

Awareness About Lithium Disilicate Crowns Among Dental Students

Research Article

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Abstract

The aim of this study is to determine the understanding regarding lithium disilicate crown among dental undergraduate students. It is to create awareness and determine the understanding of lithium disilicate crowns among dental undergraduate students. This study was conducted based on a questionnaire which consist of 10 questions through a web-linked application called Survey Monkey. A convenience sample size of 100 consecutive dental students who are currently practicing in Chennai participated in the study. The data was obtained and tabulated using Microsoft Excel software. The mentioned data were coded and transferred in to SPSS PC version 2.0 (IBM 2019) software for statistical analysis. Pearson Chi Square Test, was used to assess the association between the gender and the responses. As an overall result, most of the participants are aware of lithium disilicate crowns in dentistry. With in the limitations of the study, it is concluded that the majority of dental students have fair knowledge about lithium disilicate crowns. However, this study was limited to only one dental institute in Chennai and only 100 students participated. Further more, this study should be conducted in a larger scale area and sample size to get a proper overview regarding this topic with in dental students concerning the new advent technologies.

Keywords: Lithium Disilicate; Crown; Dental; Awareness; E. Max; FPD.

Introduction

Lithium disilicates are categorized as a glass-ceramic, in the category of particle-filled glass materials. In the era of the 90's, this material was introduced in the market with a commercial formulation named IPS Empress 2 [1]. It showed valuable mechanical characteristics such as flexural strength, fracture toughness, heat extrusion temperature and thermal expansion coefficient [2].

At first, this material was made commercially available as in gotts, to be utilized according to the heat-press fabrication procedure, similar to the classic lost wax technique for metal-alloy casts [3]. It was aimed to produce cores, hot pressed in to a mold. In order

to get an appealing reproduction of the optical characteristics of natural teeth, the cores are lately veneered with a very translucent fluorapatite ceramic, containing 19–23% of fluorapatite crystals embedded in a glassy matrix [4].

However in 2005, a new formulation of lithium disilicate crown was commercially available as IPS e.max Press, exhibiting improved mechanical properties and optical features [5]. The high mechanical performance of this material is due, on one side, to a layered, tightly interlocked distribution of the elongated disilicate crystals, [11] hindering crack propagation across the planes and, on the other side, [6] to a mismatch between the thermal expansion coefficients of lithium disilicate crystals and the glassy

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matrix, so that the latter induces a tangential, compressive stress around the crystals [7].

Besides the production of ceramic cores for bilayered crowns, the increase of strength and toughness of IPS e.max. [8] Press has allowed to extend its clinical indication to monolithic restorations, without veneering ceramic, anatomically shaped, colored by surface stains and characterized by a higher fatigue resistance than the bilayered ones. Other than heat-pressed technique, the widespread, increasing implementation of computer-aided design/computer-aided manufacturing (CAD-CAM) technologies has led to the introduction of ceramic blocks aimed at the production of restorations by milling devices (IPS e.max CAD), also suitable for chairside production of restorations [9].

As regards mechanical resistance, veneered lithium disilicate crowns exhibit significantly lower fracture load values compared to monolithic ones, the main failure mechanism being bulk fracture initiating from the occlusal surface [10]. Till date, there is strong evidence from many previous literature that, differently from bilayered restorations, monolithic ones show fracture strength and fatigue resistance suitable for use in the posterior areas, both in tooth- and implant-supported single crowns and 3-unit fixed dental prostheses [13, 21].

Although this material shows maximum of positive review, they also have disadvantages such as fatigue resistance which is strongly influenced by many experimental variables, [12] like amount of cyclic loading, abutment and antagonist design and material, thermocycling parameters and test environment. Therefore, the heterogeneity and lack of standardization in research designs, tested materials and experimental conditions make a comparison of data not easily feasible [14].

In regards to clinical indications of lithium disilicate crowns, it has to be emphasized that this crown is one of the most versatile metal-free materials for its high esthetic potential, good mechanical properties and favourable bonding strength to dental tissues. [15] It is mainly due to the silica content in lithium silicate crowns. Moreover, this ceramics can be utilized both for tooth- and implant-supported restorations, ranging from single crowns to fixed dental prostheses, from anterior veneers to posterior inlays, onlays and overlays. Therefore this study aimed to analyse the awareness of dental students in regards to lithium disilicate.

Material and Methods

This study was conducted under a hospital based university setting. Ethical approval for this study was granted by the institute's ethical committee (ethical approval number: SDC/SIHEC/2020/DIASDATA/0619- 0320). A convenient sample size of 100 consecutive dental undergraduate students who are currently pursuing in Saveetha Dental College, Chennai participated in the study. A cross-sectional observational online based study was conducted. Questionnaire was constructed on the Survey Monkey website with dichotomous responses and multiple choice questions. The questionnaire consists of 10 questions as shown in Table 1. A link containing these questionnaires was shared with all the participants and required them to answer the questions. The data was obtained and tabulated using Microsoft Excel software. The mentioned data were coded and transferred in to SPSS PC version 2.0 (IBM 2019) software for statistical analysis. Pearson Chi Square Test, was used to assess the association between the gender and the responses. The results were recorded and were depicted in the form of bar graphs and pie charts. The difference was considered statistically significant as the p value was less than 0.05. (p<0.05).

Results

In this study the gender distribution of dental students participants were 63% of female and 37% of male, as shown in figure 1. Figure 2 described the response of participants regarding choosing an example of lithium disilicate latest brand, most of the participants choose the option 'I don't know'(52%). Only 37% of them chose the correct option, which is IPS E Max crown. Remaining 11% of them chose the Yttria-Stabilized crown option. In figure 3, the majority(54%) respondents have answered the question regarding shades of customized lithium silicate crowns (both monolithic and dichromatic). 31% and 15% of them chose only monolithic and dichromatic respectively. Figure 4 elaborated about the knowledge of the participants regarding translucency properties of lithium disilicate. Majority (41%) of the participants agreed that lithium disilicate crowns have higher translucency properties than zirconium, where as 29% of them disagreed with this statement. Remaining 30% of them had no clue about this topic. Figure 5 described the response of participants regarding their insinuation on their knowledge regarding the thickness of lithium disilicate crowns. About 44% of the participants were aware of the thickness of the crown as they chose the option

Table 1. Shows the questions asked in the questionnaire.

QUESTIONS
Q1. Are you aware of lithium disilicate crowns?
Q2. Do you think lithium silicate has higher strength compared to zirconia?
Q3. Which of the following is a lithium disilicate crown?
Q4. Lithium disilicate can be customised according to shades as?
Q5. Lithium disilicate crown has high translucency property compared to zirconia crown?
Q6. Lithium disilicate crowns are not able to fabricate using CAD-CAM milling?
Q7. Will you suggest lithium disilicate crowns to your patients?
Q8. Will you use lithium disilicate crowns in patients with darker tooth discolouration?
Q9. What is the thickness of a lithium disilicate crown?
Q10. Lithium disilicate crowns can be used for short span bridges?

Figure 1. Pie chart shows the gender distribution of dental students participating in a survey regarding awareness on lithium disilicate crowns. It shows that more females (light blue) when compared to males (purple).

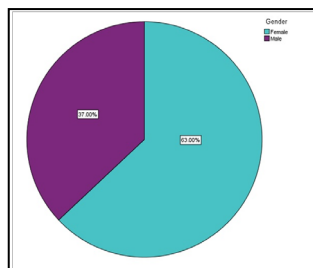


Figure 2. Pie chart shows the response of participants regarding the question asked to identify the lithium disilicate crown which was available commercially. The highest response which was given by participants was “I Don’t Know” (beige - 52%).

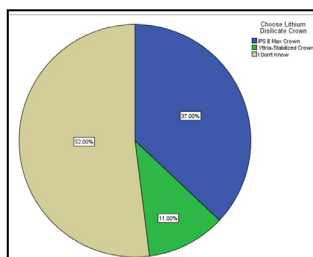


Figure 3. Pie chart shows the response of participants regarding the question asked about lithium disilicate crowns which can be customized according to shades as the followings. The highest response given by participants is “All of Above” (beige-54%). This implies that the majority of participants are aware of the shades which can be customized for each patient using monolithic layers or di-chromalytic layers.

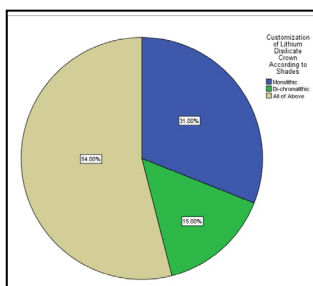
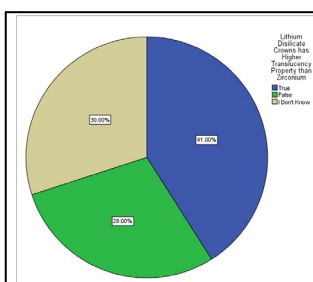


Figure 4. Pie chart shows the response of participants regarding their knowledge whether lithium disilicate crowns have higher translucency properties compared to zirconium crowns. The chart implies that the majority of the participants are aware that lithium disilicate crowns have high translucency properties and they answered “True” (blue- 41%).



‘1.5mm-2mm’. Remaining 35% and 21% of them chose the option ‘0.5mm-1mm’ and ‘I don’t know’, respectively.

Figure 6 showed the association between the gender of the respondents and the question on awareness of lithium disilicate crowns. Female participants had a greater awareness of lithium disilicate crowns than male participants. Chi-square test [2.9663; $p=0.227(p>0.05)$] showed that it is statistically not significant implying the gender didn't have any association pertaining to

the awareness level of respondents regarding lithium disilicate crowns. Figure 7 implied that the association between the gender of the respondents and the knowledge on identifying the commercially available lithium disilicate crown. Female participants had a greater tendency to identify the lithium disilicate crown compared to male participants. Chi-square test [2.544; $p=0.280(p>0.05)$] showed that statistically not significant implying the gender didn't have any association pertaining in identifying the lithium disilicate crown. The association between the gender of

Figure 5. Pie chart shows the response of participants regarding their insinuation on their knowledge regarding the thickness of lithium disilicate crowns. About 44% (blue) of the participants were aware of the thickness of the crown as they chose the option “1.5mm-2mm”.

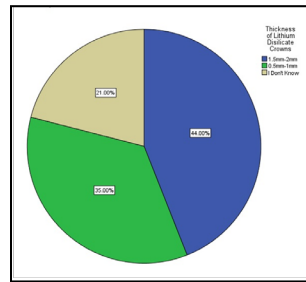


Figure 6. Bar graph showing the association between the gender of the respondents and the question on awareness of lithium disilicate crowns. X axis represents the responses and Y axis represents the number of respondents. Females (light blue) had a greater awareness of lithium disilicate crowns. A Chi-square test [2.9663;p-0.227(p>0.05)] statistically not significant implying the gender didn't have any association pertaining to the awareness level of respondents regarding lithium disilicate crowns.

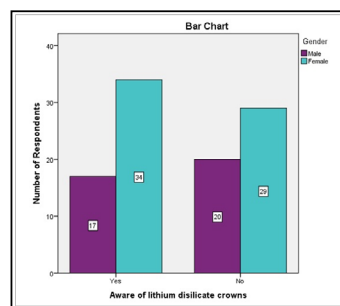
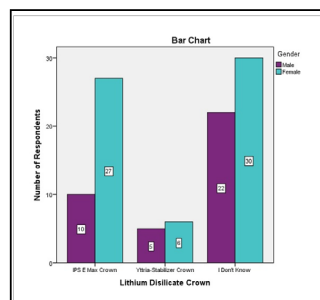


Figure 7. Bar graph showing the association between the gender of the respondents and the knowledge on identifying the commercially available lithium disilicate crown. X axis represents the types of crown available commercially and Y axis represents the number of respondents. Females (light blue) had a greater tendency to identify the lithium disilicate crown. A Chi-square test [2.544;p-0.280(p>0.05)] statistically not significant implying the gender didn't have any association pertaining in identifying the lithium disilicate crown.



the respondents and the question asked about types of shading used to customize lithium disilicate crowns is shown in figure 8. Majority of female participants and male participants felt both monolithic and di-chromalytic can be used for shade matching in lithium disilicate crowns.

Figure 9, showed association between the gender of the respondents and the question will they suggest lithium disilicate crowns for their patients. Majority of females agreed that they would suggest lithium disilicate to the patients compared to males. Figure 10, showed association between the gender of the respondents and the opinion regarding the strength of lithium disilicate crowns compared to zirconium crowns. Females felt zirconium crowns have higher strength compared to lithium disilicate crowns. Chi-square test [6.492; p-0.011 (p<0.05)] showed statistically significant implying that females felt the zirconium crown has greater strength.

Discussion

Dento-Facial esthetics has been used to describe the interrelationship between the face, lips, gingival and teeth in obtaining an overall esthetic result. Smile rejuvenation can positively impact a patient's self-esteem and emotional health through improved appearance. Excellent soft tissue health and correct tooth contours and emergence profiles are just as important as the actual color of the new restoration/adjacent teeth. [16] For more than three decades metal ceramic restorations have been the choice thanks to their predictable performance and reasonable esthetics.

Metal-ceramic prosthesis are widely accepted and are the most commonly used extracoronal restoration because they combine the strength of the metal and the esthetic quality of the ceramic material [17]. Nevertheless they presented many problems such

Figure 8. Bar graph showing the association between the gender of the respondents and the question asked about types of shading used to customize lithium disilicate crowns. X axis represents the response and Y axis represents the number of respondents. Majority of females (light blue) and males (purple) felt both monolithic and di-chromalytic can be used for shade matching in lithium disilicate crowns . A Chi-square test [7.493;p<0.041(p<0.05)] statistically significant implying that females are more accurate than males in knowledge regarding shade customising in lithium disilicate crowns.

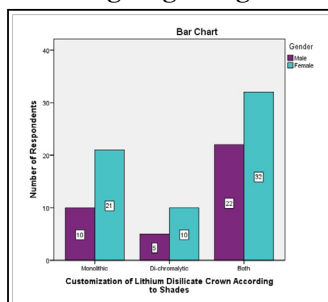


Figure 9. Bar graph showing the association between the gender of the respondents and the question will they suggest lithium disilicate crowns for their patients. X axis represents the response and Y axis represents the number of respondents. Majority of females (light blue) agreed that they would suggest lithium disilicate to the patients compared to males (purple) . A Chi-square test [21.22;p<0.32(p<0.05)] statistically significant implying that females felt that lithium disilicate crowns will be beneficial to their patients.

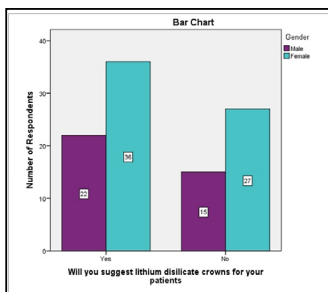
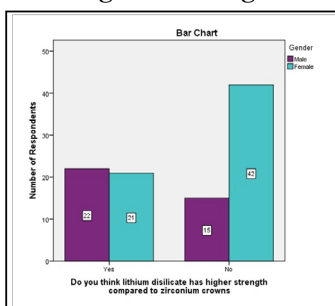


Figure 10. Bar graph showing the association between the gender of the respondents and the opinion regarding the strength of lithium disilicate crowns compared to zirconium crowns. X axis represents the response and Y axis represents the number of respondents. Females (light blue) felt zirconium crowns have higher strength compared to lithium disilicate crowns . A Chi-square test [6.492;p<0.011(p<0.05)] statistically significant implying that females felt the zirconium crown has greater strength.



as Low translucency due the increased light reflectivity from the opaque porcelain used to mask the metal substructure and problems of metal-ceramic bonding, corrosion (galvanism) and risk of gingival discoloration (tattooing). Another problem is the light gray discoloration that often occurs at the adjacent gingival tissues due to the increased reflectivity exhibited by metal ceramic restorations. Despite their success the demand of improved esthetic has led to introduction of all ceramic restorations.

Bonded composite cores require the presence of a minimum of 1.5-2 mm height of ferrule after crown preparation. In this case the remaining sound dentin (ferrule) was 2mm, thus restoring with fiber post and composite core was selected and was a suitable option underlying vitro ceramic crowns. In this case report and due to the thickness, color stability of the Lithium disilicate

(E-max press) based crowns, it is unnecessary to use the try-in paste prior to cementation to simulate the cement color [18].

E-MAX ceramic crowns are a preferable type of crowns due to their esthetic appearance and high strength of 470 MPa. [19] They are translucent in color, which ensures the closest match of light properties of natural teeth and eliminates the ugly metal band around the gum line that is characteristic of metal ceramic crowns. Bacterial plaque accumulation has also been reported to be less on porcelain margins as compared to metal margins [20]. On another hand Dental porcelain must be glazed or highly polished because it is more abrasive of enamel than of other restorative materials (e.g, gold or amalgam) and has been implicated in severe occlusal wear [21].

Table 2. Giving the response of the participants to questions.

QUESTIONS	YES	NO
Are you aware of lithium disilicate crowns?	51	49
Do you think lithium disilicate has higher strength compared to zirconium crowns?	43	57
Will you suggest lithium disilicate crowns for your patients?	58	42
Will you use a lithium disilicate crown for a root canal treated tooth which is highly discoloured?	39	61

Table 3. Giving the response of the participants to questions.

QUESTIONS	1	0
Lithium disilicate crowns are not able to fabricate using CAD CAM milling process.	38	62
Lithium disilicate can be used for short span bridges?	51	49

Conclusion

With in the limitations of the study, we have concluded that the majority of dental students have fair knowledge about lithium disilicate crowns. However, this study was limited to only one dental institute in Chennai and only 100 students participated. Furthermore, this study should be conducted in a larger scale area and sample size to get a proper overview regarding this topic with in dental students concerning the new advent technologies.

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