object, the proportion of the visible spectrum of light, that is not absorbed by the object, is reflected to the eyes and brain respectively, where it is processed, and allows shade perception. Staring at the teeth for more than 5 seconds confuses the shade perception because it catches the eyes with red and yellow shades [10]. In order to avoid eyestrain during shade selection, the dentists can occasionally focus their look on the surfaces with light blue or neutral gray shades and continue their shade selection process [5]. Metamerism refers to the fact that objects reflect different shades under different spectral lights; it can influence the process of tooth shade selection [11&12]. The best source of light for shade selection is the natural daylight or the light source that has undergone shade correction and has about 5500K shade temperature and a shade rendering index of 90 or higher [6]. The fluorescent lamps, which have not undergone shade correction, have a spectrum of red light which leads to wrong shade selection [8]. Walls and cabinets should be smooth and bright enough to keep brightness without the dazzling reflection of light; therefore, the recommended shade for office rooms, cabinets and patients' aprons is neutral gray or light blue [13]. It has been reported that the dentists who have impaired shade vision are more mistaken in the process of shade selection and shade matching [14, 15]. Research has shown that women are generally more capable than men in the process of shade selection and shade matching [16, 17]. This may contribute to the fact that the spectrum of shades observed by men are fewer than women [4]. It has been suggested that dentists consult someone in the process of shade selection [18-20].

Having accurate knowledge of the aforementioned principles is important in visual shade selection approach to enable repeatable and proper shade selection. Research has shown that most of dentistry communities are not familiar with this protocol [21 – 24]. The process of shade selection amongst Iranian dentists and the extent of patients' satisfaction with the selected shade by dentists have not yet been evaluated to the present date.

The aim of the reform in dental education is training dentists who can provide comprehensive oral health care for patients, have strong foundation in research, have the necessary skills to manage the clinical practice of dentistry and have essential skills for interpersonal communication and teamwork. Another benefits of these changes are institutionalizing the social responsibility and cultural skills in dental graduates, providing a deeper understanding of the relationship between medicine and dentistry, transferring educations based on the community needs and critical scientific thought skills, creation of lifelong learning thought and finally, evidence-based clinical practice in dental students [25]. In a restorative treatment or prosthesis, if all of the necessary esthetic elements have been met but the shade selection be wrong, treatment will fail. Non-compliance of reconstructed tooth shade with other teeth can cause economic problems including substitution treatment with dentist costs, as well as patient dissatisfaction and even can cause honor adverse consequences to the dentist [26]. The purpose of this study is to investigate the necessity for presenting the science of determining the shade of teeth course in educational curriculum in dentistry faculties based on the evaluation of the amount of knowledge and performance of general dentists.

MATERIALS AND METHODS

The present research is a descriptive-analytic study approved by the Ethics Committee of Ahvaz Jundishapur University of Medical Sciences under the number *IR.Ajums.REC.1394.432*. To this end, 84 dentists, who worked in private dentistry offices in Ahvaz in September 2015, participated in this study as research population. Data collection was based on random stratified sampling method (according to the aggregate of dentistry offices in different parts of Ahvaz) using a questionnaire. The questionnaire consisted of two sections; the first section required information about the dentists' sex, age, experience and the most type of treatment they offered to patients. The second section presented questions about the shade selection techniques, light source, working conditions and environment, and the extent of patients' satisfaction with the shade matching between the restorative material and the natural teeth. The validity of the questionnaire was verified by three assistant professors of the school of dentistry in Ahvaz Jundishapur University of Medical Sciences (AJUMS). The reliability of questionnaire was not

assessed with respect to the type of questions and their related options (according to the statistical consultants of the project). In addition to the questionnaire, the dentists were asked to read the plates of Ishihara booklet in sequence to test their shade blindness. The test consists of 18 shade plates with numbers. The booklet was placed at the distance of 75 cm from the dentist; and the dentists were asked to read the shaded numbers on the plates. Their correct or incorrect responses were recorded in related answer sheets. Each page took 3 seconds to be read. The dentists which could read the numbers of 9 plates or more correctly had natural shade vision. On the contrary, if they could read less than 9 plates, they were considered to have impaired shade vision. The test was done separately in the environmental conditions of each dentist's office. After data collection, data were analyzed using SPSS₂₁ and Chi-square test at 0.05 significance level. Furthermore, frequency distribution table was used to describe data.

RESULTS

Out of 84 participants, 56 dentists (%66.7) were males with a mean age of 34.5 ± 5.7 years and 28 dentists (%33.3) were females with a mean age of 40.5 ± 6.4 years. There was a significant difference between the mean age of women and men (P-value: 0.002). All the participants were general dentists. Furthermore, 28 dentists (%33.3) had less than 5 years of treatment experience while 52 dentists (%61.9) had more than 5 years of experience (Table 1).

Table 1: Frequency Distribution of Dentists based on years of dentistry experience

Years	Number of Dentists	Percentage
<5	28	33.3
5 - 10	52	61.9
10 - 15	4	4.8
Total	84	100.0

Table 2: The Frequency of Responses to Some Questions and the Statistical Difference between Males and Females

Options	Number	Female	Percentage	P-value
		Male		
What kind of light do you use in process of tooth shade selection?				
Natural daylight	48	20	57.1	0.019
		28		
The light of dentistry unit	20	8	23.8	
		12		
Natural daylight and the light of dentistry unit	12	0	14.3	
		12		
Fluorescent light	0	0	0	
		0		
Fluorescent light and natural daylight	4	0	4.8	
		4		
How accurate are you to select the shade of restorative teeth?				
I look at the tooth less than 5 seconds and trust my first tooth shade selection.	16	8	19	0.004
		8		
I look at the tooth about 30 seconds and select the best shade amongst several choices	12	0	14.28	
		12		
I look at the tooth less than 5 seconds and select the best shade amongst several choices	56	20	66.66	
		36		
I look at the tooth for some minutes and select the best shade amongst several choices	0	0	0	
		0		
How much are your patients satisfied with your selected shade?				
More than %90	36	12	42.9	0.000
		24		
%70 to %90	24	0	28.6	
		24		
%50 to %70	24	16	28.6	
		8		
Less than %50	0	0	0	
		0		

52 dentists (%61.9) had managed to provide the services in dental restorative treatments and prosthesis. Only %57 of dentists chose natural daylight during the process of tooth shade selection. Almost %70 (female) and %50 (male) of dentists considered natural daylight in shade selection. There was a statistically significant difference between men and women in this regard (P= 0.019).

Moreover, %47.6 of dentists consulted other individuals during shade selection. There was a statistically significant positive relationship between the experience of dentists and opinion of others during tooth shade selection. Dentists with more than 5 years of experience used the opinion of others more than inexperienced dentists; the difference between them was significant ($P=0.001$).

Only %15 of dentist preferred tooth shade selection in the working environment with gray walls, ceiling and surfaces while %10 of them used devices like spectrophotometer or colorimeter for shade selection. In terms of accuracy of shade selection, only %19 of dentists trusted and verified their first shade selection after staring at the tooth for 5 seconds. There was a significant difference between the responses of men and women ($P=0.017$). Besides, 24 dentists claimed that almost %30 of their patients were not satisfied with the selected shade for restoring their teeth. Of these, %57 (16 /28) and %14 (8 / 56) were respectively females and males, which showed a significant difference ($P=0.000$). The number and percentage of responses to each question were presented in Tables 2, 3 and 4.

Table 3: The Frequency of Responses to Some Questions based on Experience

Options	Number	Experience	Percentage	P-value
		Female		
		Male		
Do you consult others (Like assistant and secretary) in the process of tooth shade selection				
Always or Often (more than %70)	40	12	47.6	0.001
		28		
Sometimes (about %50)	24	4	28.6	
		20		
Never	20	12	23.8	
		8		
How much are your patients satisfied with your selected shade?				
More than %90	36	4	42.85	0.000
		32		
%70 to %90	24	12	28.57	
		12		
%50 to %70	24	12	28.57	
		12		
Less than %50	0	0	0	
		0		

DISCUSSION

The present study intended to investigate the performance of dentists in tooth shade selection. The results showed that providing treatment services in restorative and cosmetic dentistry is amongst the treatment in which dentist are more experienced. The tendency of dentist to prefer these treatments is admissible due to the increasing demands of patients for cosmetic dentistry treatments [27], influenced by media advertisement [including photos of celebrities, magazines, cinema, TV], through which they can earn more income. If dentists do not receive necessary trainings in cosmetic dentistry or do not consider the pre-requisite stages of such treatments, including examination, patient's need analysis and expectation form treatment, the extent of lawsuit against them increases. One of the cases which increases the complaints against dentists is the lack of proper tooth shade selection [28]. Therefore, it seems necessary that all dentists have a complete understanding of the visual shade selection approach in dentistry to be able to provide patients with satisfactory treatments.

Based on the percentage of participants' responses to questions about the type of light source, environment shade, and accuracy in shade selection, it was revealed that most dentists do not observe at least one of the visual shade selection conditions. Sabouri et al. [29] found that none of the dentists use appropriate light for shade selection in Shiraz, Iran. Habib et al. [30] reported that more than %50 of dentists does not pay attention to the patients' outfit shade and makeup whilst selecting the tooth shade although these factors can influence the shade choice. In this regard, the results of all the three studies are in line with each other. It seems that taking this factor into consideration can reduce the increasing statistic of complaints against dentists [31] on the part of patients.

On the other hand, Barana [21] and Haddad [17] found that the complexity of shade selection process is to the extent that even work experience cannot help the process of shade matching and discrimination. The results of this study is

consistent with the findings of Sabouri et al.[29] in that the percentage of patients who were satisfied with the selected shade by experienced dentists is higher than inexperienced dentists. The variation between different studies is because of the differences in the methodology and research population. It should be noted that, according to the present study, the experienced dentists consulted their assistants for shade selection more than inexperienced dentists; hence, they had a better shade choice. Therefore, it has been recommended that dentists consult their assistants during shade selection due to the considerable effects of eyestrain, shade vision deficiency, and environmental shades on the process of tooth shade selection [4 & 26]. However, only about the half [%50] of participant dentists always tried to consult their assistants in this regard. Although consulting with assistants about the shade selection take a little more time for treatment, it, ultimately, leads to patients' satisfaction with the selected shade and reduces the need to replace or correct the restoration for the benefit of dentists.

It was also found that the number of female dentists who paid attention to their patient's satisfaction with the selected shade was noticeably higher than males. Besides, the accuracy of female dentists in shade selection was higher than male dentists based on their response to "How accurate are you to select the shade of restorative teeth?" The results contradict with the findings of Esan's study in Nigeria [8]. The difference may be due to the age difference of research population between these two studies. The mean age of women was higher than both the mean age of men in the present study, and the mean age of all participants in Esan's study. The mean age difference was significant with regard to the point that age increase can affect shade perception [28].

The source of light can influence the process of shade selection [32]. The best source of light is natural daylight because its spectrum is closer to white light. However, considering the fact that the quality of light is different during different times of the day, locations, seasons and climate conditions, some studies have rejected the positive effect of natural daylight on shade selection; instead, they have recommended the use of shade corrected sources of light [15, 33, 34, 35,36]. Nonetheless, more than %40 of dentists used different sources of light in the process of shade selection, in the present study, which may get the process into troubles and, hence, requires consideration.

The schools of dentistry do not teach the science of shade. Dentistry students spend only %4.8 of their education to learn cosmetic dentistry; thus, it is not clear how much of this amount is related to tooth shade selection in dentistry [31]. Most dentists, participated in the present study, confirmed the lack of sufficient trainings in this field and they all would like to participate in retraining courses on tooth shade selection in dentistry. This is in line with Öngül et al, Clary et al, Dubois et al, Ristic et al and studies[38-41].

CONCLUSION

Medical science curriculum has the highest effectiveness when its basis is the health needs of the community. Thus, university will contribute in tests of productivity, efficiency and effectiveness of different ways to solve problems of community health. Based on this belief and to enhance the capabilities of dental students in understanding the problems associated with oral health of community and skills to solve these problems and as a result more satisfied patients, it is necessary that the science of determining the shade of teeth course be included in the educational curriculum of general dentistry. Moreover, the faculty members who are providers of this course must have a complete understanding of the purposes, various headings and expected skills for students after completion of this course.

Because the proper, continuous and constant training of dentists about the science of shade and the manner of selection and match of teeth shade between restorative material and natural teeth can increase the quality of esthetic services in dentistry and as a result causes more satisfaction of patients and also because dentists are eager to participate in retraining courses in this area, it is suggested that policy makers in educational, sanitary and therapeutic scope pay more attention to this point.

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