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Knowledge, Attitude, And Practice Of Endocrown In Post-Endodontic Management Among General Practitioners

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Abstract: Postendodontic treatment management consists of restoration that should give protection and preservation of remaining tooth structure while giving satisfactory aesthetics appearance, its form, and good function. The endocrown consists of a single unit with a circular butt-joint finish line and a central retention cavity inside the pulp chamber. The goal of endocrown usage is to achieve minimally invasive preparations and to conserve the existing tooth structure. The aim of this survey was to assess the level of awareness and the current state of knowledge and opinions toward endocrown as one of postendodontic management in practice amongst dental practitioners. This cross-sectional study was done among dental interns and practitioners from various institutions in Chennai. A total of 120 participants took part in this survey study. Results were analysed and compared using the SPSS Statistical Software by doing both the frequency tests and correlation tests. More than half of dental practitioners (55.83%) reported that they were aware of the use of endocrown as one of the post endodontics management. However, only 27.5% said that they had practised the use of endocrown during their training. Within the limits of the study, dental practitioners commonly have less training and practice in management of post endodontics restoration using endocrown. In regard to their knowledge, they showed an acceptable level of knowledge and awareness of usage of endocrown as one of post endodontics management.

Keywords: Endocrown; dental aesthetic; endodontics restoration; Post endodontics management; general practitioners

INTRODUCTION

Postendodontic treatment management consists of restoration that should give protection and preservation of remaining tooth structure while giving satisfactory aesthetics appearance, its form, and good function.(Robbins, 2002) The main function of such post endodontic management is to provide minimally invasive teeth preparation with maximum conservation of tissues surrounding the restored teeth.(Blanco et al., 2017) Such aim needed to achieve the tooth-restoration complex that is mechanically stabilized and has an adequate surface for adhesion. There are various options that can be chosen by the practitioner to manage the post endodontic restoration such as post and cores, crown placement, and others based on different case scenarios.(Biacchi, Mello and Basting, 2013; D and Rihab, 2019) All the options available are based on tooth structural integrity, patients' aesthetic desire, and its requirement for remaining tooth structure protection. The endodontically treated teeth have a higher risk of fracture compared to the vital teeth structure due to its decrease in biomechanical strength. (Acosta et al., 2017)There are many changes that occur in endodontically treated teeth such as stiffness reduction, decrease in fracture resistance due to its loss of structural integrity associated with dental caries, trauma, or extensive cavity preparation during treatment. The teeth also may have dehydration and physical changes in dentin structure.(Christensen, 1996)

The choice of post endodontic treatment management influenced by different types of teeth involved whether the tooth in anterior or posterior and its amount of tooth structure remaining.(Rosenstiel, Land and Fujimoto, 2006)(Walmsley, 2012) Therefore, in order to solve these problems, there are few clinical techniques that had been suggested to the practitioners. The direct restoration can be done for anterior teeth with a limited access opening and have sufficient tooth remaining structure. These kinds of case scenarios of anterior teeth do not require crown placement. However, direct restoration in posterior teeth cannot be done as they needed cuspal coverage due to their different characteristic morphology and increased loads. A core buildup and a crown placement are needed in the tooth with substantial coronal structural loss. However, if the core is not as retentive

as it should be, an extra retentive mechanism is needed such as placement of the dowel.(Sevimli, Cengiz and Oruç, 2015)

The adhesives introduction in conservative dentistry world and an effective dentine adhesives development changed the way of practitioner managing the endodontically treated teeth, which made the usage of radicular post a less chosen option as long as there is sufficient surface area in tooth structure for adhesion. Pissis in 1995 introduced a novel technique where he suggested for conventional metal post and core replacement with a single unit porcelain core and crown.(Pissis, 1995) By 1999, Bindle and Mörmann introduced the Endocrown technique for the first time where it was based on the Pissis concept. It was described by them as an adhesive full porcelain crown that fixed to the endodontically treated teeth for the posterior.(Bindl and Mörmann, 1999)

The endocrown consists of a single unit with a circular butt-joint finishline and a central retention cavity inside the pulp chamber. The goal of endocrown usage is to achieve minimally invasive preparations and to conserve the existing tooth structure. The ceramic fabrication technology evolution in dentistry such as Dental CAD/CAM and high-quality adhesive cementations production has enhanced the manufactured idea for higher biocompatibility and optimal mechanical properties of ceramic endocrown.(Göhring, Mörmann and Lutz, 1999; Santos et al., 2013; Batson et al., 2014; Deepak and Nivedhitha, 2017)

There are various advantages of using endocrown over posts and core, and crown placement. Endocrown requires minimal time consumption in tooth preparation and application, and it also needs minimal treatment visits by patients.(Bindl and Mörmann, 1999; Sevimli, Cengiz and Oruç, 2015) The aesthetic appearance of endocrown also gives a good attraction for practitioners to choose it as restorative modalities. The adhesive restorative used in the endocrown may decrease the chance of microorganisms infiltration from the coronal part to the apical portion of the root canal system thus give an improvement in the root canal treatment success rate.(Imen, 2018)

Endocrown indicated in the cases with suitable pulp chamber depth. The cases where posts are contraindicated due to narrow and short canal, the endocrown can be used, as long as adhesion is not certain and there is still tooth remaining structure.(Imen, 2018; Oswal et al., 2018)

Previously our team had conducted numerous clinical trials (Ramamoorthi, Nivedhitha and Divyanand, 2015; Nandakumar and Nasim, 2018; Nasim et al., 2018; Janani, Palanivelu and Sandhya, 2020) and lab animal studies (Teja, Ramesh and Priya, 2018) and in-vitro studies(Ramanathan and Solete, 2015; Noor, S Syed Shihaab and Pradeep, 2016; Kumar and Delphine Priscilla Antony, 2018; Manohar and Sharma, 2018; Ravinthar and Jayalakshmi, 2018; Rajakeerthi and Ms, 2019; Rajendran et al., 2019a; Siddique et al., 2019; Teja and Ramesh, 2019; Jose, P. and Subbaiyan, 2020) over the past 5 years. Now we are focussing on epidemiological surveys. The idea for this survey stemmed from the current interest in our community.Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (Deogade, Gupta and Ariga, 2018; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; Jeevanandan and Govindaraju, 2018; J et al., 2018; Menon et al., 2018; Prabakar et al., 2018; Rajeshkumar et al., 2018, 2019; Vishnu Prasad et al., 2018; Wahab et al., 2018; Dua et al., 2019; Duraisamy et al., 2019; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Gheena and Ezhilarasan, 2019; Malli Sureshbabu et al., 2019; Mehta et al., 2019; Panchal, Jeevanandan and Subramanian, 2019; Rajendran et al., 2019b; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Sharma et al., 2019; Varghese, Ramesh and Veeraiyan, 2019; Gomathi et al., 2020; Samuel, Acharya and Rao, 2020)

Therefore, the aim of this survey was to assess the level of awareness and the current state of knowledge and opinions toward endocrown as one of postendodontic management in practice amongst dental practitioners.

MATERIALS AND METHODS

Study Setting

This cross-sectional study was done among dental interns and practitioners from various institutions in Chennai. A total of 120 participants took part in this survey study.

Study Subjects

A total of 120 dental interns and practitioners took part in this survey

Methodology

A survey was conducted through an online standard questionnaire with 15 multiple choice questions sent via a Google Form application. The questionnaire consisted of questions about the knowledge, awareness, and practice of endocrowns for post endodontic management. Adequate time was provided to fill the questionnaire. The responses of the students were recorded, analyzed for flaws, checked for completeness and were taken up for assessment.

Statistical Analysis

After data was collected and coded, the statistical analysis was done using the IBM SPSS Statistical Software package (Version 20.0). All the frequency tests were carried out and the Chi-square test was done at a significance level.

RESULTS

A total of 120 dental practitioners participated in the study, where all of these dental practitioners include dental students, dental Intern, postgraduate students, faculties, and general practitioners.

When questioned on their awareness on endocrown as post endodontics management in their previous training or experience, the majority of dental practitioners (55.83%) answered 'Yes'. However, 44.17% of dental practitioners answered 'No'. [Figure 1]

When inquired about the indication for endocrowns in endodontics practice, majority believe it is indicating for molars (83.33%), 13.33% believe it is for anterior teeth and the rest, 3.33%, believe it is for canine. [Figure 2]

Assessment in their endocrown cementation materials knowledge, the majority of dental practitioners gave answers as Type 1 GIC (83.33%). Meanwhile for the rest, 9.17% gave answers as Zinc Oxide Eugenol and only 2.5% gave answers as Resin Composite. [Figure 3]

On the other hands, when inquired regarding endocrown fabrication, 82.5% think that endocrown can be fabricated using CAD/CAM technology, 10.83% think fabrication of emdocrown using pressable ceramic technology and the rest, 6.67% think both CAD/CAM and pressable ceramic technology can be used to fabricate endocrown. [Figure 4]

Assessment on clinical application of endocrown for loss of tooth structure gave the following results, 42.5% dental practitioners answered 'loss of three walls', 35.0% answered 'loss of two walls' and only 22.5% answered 'loss of one wall'. [Figure 5]

On questioning of finishline used in endocrown tooth preparation, majority of dental practitioners (80.83%) answered circular buttjoint finishline, 10.0% answered shoulder finish line and 9.17% answered Chamfer finish line. [Figure 6]

Analyzation of their knowledge of endocrown in principle of retention, 64.17% answered adhesive as its main retention source, 21.67% answered pulpal chamber and only 14.17% answered both, adhesive and pulpal chamber as source of retention. [Figure 7]

When questioned about the advantage of endocrown if compared to the conventional crown, majority (56.67%) believed that the endocrown will take minimal time, 25.0% believed that endocrown need minimal preparation, and the rest (18.33%) believed that endocrown is economical in cost. [Figure 8]

When questioned on the disadvantage of endocrown, the majority (80.0%) of dental practitioners gave debonding as their answer. There were also few dental practitioners that answered 'root fracture' (18.33%) and both, debonding and root fracture (1.67%). [Figure 9]

Assessment of dental practitioners' knowledge of whether surface treatment required in endocrown cementation, 85.83% gave 'Yes' as their answer and the rest, 14.17% answered 'No'. [Figure 10]

When the dental practitioner was questioned about the minimum occlusal height reduction in the axial direction for endocrown preparation, the majority of dental practitioners (76.67%) answered 2mm, 17.5% answered 3mm and only 5.83% answered 4mm. [Figure 11]

On a question regarding the ideal endocrown ceramic occlusal thickness, 63.33% dental practitioners answered that the thickness should be between 3mm to 7mm. Meanwhile, 19.17% answered that the occlusal thickness should be less than 3mm and 17.5% answered as thickness should be exactly 4mm. [Figure 12]

When assessing the dental practitioners in their endocrown fabrication knowledge, the majority (84.17%) of dental practitioners answered Monolithic and Zirconia as ceramic used in endocrown fabrication. 10.83% answered Zirconia only and 5.0% answered only Monolithic ceramic. [Figure 13]

On assessment of dental practitioners' knowledge of endocrown preparation, whether ferrule is important in the preparation step, most dental practitioners (88.33%) answered 'Yes' and only 11.67% answered 'No'. [Figure 14]

Based on their experience practising endocrown in their training, 72.5% dental practitioners answered they had never practised endocrown previously and only 27.5% gave feedback they had practiced endocrown. [Figure 15]

Chi-Square test was done to assess the association between awareness of dental practitioners toward endocrown and endocrown practice among dental practitioners, where P-value=0.026, $P<0.05$, which is statistically significant. We can conclude that there is significant association between the awareness of dental practitioners and the endocrown practice among dental practitioners. [Figure 16]

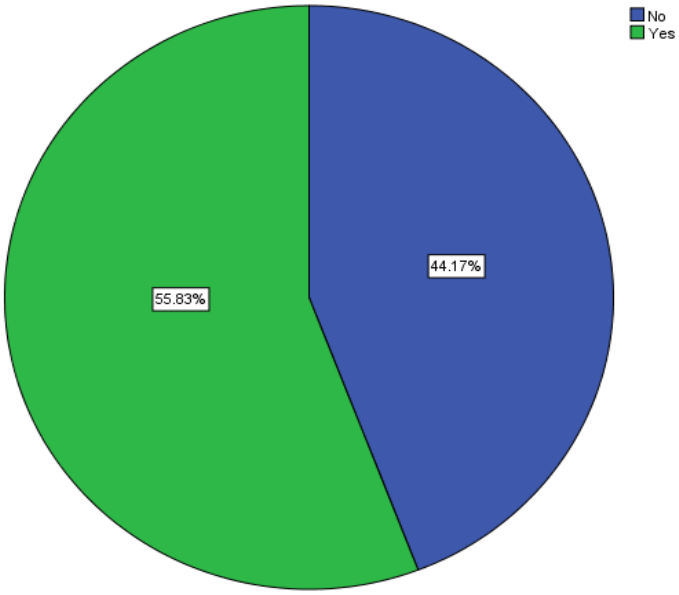

Fig.1: Pie chart representing the percentage distribution of the awareness of endocrown as post endodontics management among general practitioners. Majority of respondents (55.83%) reported that they had heard about the endocrown previously (green colour).

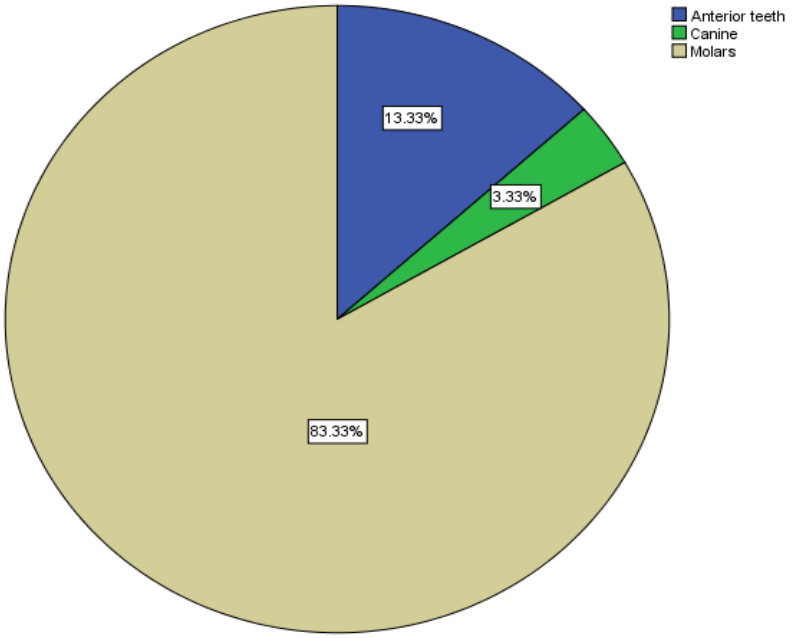

Fig.2: Pie chart representing the percentage distribution of the knowledge about indication for endocrown in endodontics practice. Majority of respondents (83.33%) reported that molars (grey colour) are indications for endocrown.

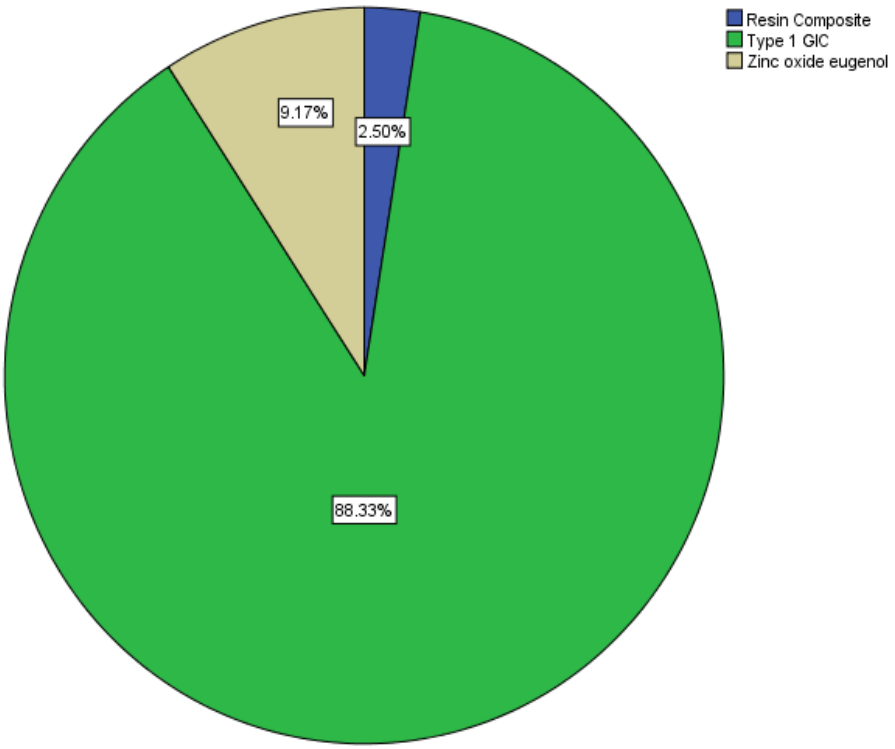

Fig.3: Pie chart representing the percentage distribution of knowledge about the materials used for endocrown cementation. Majority of respondents answered the wrong choice which is Type 1 GIC (green colour) (88.33%).

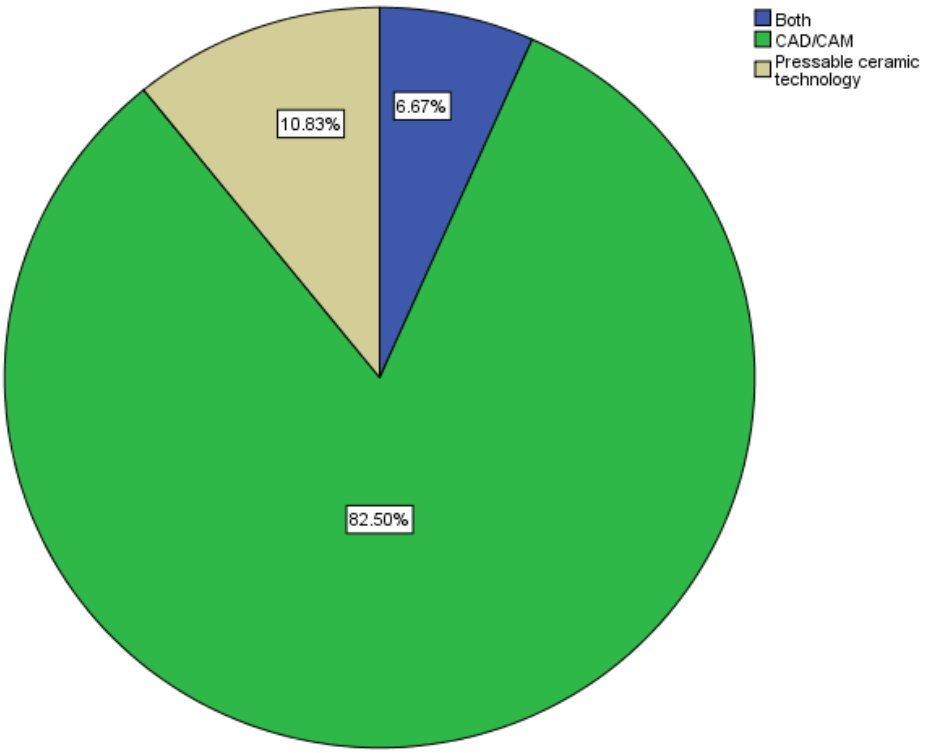

Fig.4: Pie chart representing the percentage distribution of knowledge about endocrown fabrication. Majority of respondents (82.5%) answered CAD/CAM (green colour) as the endocrown fabrication method.

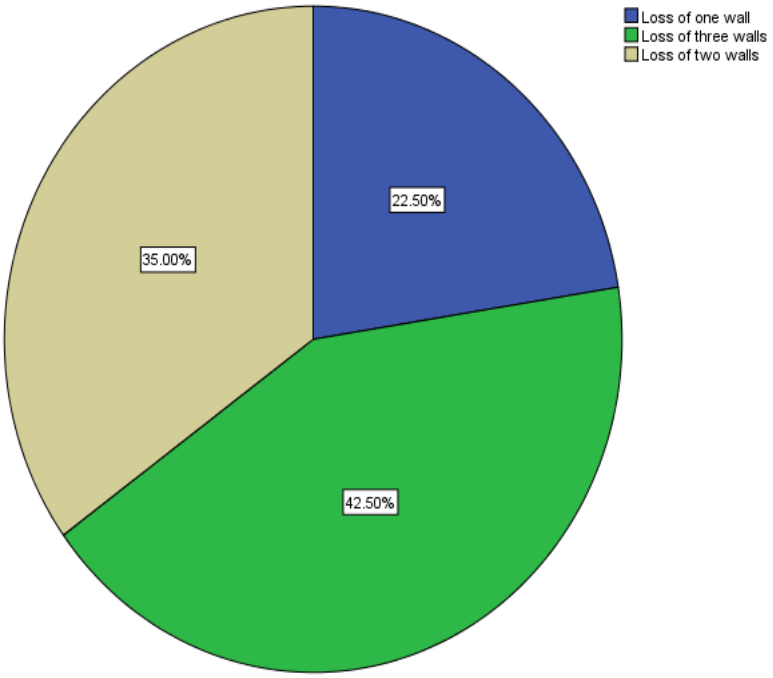

Fig.5: Pie chart representing the percentage distribution of knowledge about the clinical application of endocrown for loss of tooth structure. Majority of respondents (42.5%) answered the loss of three walls (green colour).

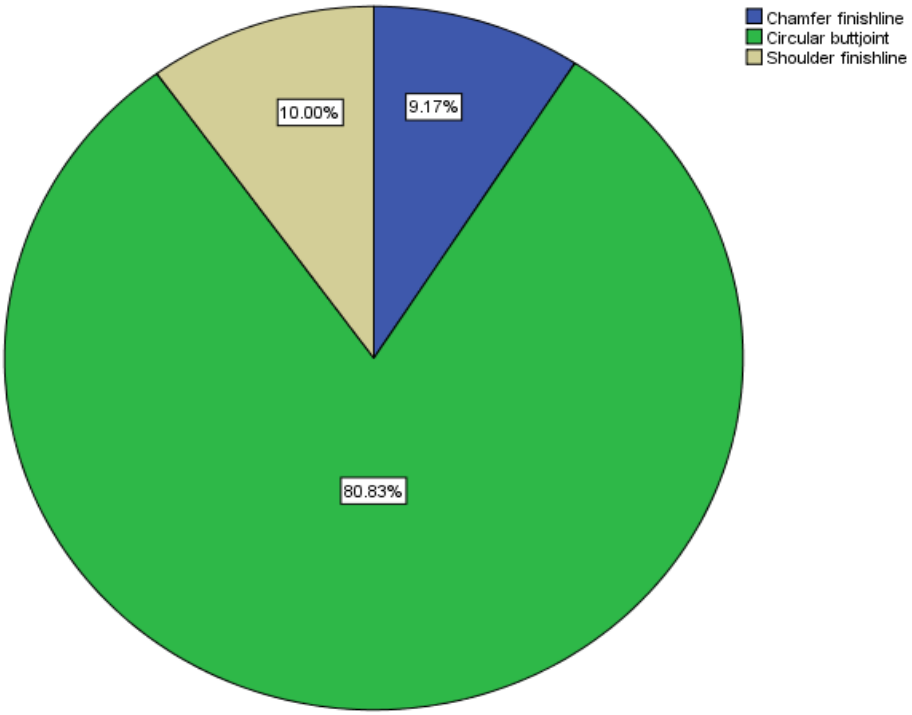

Fig.6: Pie chart representing the percentage distribution of knowledge about the finishline for endocrown tooth preparation. Majority of respondents (80.83%) answered the circular buttjoint as the endocrwon finishline (green colour).

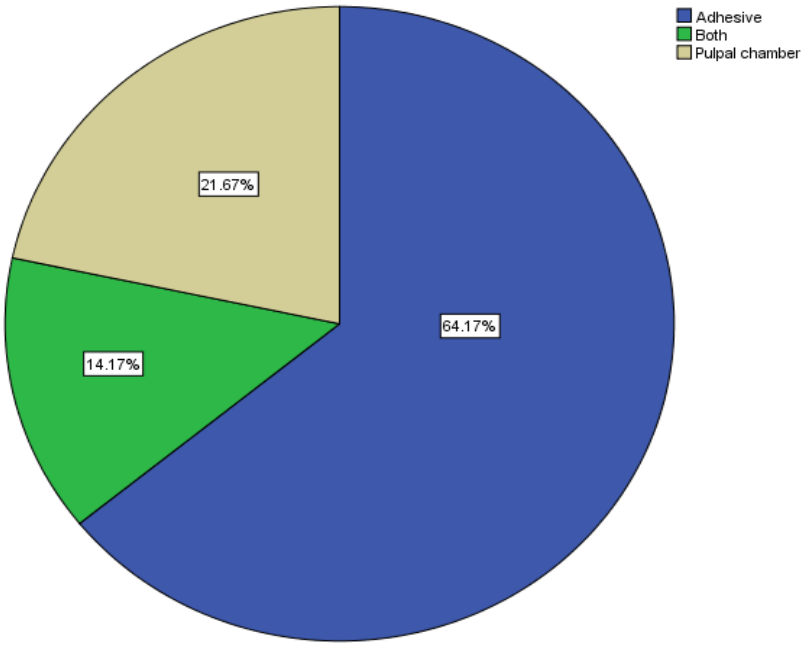

Fig.7: Pie chart representing the percentage distribution of knowledge about the principle of retention for endocrown. Majority of respondents (64.17%) answered adhesive as the principle of retention for endocrown (Blue colour).

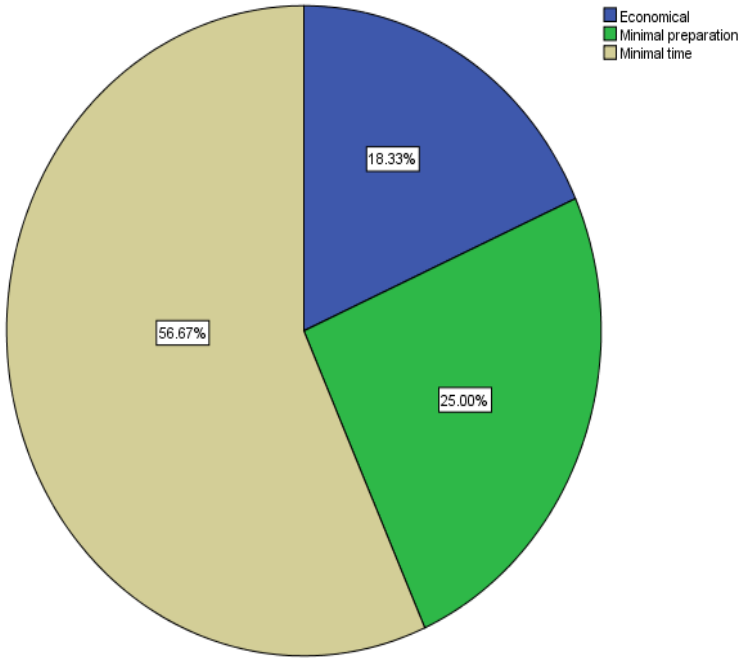

Fig.8: Pie chart representing the percentage distribution of knowledge about the advantage of endocrown if compared to the conventional crown. Majority of respondents (56.67%) answered the minimal time as the advantage of endocrown (grey colour).

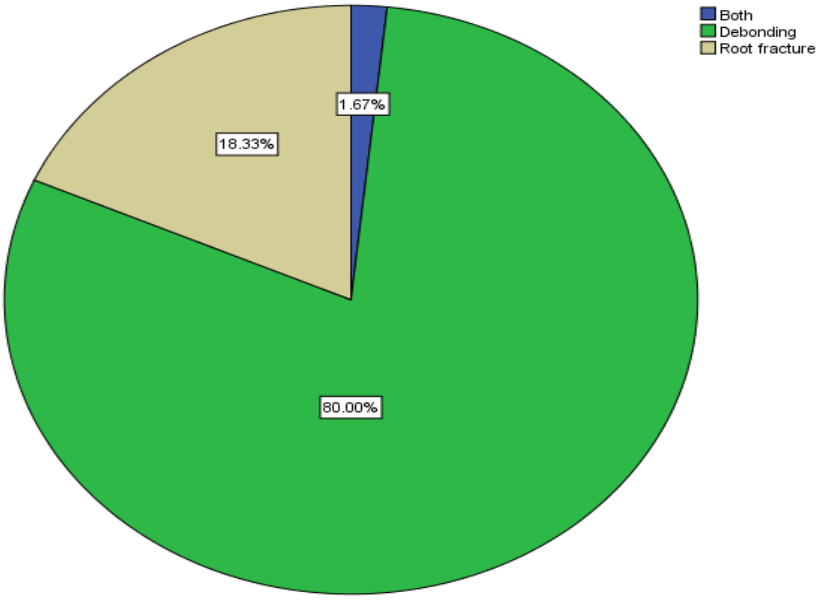

Fig.9: Pie chart representing the percentage distribution of awareness of general practitioners about the disadvantage of endocrown. Majority of respondents (80.00%) answered debonding as the disadvantage of endocrown (green colour).

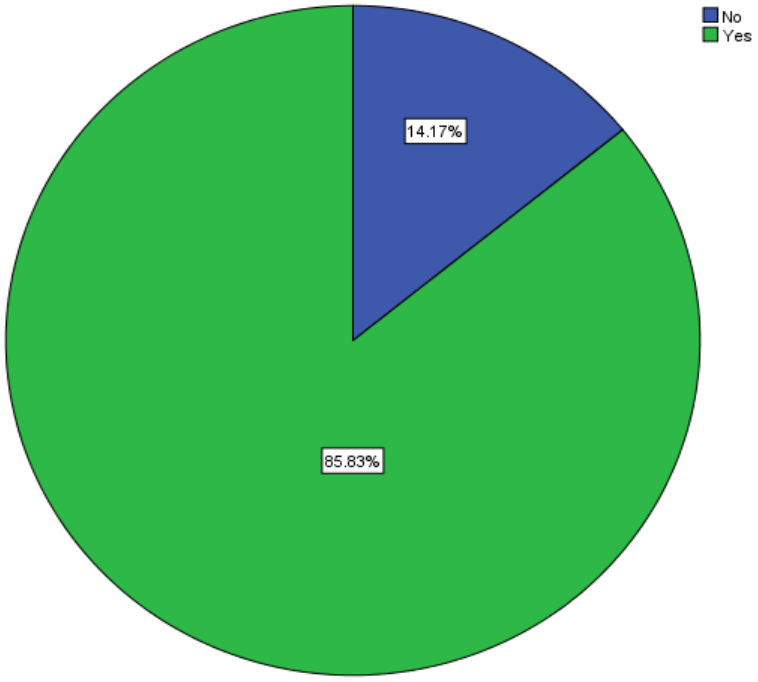

Fig.10: Pie chart representing the percentage distribution of knowledge about the surface treatment required before cementation of endocrown. Majority of respondents (85.83%) believed that the surface treatment is required before endocrown cementation by choosing 'yes'(green colour) as their answer.

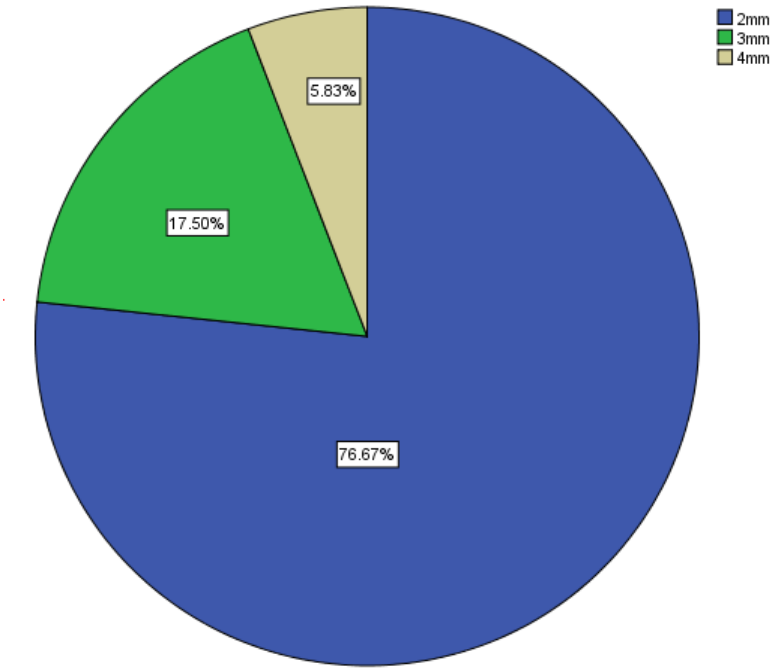

Fig.11: Pie chart representing the percentage distribution of knowledge about the minimum occlusal height reduction in the axial direction for endocrown preparation. Majority of respondents chose the correct answer (76.67%) which is 2mm (blue colour) is the minimum occlusal height reduction needed in the axial direction.

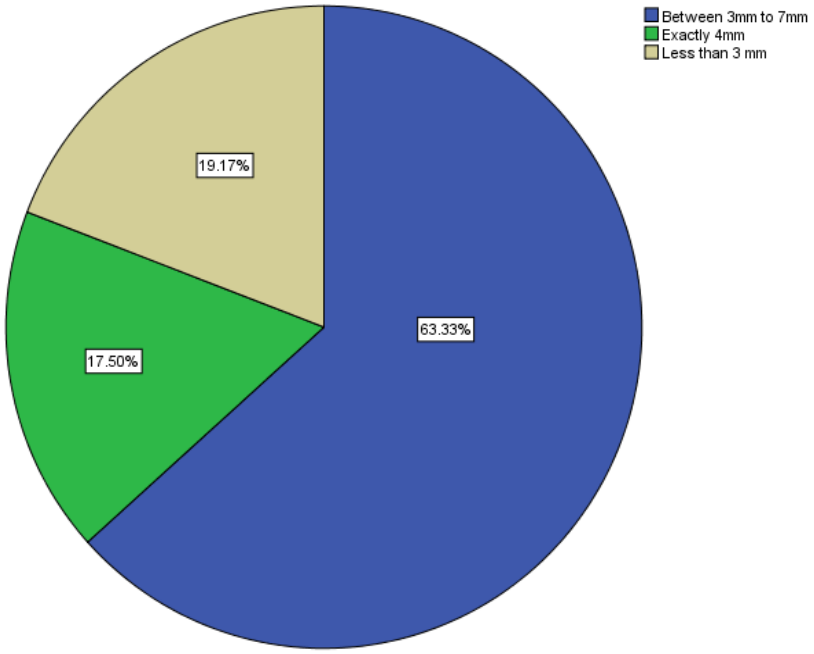

Fig.12: Pie chart representing the percentage distribution of awareness about the ideal endocrown ceramic occlusal thickness. Majority of respondents (63.33%) choose the correct choice of answer which is the ideal occlusal thickness for endocrown ceramic should be between 3mm to 7mm.

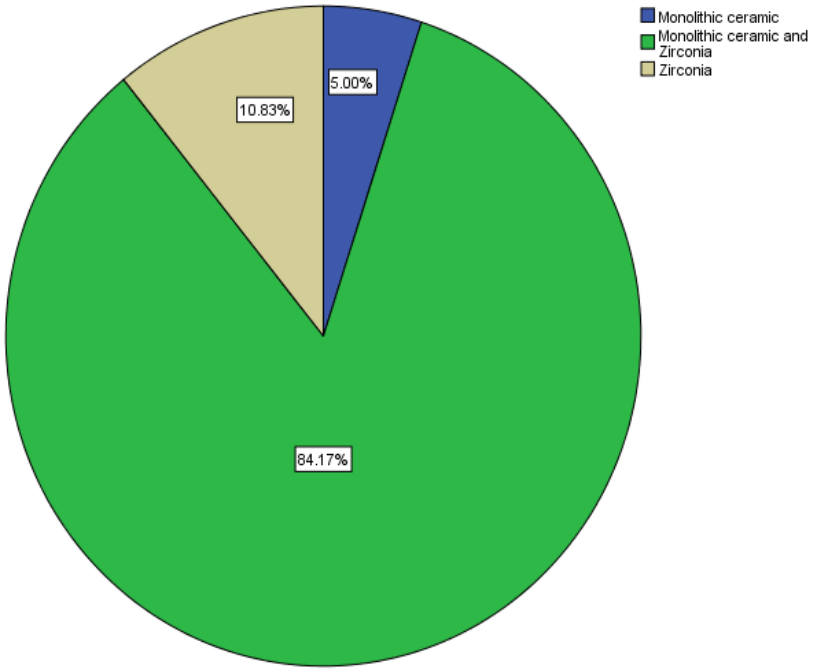

Fig.13: Pie chart representing the percentage distribution of knowledge about the ceramic used in the fabrication of endocrown. Majority of respondents (84.17%) answered the monolithic ceramic and zirconia (green colour).

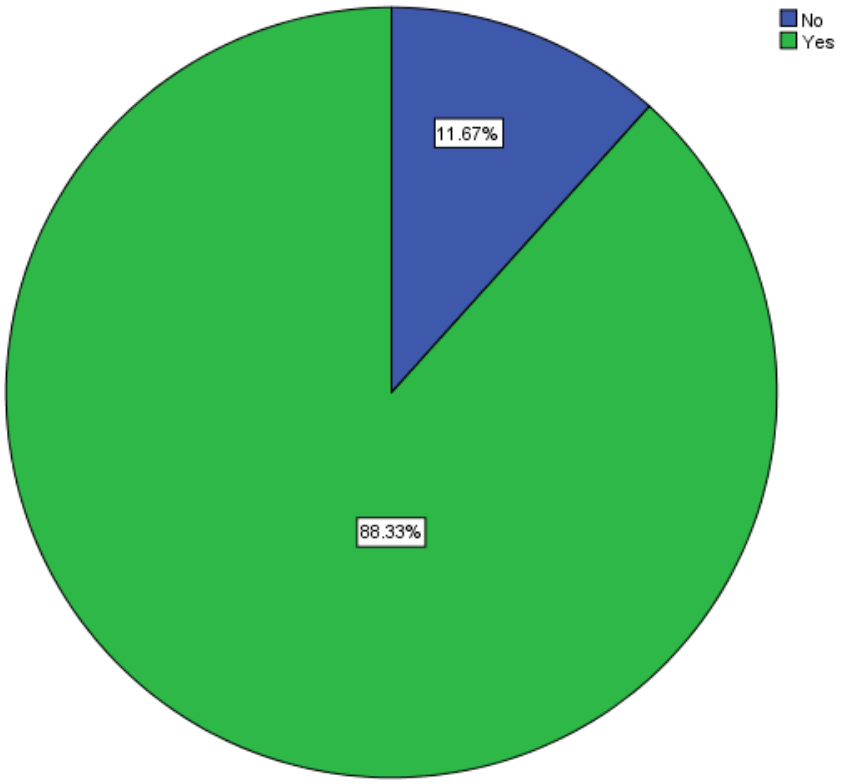

Fig.14: Pie chart representing the percentage distribution of awareness about the use of ferrule in endocrown preparation. Majority of respondents (88.33%) believed that ferrule is important in endocrown preparation by answering "Yes"(Green colour)

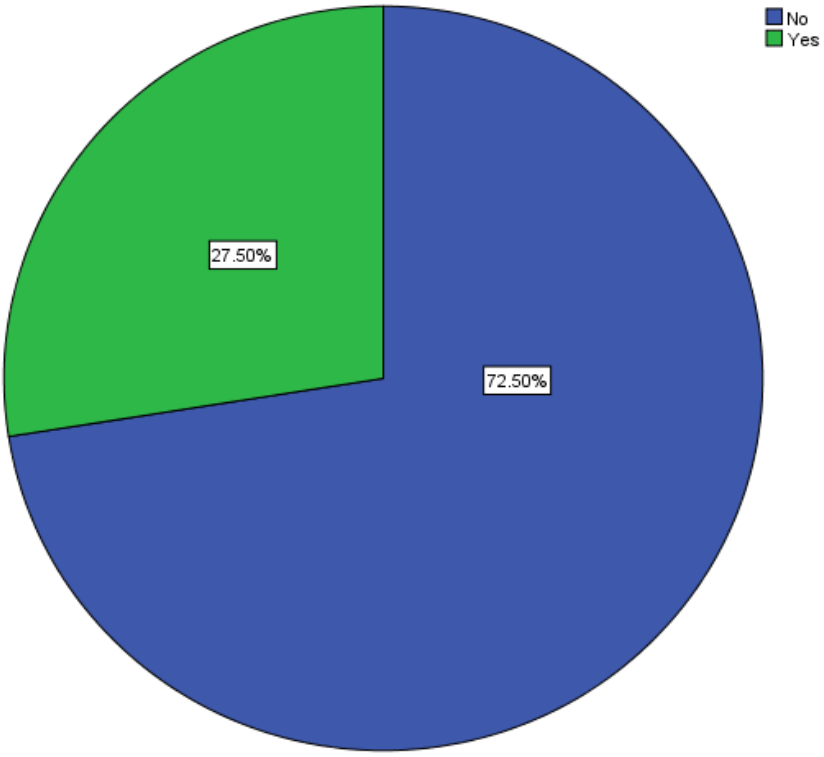

Fig.15: Pie chart representing the percentage distribution of dental practitioner practice on endocrown in their previous training. Majority of respondents (72.5%) reported that do not have any experience in handling endocrown by answering "No" (Blue colour)

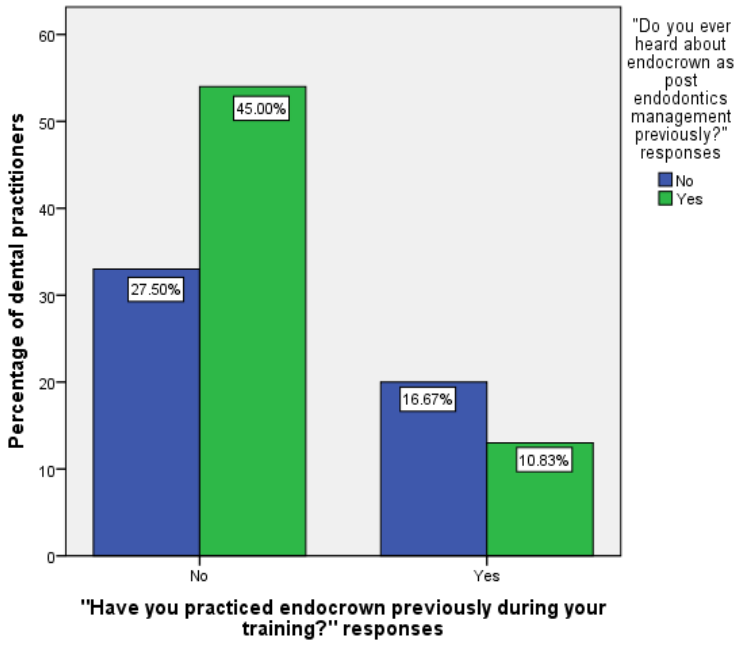

Fig.16: Bar graph denotes association between awareness of dental practitioners toward endocrown and endocrown practice among dental practitioners. X-axis denotes responses of dental practitioners for questions regarding their awareness and practice, and Y-axis denotes the percentage of dental practitioners responded. Majority of dental practitioners (45%)(green colour) give "No" as response for both questions in their awareness and practice of endocrown. Chi-square test shows P=0.026, P<0.05, a significant value. Hence proving that there is significant association between the awareness of dental practitioners and the endocrown practice among dental practitioners.

DISCUSSION

This cross-sectional study was used to assess the level of awareness and the current state of knowledge and opinions toward endocrown as one of postendodontic management in practice amongst dental practitioners.

Based on the current study, the dental practitioners seem to have limited theoretical knowledge and are lacking in clinical practice.

In present study, when inquired about the indication for endocrowns in endodontics practice, majority believe it is indicating for molars. However few had believed it is for anterior teeth and for canine. [Figure 2] In the restoration using endocrown as an option, Sevimli et al. gave suggestion in their review that endocrown can be used as a prosthetic option in endodontically treated teeth in incisors, premolars and excessive tissue loss molars. (Sevimli, Cengiz and Oruç, 2015) However, bindl et al. in their study stated that the small pulp chamber in premolars will limit the adhesive and resin cement bond strength. (Bindl, Richter and Mörmann, 2005) In a clinical report by Lander et al., the different premolar crowns configuration where it has greater height than its width may increase the chance of rupture and displacement.(Lander and Dietschi, 2008) Therefore, the endocrown should be restricted to molars only, especially those with shorter crowns, root canal that is calcified, or narrow canals.(Dogui et al., 2018)

In this study, the assessment of dental practitioners' endocrown cementation materials knowledge showed that the majority of dental practitioners gave answer Type 1 GIC as the cement material of choice. However, there were only a few dental practitioners who gave answers as Resin Composite. [Figure 3] Sevimli et al. in their review suggested that resin composite cement composed of Bis-GMA or UDMA resin matrix and inorganic filler particles are the endocrown cementation materials of choice. When the resin composite compared to the conventional cements, resin composite have increasing use in ceramic cementation, metal or composite indirect restoration due to its excellent in mechanical and aesthetic properties.(McCabe and Walls, 1998; Sevimli, Cengiz and Oruç, 2015)

When questioned on the disadvantage of endocrown, the majority of dental practitioners gave debonding as their answer. There were also few dental practitioners that answered 'root fracture' and both, debonding and root fracture as their answer [Figure 9]. Vaselinovic et al. in their case reports, suggested that endocrowns have disadvantage in debonding. It also have a possibility of root fracture due to the difference in the modulus of elasticity between the hard restoration and soft dentin.(Veselinović et al., 2008)

The assessment of dental practitioners' knowledge of whether surface treatment required in endocrown cementation shows that the majority of dental practitioners know the importance of surface treatment in endocrown. [Figure 10] Dentin surface treatment is done by using the application of 35% to 37% phosphoric acid. The application of phosphoric acid enhances the dentin surface energy, removal of the smear layer and leads to the demineralization of hydroxyapatite crystals surface. The monomers of resin or primer, will infiltrate the water-filled spaces between the collagen fibers. This action will produce a "hybrid layer" in the dentin surface which is composed of resin, collagen, hydroxyapatite and water. The hybrid layer produced will increase the adhesive system micromechanical retention on dentin. Other example of dentin surface treatment used in endocrown are using the 10% hydrofluoric acid (HF), silane coupling, Tribochemical coating and laser treatment.(Zainon, Kassim and Lim, 2019)

There were some limitations that were encountered which includes a limited sample size and a short duration of study time. In the future, to provide an even better outcome, a bigger sample size should be obtained, and a longer duration should be established. Our institution is passionate about high quality evidence based research and has excelled in various fields ((Pc, Marimuthu and Devadoss, 2018; Ramesh et al., 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai et al., 2019; Sridharan et al., 2019; Vijayashree Priyadharsini, 2019; Mathew et al., 2020)

CONCLUSION

Within the limits of the study, dental practitioners commonly have less training and practice in management of post endodontics restoration using endocrown.

In regard to their knowledge, they showed an acceptable level of knowledge and awareness of usage of endocrown as one of post endodontics management.

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