

ASSESSMENT OF KNOWLEDGE, ATTITUDE, PRACTICE BASED SURVEY ON DIGITAL DENTISTRY AMONG DENTAL PRACTITIONERS

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ABSTRACT

The aim of the present survey is to assess the knowledge, attitude and practice regarding the use of digital dentistry in endodontics among practitioners. Questionnaire based survey comprising 15 questions divided into knowledge based, attitude based and practice based questions. The questionnaire was circulated via electronic media through mails. 218 responses were received from the respondents. On analyzing the responses to the questionnaire, it was found that the most of the practitioners were looking forward towards use of digital dentistry based procedures. Highly significant values were obtained when statistical analysis was done about the question pertaining to this trend for better clinical outcome with [p Value = 0.001], Other relevant facts being, Titanium Oxide powder is used with CEREC System with [p Value = 0.038], which was statistically significant. Within the limitations of the study, it shows that the knowledge with respect to digital dentistry based procedures is moderate compared to attitude and practice among respondents. The survey revealed that most of the participants were looking forward to enhance their knowledge and skills in the field of CAD-CAM.

Key words: Applications of digital dentistry procedures; CAD-CAM; Endodontics; KAP survey; Zirconia in dentistry

INTRODUCTION

Mormann was the one who introduced the first commercially designed CAD CAM system within the year 1985 (Mormann *et al.*, 1990) and gave the name of CEREC to it system. He fabricated an inlay from a ceramic block after taking a digital impression from an intra oral camera (Patzelt *et al.*, 2014). That was a bit easy as compared to requiring the impression of a prepared abutment tooth. Now this technique is getting used everywhere across all varied fields of dentistry successfully for the fabrication of crowns, inlays, onlays etc. Dr Andersson developed the Procera system (Kokubo *et al.*, 2009) within the mid-1980s and worked on titanium as a substitute for nickel chromium alloys. Previously, gold alloys were getting used, but thanks to increase in prices of gold, people had to consider substitutes. Dr Andersson came up with titanium because allergies were reported with nickel chromium (Hildebrand, Veron and Martin, 1989).

CEREC 2 was introduced in 1994 by Siemens. This method was supported by two dimensional principles and capable of manufacturing inlay, onlay, veneers (Ravinthar and Others, 2018), partial and full crowns and copings. Currently 3rd generation of CEREC is in use, which is capable of manufacturing inlay, onlay, veneers (Jose, P. and Subbaiyan, 2020), partial & full crowns, copings likewise as virtual automatic occlusal adjustment through the software. This method was introduced by Sirona in 2005 ('Spectacular impression made by DentsplySirona', 2019). This technique is largely the advanced variety of CEREC 3 (Nakamura et al., 2003) which was earlier introduced in 2000 by Sirona but that system worked on two dimensional principles and wasn't ready to provide virtual automatic occlusal adjustments.

There are various applications of Digital dentistry systems in endodontics which are for fabrication of Crown and Bridge, fabrication of Inlays/Onlays, fabrication of Veneers (Nandakumar and Nasim, 2018). These systems are also used for fabrication of Clear Aligners in Orthodontics, fabrication of surgical guides for implants, fabrication of MaxilloFacial Prosthesis, for fabrication of Endocrowns. In recent time they are also used for assessing the root canal configuration through CBCT (Ramanathan and Solete, 2015).

The CAD-CAM systems are few in number which have gained substantial popularity. They offer better restoration fabrication as compared to dental composites (Hussain et al., 2018). The most common of these is the CEREC system which stands for ChairSide Economical Restoration for Esthetics Ceramics. The CEREC system is used with ceramic and composite blocks. This system has an automatic as well as a manual mode. The CEREC system is unknown to have a feature called as the biogeneric copy (Arslan et al., 2015). This biogeneric copy involves the replication of the exact tooth structure as compared to the natural pre existing tooth as this does not create laboratory based errors and the resultant crown perfectly fits well. The CEREC system uses the titanium oxide powder (Shearer, Heymann and Wilson, 1993) which is the main component of the Titanium oxide powder.

The E4D system is an innovation by D4D technologies, uses the red laser light camera, and E4D liquid instead of TiO₂ powder. Dentalogic Software uses a minimum nine separate images. It is used for cone scanning, this system is also having the feature of bite registration technique. (Harsono et al., 2013).

Lava-Os system - Only system with video capturing technology, it uses active wavefront sampling 3D glasses are available. The Field of view of this system is 10mm X 13.5 mm. Can easily record most posterior distal teeth also and this system has got an auto stop feature where the sensor stops capturing the tooth if the sensor is at a distance of 15 mm from the tooth. (Vafaei et al., 2016)

The CAD-CAM system plays a significant role in delivering the restorations like inlay or onlay that have better fit and are processed faster. The ideal output time in the delivery of the restoration of the CEREC system is near one hour under ideal conditions

The major challenge of the CAD-CAM systems in the field of dentistry is the cost effectiveness as these systems are not economical to use by the operator and the cost factor is on the higher side as experienced by the patient. CAD - CAM systems have definitely uplifted the efficiency of the manufacturing of the restorations and the crown and ensured the and ensured through better prognosis of root canal. This has improved the success rate of endodontics. The aim of this survey was to assess the knowledge, attitude and practice of digital dentistry procedures in endodontics among endodontists, postgraduate students in endodontics and general practitioners.

MATERIALS AND METHODS

The survey was conducted in May 2020 among General dentists, PG students in endodontics, Endodontists to assess the knowledge, attitude and practice regarding the use of digital dentistry in

endodontics. This questionnaire based survey consisted of 15 questions with multiple choice. The questionnaire was divided into demographic data, knowledge based and attitude based. The questionnaire was circulated via electronic media through mail. The collected data was converted into excel sheets. Bar graphs and pie charts were used for pictorial representation of the result of the study.

RESULTS AND DISCUSSION

Our survey revealed the following relevant information. 218 responses were received from the respondents. Among the 218 responses received from the participants, 51.4% were from post graduate students, 48.6% were from non specialists which included general practitioners and undergraduate students. Majority of participants were from the age group of 25 - 30 years at 49.1% followed by participants of the age group of 30 - 40 years at a percentage of 27.5%. The results obtained after applying the Chi square tests show no statistically significant difference [$p > 0.05$] [Table 1]

Most of the participants were aware about the CAD-CAM technology. Chi square tests show no statistical significant difference [$p > 0.05$] [Figure 1]. The participants further responded that the CEREC system is the first CAD CAM design. Participants responded that the LAVA OS is the second most common device. CEREC stands for Chairside Economical Restoration of Esthetic Ceramics (Ritter, 2017). Chi square test showed [$p > 0.05$] which was statistically not significant [Figure 2]

When the respondents were asked whether they were aware of the modern upcoming intraoral scanners which take impressions of the arch digitally through the sensor system, it was revealed that most of the participants were aware of these modern intraoral scanners [Figure 3]. These scanners play a significant role in taking the arch impression more accurately. The only challenge faced by the operator is that subgingival margins are difficult to record. (Bindl and Mörmann, 1999)

The participants believed that the CEREC system has intraoral camera while the review of literature suggests that the video based intra oral camera is associated with the use of the LAVA OS system (Bhambhani, Bhattacharya and Sen, 2013). Chi square test showed [$p > 0.05$] which was statistically not significant [Figure 4]. On asking the respondents that Titanium Oxide powder is used with which CAD-CAM system the respondents revealed that it was mostly with the CEREC system (Shearer, Heymann and Wilson, 1993) The statistical analysis revealed that the findings were statistically significant with a p value of 0.038. [Figure 5]

One of the latest innovative products for use in CAD-CAM which is basically a combination of nanosized silica particles and zirconia is called LAVA ULTIMATE (Krejci and Daher, 2017). This product offers adequate strength and as the particles are nanosized it offers great sculptability and life. Most of the respondents were aware of this fact. Chi square test showed [$p > 0.05$] which was statistically not significant [Figure 6]

Most of the respondents wanted to recommend the digital dentistry systems for better clinical outcome. The statistical analysis revealed a highly significant outcome with $p = 0.001$. The digital dentistry systems offer better control over the treatment outcomes and save the time of the operator [Figure 7]

The respondents were also aware of the various kinds of restorations build through CAD-CAM devices [Figure 8]. Out of fabrication of Inlay/Onlay, Crowns, and Endocrown, the majority of participants responded to the fact that the most common restoration fabricated through the CAD-CAM devices was the Crown, followed by Endocrown and Inlay and Onlays. The results obtained show statistically significant difference between the variables [$p < 0.05$] [Figure 9]. Most of the participants revealed the fact that CEREC II (Estafanet *al.*, 2003) was the most commonly used CAD-CAM device in their area of practice, which was followed by the option of CEREC [Figure 10]. The statistical analysis revealed that no significant differences observed [$p > 0.05$]. Most of the participants wanted to recommend CAD-CAM for taking digital impressions [Figure 11]. Most of the participants were willing to attend the CDE program in order to keep them well informed about digital dentistry procedures [$p < 0.05$] [Figure 12].

The advantages of the CAD-CAM technology are as follows. CAD-CAM procedures give the advantage of recently developed material used as many high strength based materials for fabrication of FPDs are difficult to process using conventional dental laboratory. CAD-CAM procedures give the advantage better time effectiveness, reduced labour and better quality control. A digital impression reduces the inconvenience of the patient during the impression taking procedure with the help of conventional trays and is much more accurate and can be replicated multiple times. Modern CAD-CAM devices make the treatment outcomes successful in challenging procedures like that of Guided endodontic access.

However, there are certain limitations of CAD-CAM devices. One of the eminent limitation is that the functional device is costly. The learning curve involved is greater which involves a lot of time of the operator to get skilled with this highly sensitive technology. The subgingival capturing of the margin (Trost, Stines and Burt, 2006) is an issue as it is not done efficiently by the CAD-CAM systems. Also unlike composite materials (Ramírez-Sebastià *et al.*, 2013) the repair of the restoration if fractured is not possible, it has to be fabricated again. The maintenance cost of these devices is very high. One more challenge faced by the operator is that the technology of the CAD-CAM devices keeps constantly updating so upgrades are required which are expensive. Shade matching (Abou-Steit, ElGuindy and Zaki, 2019) of the ceramic blocks is a critical challenge faced by the operator hence better shade matching skill is required by the operator. The restoration made from the CAD-CAM devices has an overcontoured proximal part which is a challenge with the placement of restoration in inlay based cavities like that of Inlay Class 2 restorations with MO or DO.

Numerous molecular studies (Teja, Ramesh and Priya, 2018), clinical trials (Ramamoorthi, Nivedhitha and Divyanand, 2015)(Janani, Palanivelu and Sandhya, 2020)(Kumar and Antony, 2018), studies on material science (Teja and Ramesh, 2019)(Siddique *et al.*, 2019)(Noor, S Syed Shihaab and Pradeep, 2016), in vitro studies (Rajendran *et al.*, 2019)(Nandakumar and Nasim, 2018), surveys (Manohar and Sharma, 2018)(R, Rajakeerthi and Ms, 2019), etc. have been conducted by our team, previously, hence we decided to focus on Surveys.

Surveys help in assessing the level of knowledge attained by the practitioners/participants and also enables the researchers to reach a wider group of population and assess the awareness, knowledge and practice of the practitioners especially regarding the recent advancements in the field of dentistry.

The limitations of our survey are that it is confined to a smaller number of respondents, cannot be generalized to a large population. Also web based surveys are inaccessible to challenging respondents who may lack access to the survey. Sometimes sampling errors arise due to online surveys and open ended questions and responses might lead to interviewer bias. In future, a larger population, particularly for a certain speciality/age/ experience group among dentists should be studied.

CONCLUSION

The most frequent applications of CAD-CAM in Endodontics are for crown fabrication, fabrication of inlays and onlays and fabrication of endocrowns. However there are also certain potential limitations of CAD-CAM which the clinician should keep in mind while practicing in a clinical set up.

This survey was done to assess the knowledge, attitude and practice regarding the usage of digital dentistry procedures in Endodontics. This survey enables the reader to get a better understanding of the precise and indispensable usage of CAD-CAM based devices in Endodontic practice. Within the limitations of the study, it shows that knowledge with respect to Digital dentistry procedures in endodontics is moderate, compared to attitude and practice among respondents. It is recommended that CDE programs can be conducted for dentists to increase their awareness and to gain more knowledge about the usage of further upcoming Digital dentistry procedures in Endodontic practice.

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AUTHOR CONTRIBUTIONS

All authors contributed equally for the study.

CONFLICTS OF INTEREST

Nil

REFERENCES

- [1] Abou-Steit, S., ElGuindy, J. and Zaki, A. (2019) 'Evaluation of patient satisfaction and shade matching of Vita Suprinity versus lithium disilicate (E-max) ceramic crowns in the esthetic zone: a randomized controlled clinical trial', *F1000Research*, p. 371. doi: 10.12688/f1000research.18337.1.
- [2] Arslan, Y. et al. (2015) 'Evaluation of biogeneric design techniques with CEREC CAD/CAM system', *The journal of advanced prosthodontics*, 7(6), pp. 431–436.
- [3] Bhambhani, R., Bhattacharya, J. and Sen, S. K. (2013) 'Digitization and its futuristic approach in prosthodontics', *Journal of Indian Prosthodontic Society*, 13(3), pp. 165–174.
- [4] Bindl, A. and Mörmann, W. H. (1999) 'Clinical evaluation of adhesively placed Cerecendocrowns after 2 years--preliminary results', *The journal of adhesive dentistry*, 1(3), pp. 255–265.
- [5] Estafan, D. et al. (2003) 'Scanning electron microscope evaluation of CEREC II and CEREC III inlays', *General dentistry*, 51(5), pp. 450–454.
- [6] Harsono, M. et al. (2013) 'Evolution of chairside CAD/CAM dentistry', *Texas dental journal*, 130(3), pp. 238–244.
- [7] Hildebrand, H. F., Veron, C. and Martin, P. (1989) 'Nickel, chromium, cobalt dental alloys and allergic reactions: an overview', *Biomaterials*, 10(8), pp. 545–548.
- [8] Hussainy, S. N. et al. (2018) 'Clinical performance of resin-modified glass ionomer cement, flowable composite, and polyamory -modified resin composite in noncarious cervical lesions: One-year follow-up', *Journal of conservative dentistry: JCD*, 21(5), pp. 510–515.
- [9] Janani, K., Palanivelu, A. and Sandhya, R. (2020) 'Diagnostic accuracy of dental pulse oximeter with customized sensor holder, thermal test and electric pulp test for the evaluation of pulp vitality: an in vivo study', *Brazilian Dental Science*, 23(1), p. 8.
- [10] Jose, J., P., A. and Subbaiyan, H. (2020) 'Different Treatment Modalities followed by Dental Practitioners for Ellis Class 2 Fracture – A Questionnaire-based Survey', *The Open Dentistry Journal*, pp. 59–65. doi: 10.2174/1874210602014010059.
- [11] Kokubo, Y. et al. (2009) 'Clinical evaluation of ProceraAllCeram crowns in Japanese patients: results after 5 years', *Journal of oral rehabilitation*, 36(11), pp. 786–791.
- [12] Krejci, I. and Daher, R. (2017) 'Stress distribution difference between Lava Ultimate full crowns and IPS e.max CAD full crowns on a natural tooth and on tooth-shaped implant abutments', *Odontology / the Society of the Nippon Dental University*, 105(2), pp. 254–256.
- [13] Kumar, D. and Antony, S. (2018) 'Calcified Canal and Negotiation-A Review', *Research Journal of Pharmacy and Technology. A & V Publications*, 11(8), pp. 3727–3730.
- [14] Manohar, M. P. and Sharma, S. (2018) 'A survey of the knowledge, attitude, and awareness about the principal choice of intracanal medicaments among the general dental practitioners and nonendodontic specialists', *Indian journal of dental research: official publication of Indian Society for Dental Research*, 29(6), pp. 716–720.

- [15] Mormann, W. H. et al. (1990) 'CAD-CAM ceramic inlays and onlays: a case report after 3 years in place', *Journal of the American Dental Association*, 120(5), pp. 517–520.
- [16] Nakamura, T. et al. (2003) 'Marginal and internal fit of Cerec 3 CAD/CAM all-ceramic crowns', *The International journal of prosthodontics*, 16(3), pp. 244–248.
- [17] Nandakumar, M. and Nasim, I. (2018) 'Comparative evaluation of grape seed and cranberry extracts in preventing enamel erosion: An optical emission spectrometric analysis', *Journal of conservative dentistry: JCD*, 21(5), pp. 516–520.
- [18] Noor, S. S. S. E., S Syed Shihaab and Pradeep (2016) 'Chlorhexidine: Its properties and effects', *Research Journal of Pharmacy and Technology*, p. 1755. doi: 10.5958/0974-360x.2016.00353.x.
- [19] Patzelt, S. B. M. et al. (2014) 'Accuracy of full-arch scans using intraoral scanners', *Clinical oral investigations*, 18(6), pp. 1687–1694.
- [20] Rajendran, R. et al. (2019) 'Comparative Evaluation of Remineralizing Potential of a Paste Containing Bioactive Glass and a Topical Cream Containing Casein Phosphopeptide-Amorphous Calcium Phosphate: An in Vitro Study', *PesquisaBrasileiraemOdontopediatria e ClínicaIntegrada*, pp. 1–10. doi: 10.4034/pboci.2019.191.61.
- [21] Ramamoorthi, S., Nivedhitha, M. S. and Divyanand, M. J. (2015) 'Comparative evaluation of postoperative pain after using endodontic needle and EndoActivator during root canal irrigation: A randomised controlled trial', *Australian endodontic journal: the journal of the Australian Society of EndodontologyInc*, 41(2), pp. 78–87.
- [22] Ramanathan, S. and Solete, P. (2015) 'Cone-beam Computed Tomography Evaluation of Root Canal Preparation using Various Rotary Instruments: An in vitro Study', *The journal of contemporary dental practice*, 16(11), pp. 869–872.
- [23] Ramírez-Sebastià, A. et al. (2013) 'Composite vs ceramic computer-aided design/computer-assisted manufacturing crowns in endodontically treated teeth: analysis of marginal adaptation', *Operative dentistry*, 38(6), pp. 663–673.
- [24] Ravinthar, K. and Others (2018) 'Recent Advancements in Laminates and Veneers in Dentistry', *Research Journal of Pharmacy and Technology. A & V Publications*, 11(2), pp. 785–787.
- [25] Ritter, A. V. (2017) *Sturdevant's Art & Science of Operative Dentistry - E-Book*. Elsevier Health Sciences.
- [26] R, R., Rajakeerthi, R. and Ms, N. (2019) 'Natural Product as the Storage medium for an avulsed tooth – A Systematic Review', *Cumhuriyet Dental Journal*, pp. 249–256. doi: 10.7126/cumudj.525182.
- [27] Shearer, A. C., Heymann, H. O. and Wilson, N. H. (1993) 'Two ceramic materials compared for the production of CEREC inlays', *Journal of dentistry*, 21(5), pp. 302–304.
- [28] Siddique, R. et al. (2019) 'Qualitative and quantitative analysis of precipitate formation following interaction of chlorhexidine with sodium hypochlorite, neem, and tulsi', *Journal of conservative dentistry: JCD*, 22(1), pp. 40–47.
- [29] 'Spectacular impression made by DentsplySirona' (2019) *BDJ Team*, 6(5), pp. 26–26.
- [30] Teja, K. V. and Ramesh, S. (2019) 'Shape optimal and clean more', *Saudi Endodontic Journal. Medknow Publications and Media Pvt. Ltd.*, 9(3), p. 235.
- [31] Teja, K. V., Ramesh, S. and Priya, V. (2018) 'Regulation of matrix metalloproteinase-3 gene expression in inflammation: A molecular study', *Journal of conservative dentistry: JCD*, 21(6), pp. 592–596.

- [32] Trost, L., Stines, S. and Burt, L. (2006) ‘Making informed decisions about incorporating a CAD/CAM system into dental practice’, Journal of the American Dental Association , 137 Suppl, p. 32S–36S.
- [33] Vafae, F. et al. (2016) ‘Comparative Evaluation of Flexural Strength of 2 Nanoceramic Composite Resin CAD/CAM Blocks (Lava Ultimate and Vita Enamic) and a Lithium Disilicate Glass Ceramic (IPS e.max CAD)’, Scholars Journal of Dental Sciences, pp. 210–214. doi: 10.21276/sjds.2016.3.7.5.

TABLES AND GRAPHS

Demographic variables	Categories	No. of respondents	Percentage%
Age(years)	Below 25 yrs	108	22
	25 - 30 yrs	59	49.1
	30 - 40 yrs	59	27.5
	Above 40 yrs	3	1.4
Field of practice	Non Specialist	106	48.6
	Specialist	112	51.4

Table 1: Showing Demographic Data of participants, shows the distribution of respondents based on age and the field of practice. General practitioners (Non specialist), post graduates students and completed (Specialist).

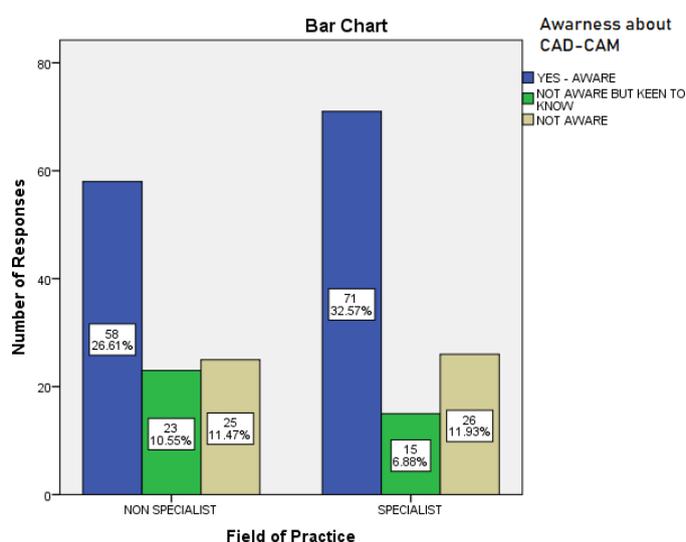


Figure 1: Bar graph showing the association between the field of practice of the participants and responses to the question of whether they are aware of CAD-CAM technology or not. X axis denotes the field of practice, Y axis denotes the number of respondents. Most of the participants are aware of CAD-CAM technology. In this graph, most of the specialist and the non specialist chose the response “yes and

aware”(Blue) colour. Chi square test shows no statistical difference in the responses between specialists and the non specialists [Pearson Chi square p value=0.240,(p>0.05)].

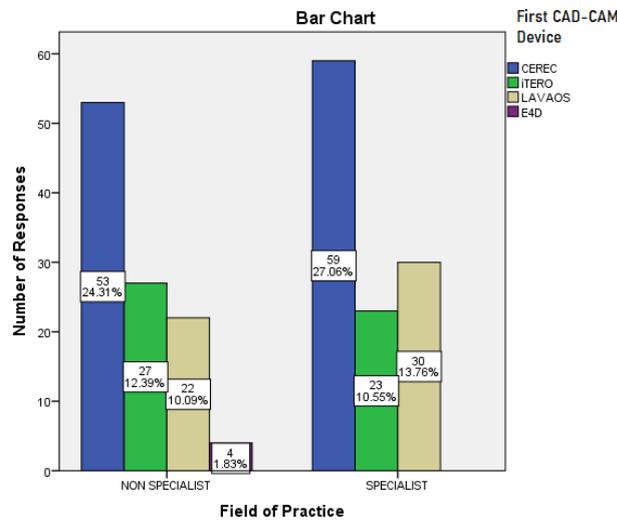


Figure 2: Bar graph showing the association between the field of practice of the participants and responses to the question of which is the first CAD-CAM device. X axis denotes the field of practice, Y axis denotes the number of respondents. Most of the respondents from specialists and non specialists are aware that CEREC (Blue) was the first to be introduced. Chi square test shows no statistical significant difference in the responses between specialists and the non specialists [Pearson Chi square, p value=0.127 (p > 0.05)].

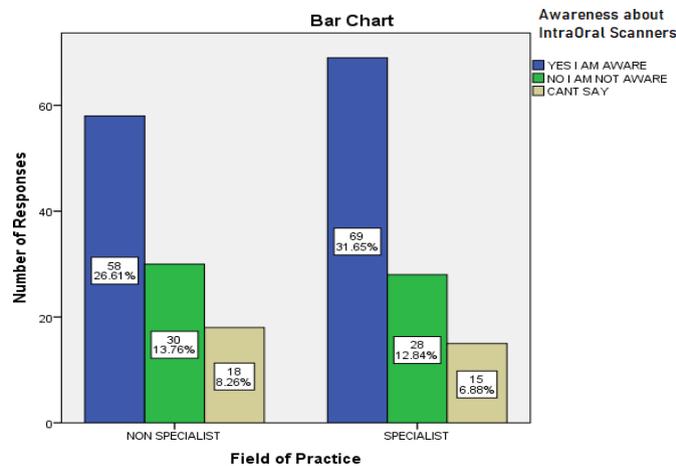


Figure 3: Bar graph showing the association between the field of practice of the participants and responses to the question that whether they are aware of intra oral scanners. X axis denotes the field of practice, Y axis denotes the number of respondents. Most of the respondents chose the option ‘yes i am aware’ (Blue). Chi square test shows no statistical significant difference seen in the responses between specialists and the non specialists [Pearson Chi square p value=0.568. [p > 0.05], most of them aware of intra oral scanners.

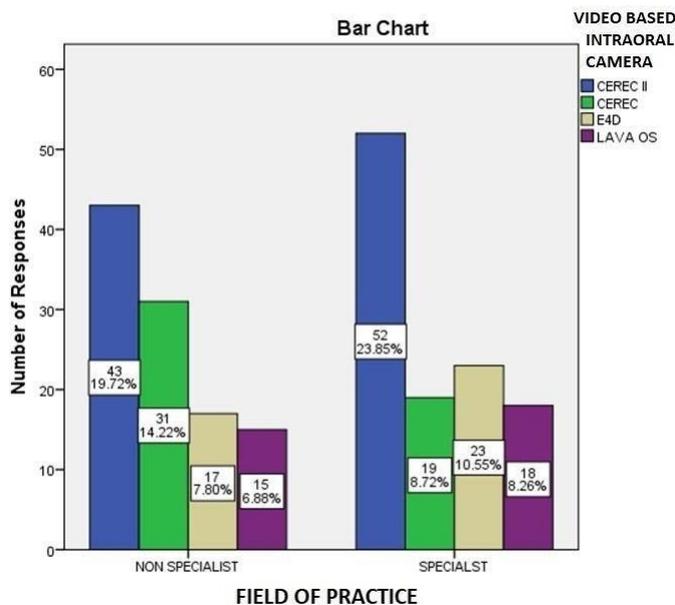


Figure 4: Bar graph showing the association between the field of practice of the participants and responses to the question that which smile design has intra oral camera. X axis denotes the field of practice, Y axis denotes the number of respondents. Most of the respondents chose the option ‘CEREC II’ (Blue colour). Chi square test shows no statistical significant difference in the responses between specialists and the non-specialists [Pearson Chi square p value = 0.192 [p > 0.05], as all of them are aware of video based intraoral camera.

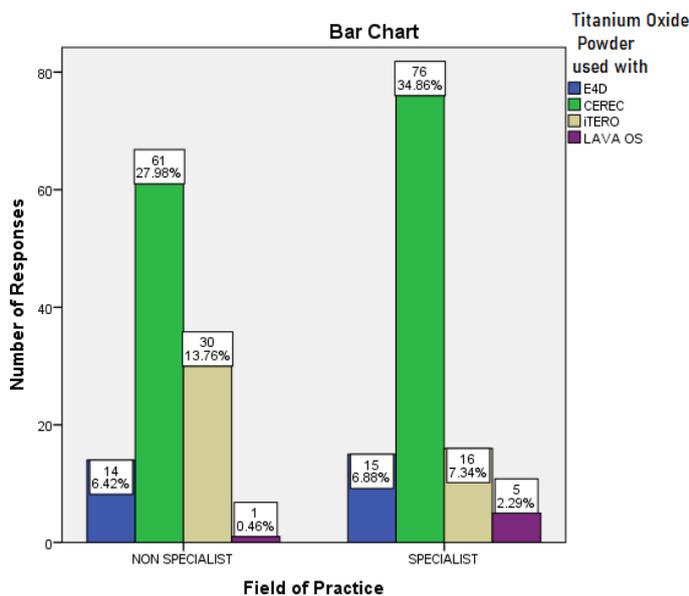


Figure 5: Bar graph showing the association between the field of practice of the participants and responses to the question that Titanium Oxide powder is used in which CAD-CAM system. X axis denotes the field of practice, Y axis denotes the number of respondents. Most of the respondents from specialists chose the option ‘CEREC’ (Green colour). Chi square test shows a statistically significant difference in the responses between specialists and the non specialists [Pearson Chi square p value = 0.038. (p < 0.05)].

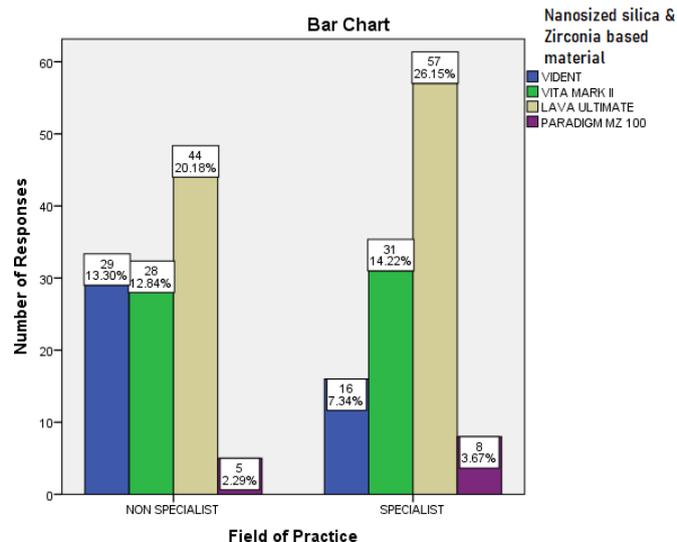


Figure 6: Bar graph showing the association between the field of practice of the participants and responses to the question that which is latest nanosized silica and zirconia based revolutionary material used with CAD-CAM devices. X axis denotes the field of practice, Y axis denotes the number of respondents. Most of the respondents chose the option 'LAVA ULTIMATE (Brown colour). Chi square test shows a statistically no significant difference in the responses between specialists and the non specialists [Chi square p value = 0.106. ($p > 0.05$)]

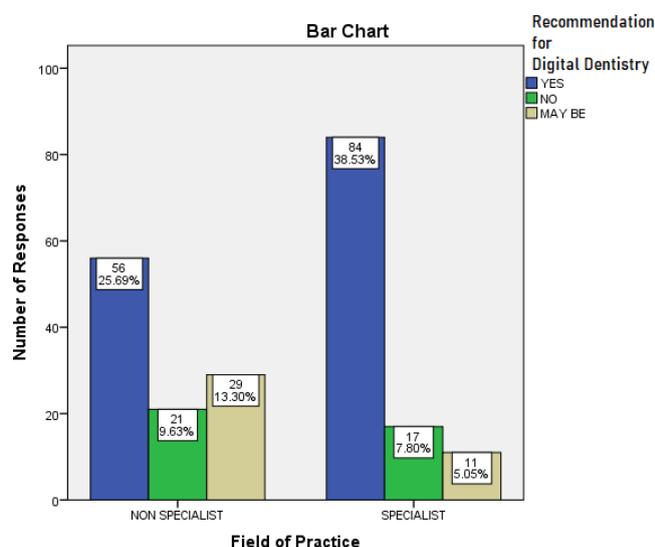


Figure 7 : Bar graph showing the association between the field of practice of the participants and responses to the question that which system would they recommend for clinical usage. X axis denotes the field of practice, Y axis denotes the number of respondents. Most of the respondents from specialists chose the option 'yes' (Blue colour). Chi square test shows a statistically highly significant difference in the responses between specialists and the non specialists [Pearson Chi square p value = 0.001. ($p < 0.001$)], however both recommend digital dentistry.

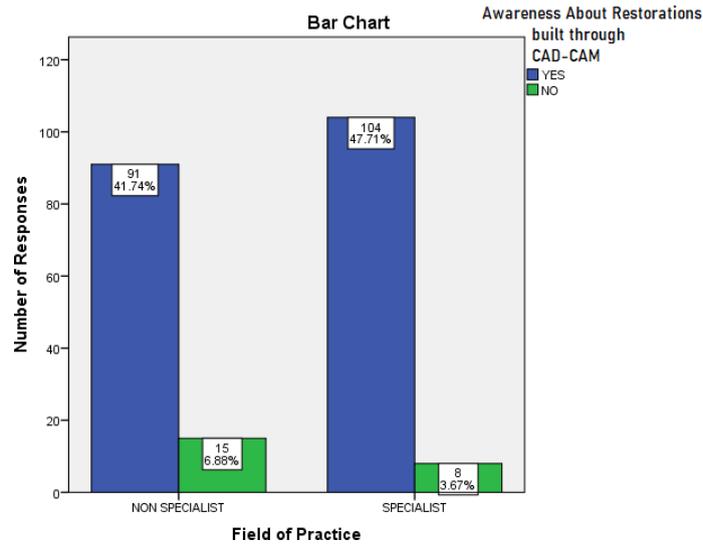


Figure 8: Bar graph showing the association between the field of practice of the participants and responses to the question that whether participants are aware of various restoration and prosthesis built through CAD-CAM. X axis denotes the field of practice, Y axis denotes the number of respondents. Most of the respondents from specialists and non specialists chose the option 'yes' (Blue). Chi square test shows no statistical significant difference in the responses between specialists and the non specialists [Chi square value p value = 0.092. ($p > 0.05$)].

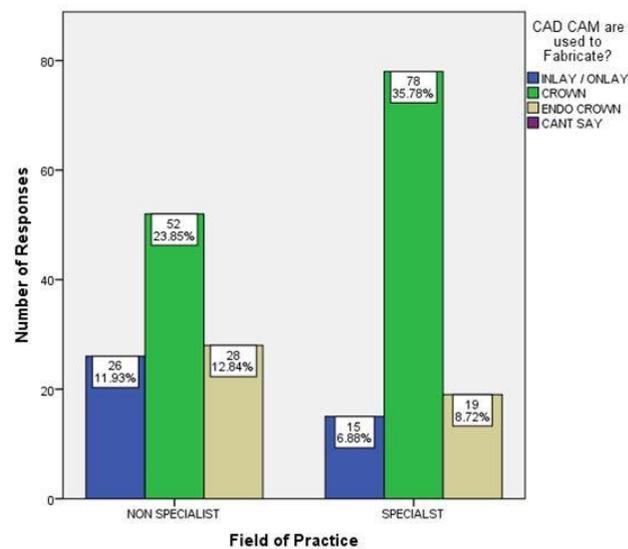


Figure 9: Bar graph showing the association between the field of practice of the participants and responses to the question that CAD CAM are used to fabricate? X axis denotes the field of practice, Y axis denotes the number of respondents. Most of the respondents chose the option 'CROWN' (Green) as an answer. Chi square test shows a statistically significant difference in the responses between specialists and the non specialists [Chi square p value = 0.008. ($p < 0.05$)], as specialists preferred more efficient in Crown. However all the prosthesis can be fabricated more efficiently using CAD CAM.

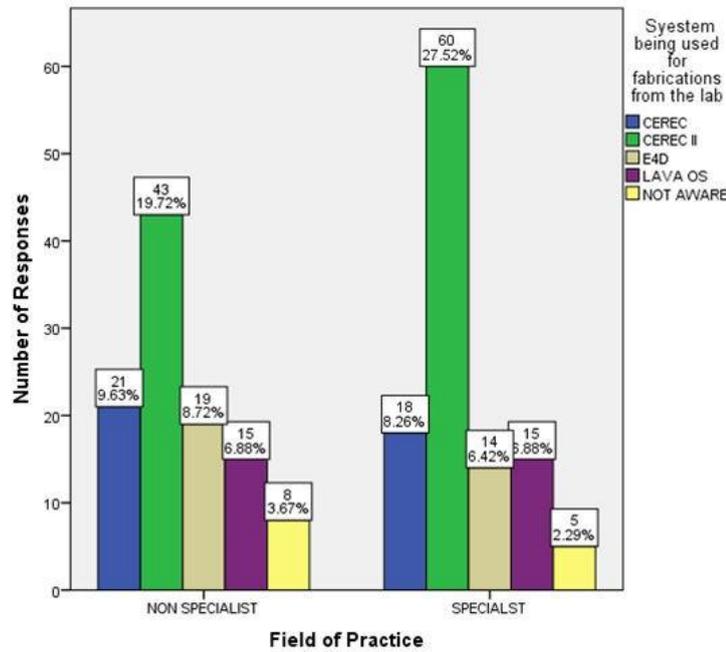


Figure 10: Bar graph showing the association between the field of practice of the participants and responses to the question which system is being used for fabrication from the lab which you give? X axis denotes the field of practice, Y axis denotes the number of respondents. Most of the respondents chose the option 'CEREC II' (Green colour). Chi square test shows a statistically no significant difference in the responses between specialists and the non specialists [Pearson Chi square; p value = 0.364. ($p > 0.05$)]. However, CEREC II was widely available at all workplaces.

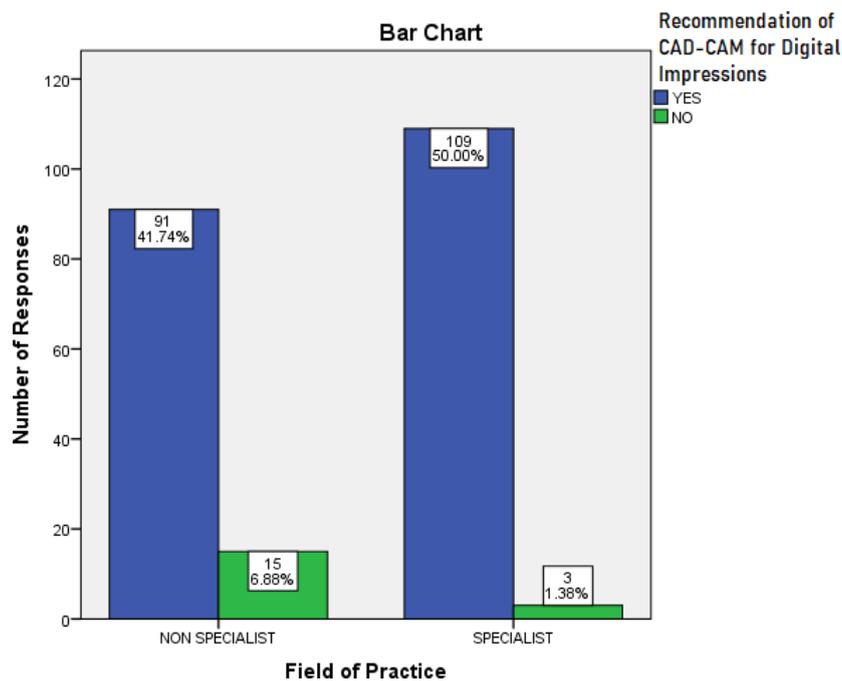


Figure 11: Bar graph showing the association between the field of practice of the participants and responses to the question that whether they would recommend CAD-CAM in taking digital impressions. X axis denotes the field of practice, Y axis denotes the number of respondents. Most of the respondents chose the option 'yes' (Blue colour) compared to 'no' indicates (Green). Chi square test shows a statistically significant difference in the responses between specialists and the non specialists [Pearson Chi square p value = 0.002. $p < 0.05$], most of them recommended digital impressions.

A Figure 12: Bar graph showing the association between the field of practice of the participants and responses to the question by respondents that whether they would like to attend CDE programs in future. X axis denotes the field of practice, Y axis denotes the number of respondents. Most of the respondents from specialists chose the option 'yes' (Blue) compared to 'no' (Green). Chi square test shows a statistically significant difference in the responses between specialists and the non specialists [Pearson Chi square p value = .036. $p < 0.05$]. However, both specialists and non specialists are willing to attend CDE programmes