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Original Article

Dentistry Section

Knowledge, Awareness and Practices of the use of Digital Technology in Dentistry among Postgraduate Students and Dental Practitioners in India: A Cross-sectional Study

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ABSTRACT

Introduction: Currently, digital dentistry is an umbrella topic that predominantly includes the areas of intraoral scanning, Three-dimensional (3D) printing and Computer-aided Designing/Computer-aided Manufacturing (CAD/CAM). It allows the transfer of information between physical and digital data, with the significant advantage of easing the transition process and increasing efficiency. Digital technology is a crucial component of modern dentistry which has a significant influence on our present and future dental practice.

Aim: To assess the knowledge, awareness and practices of the use of digital technology and its implications in dentistry among dental postgraduate students and dental practitioners.

Materials and Methods: A cross-sectional questionnaire based online survey was undertaken at KLE VK Institute of Dental Sciences, Belagavi, Karnataka, India between April 2021 and July 2021 amongst dental practitioners and dental postgraduate students of different regions across India. The questionnaire consisted of 21 questions which evaluated their awareness towards digital dentistry, its advantages and shortcomings, their knowledge and practices towards digital dentistry. Statistical analysis was done using Chi-square test in each group, using Statistical Package for the Social Sciences (SPSS) version 20.0. The p-value <0.05 was considered significant.

Results: Of total 270, 261 respondents (96.67%) were aware of CAD/CAM technology in dentistry. A total of 237 respondents (87.78%) felt that the lack of knowledge was one of the shortcomings of CAD/CAM with a p-value=0.039 rather than its high cost (184 respondents 68.15%, p-value=0.009) and there was a need to increase the knowledge and understanding regarding the same. A total of 252 respondents (93.33%) were of the opinion that digital technology is the future of dentistry and it will have a positive impact on our profession and 83.59% respondents felt that digital technology would have a role to play in the current COVID-19 scenario. The teaching faculty (92.86%), showed better understanding about the digital technology compared to private practitioners (66.22%) and postgraduate students (62.59%).

Conclusion: In the given set of participants, most of the participants were aware about digital technology which shows a satisfactory outcome. The teaching faculty showed better understanding about the digital technology compared to private practitioners and postgraduate students. However, to make them acquainted with CAD/CAM, dental education programmes and workshops should be conducted which will create a future generation of dentists who will be well-versed with digital dentistry. With so much room to grow, it will help dentists to work as one and deliver the absolute best care to their patients and create a better tomorrow.

Keywords: Aesthetics, Computer-aided design, Computer-aided manufacturing, Chairside, Dental education, Three-dimensional printing, Workflow

INTRODUCTION

Digital dentistry includes treatments performed by means of digital or computer-controlled components instead of utilising mechanical or electrical equipment [1]. The progress of digital technology and the introduction of Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) and 3D printing has brought large changes to the traditional manufacturing method, where manual work is carried out after oral impression taking [2].

The high demand for rapid but effective aesthetic dental treatment, as well as the ability to provide same day chairside restorations, is appealing to both patients and dentists [3]. The application of CAD/CAM technology has advanced greatly to serve patients and to simplify, as well as standardise the process of manufacturing dental restorations. As a result of this workflow change, clinical technicians, dentists as well as patients are influenced [4,5]. Due to increasing demand for cosmetic and metal-free restorations, a higher strength ceramic has been developed [6] that is only used in association with CAD/CAM technology [7-9]. CAD/CAM was utilised to produce implant abutments and frameworks after crown and bridgework fabrication had gained popularity in the 1990s [10].

Three-dimensional (3D) intraoral imaging data can be used for superimposition with 3D radiographic and facial imaging data. The software assists orthognathic surgery planning, dental implant surgery planning, and orthodontic treatment planning. The use of digital technologies in implant and orthognathic surgery showed the capability to supplant conventional approaches [11,12].

Western countries have adopted Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) into their routine dental practises, while in India only a limited fraction of dentists use CAD/CAM in their regular workflow. The awareness of CAD/CAM is minimal amongst the dentists in India, and even amongst the dentists who are aware, only a fraction of them use it in their practice [13]. Considering the above advantages and its vast applications in all fields of dentistry, it is of utmost importance to have a thorough knowledge regarding the use of CAD/CAM and to know its shortcomings and the slow adaption of digital technology.

The use of digital technology has become an essential part of modern dentistry. It is speculated that this will change the shape of future dental practice [14]. There have been surveys done to assess the knowledge and attitude of undergraduate students in India

towards the use of CAD/CAM [13] and to know the infiltration of CAD/CAM technology in the workflow among United Kingdom and Saudi Arabian dentists [3,15]. However, the research to investigate the current place of digital dentistry among dental practitioners in India is scarce [3]. Hence, this study was undertaken with an intent to assess and understand the knowledge, awareness and practices regarding use of digital technology among postgraduate students and dental practitioners.

MATERIALS AND METHODS

A cross-sectional questionnaire-based study was conducted at KLE VK Institute of Dental Sciences, Belagavi, Karnataka, India, between April 2021 to July 2021 which focussed on dental practitioners and postgraduate students from across India. The Institutional Ethical Committee approval was obtained (Certificate no. 1437 dated 29/04/2021).

Sample size calculation: Sample size was estimated using the formula $N=4\times PQ/D^2$

Where, N is sample size, 'P' stands for highest prevalence which was 80 for pilot study, Q=100-P and 'D' stands for acceptable error or lowest prevalence of 5%. Therefore, the sample size calculated was 256. The study included a total of 270 respondents.

Inclusion and Exclusion criteria: The study included postgraduate students, teaching faculties from different dental institutions and private practitioners. Along with the questionnaire, informed consent was obtained from these participants via Google forms. Participants who refused consent to participate in the study were excluded. The undergraduate students and interns were also excluded from the study.

The pilot testing of the questionnaire included 87 respondents which comprised of postgraduates, teaching faculty and private practitioners. The study results revealed 74 (80%) of the total respondents were aware about the use of digital dentistry. But their understanding about the applications of digital dentistry in routine dental practice was found to be less (48%).

Questionnaire

The custom questionnaire was designed, comprising of 21 questions in which 19 were closed ended and 2 open ended questions. The questionnaire was divided into three parts which included the demographic details (Q no.1-5) , knowledge based questions (Q no. 6-10), awareness (Q no. 11-14), practices (Q no. 15-21).

The questionnaire was validated for relevance of questions particular to the topic of the survey (Face validity) and for the reliability of the options provided (Content validity) with a Content Validity Index score (CVIs) of 0.60 by the faculty from the Department of Prosthodontics, KAHER VK Institute of Dental Sciences, Belagavi, Karnataka along with subject expert.

Based on the pilot study the reliability and internal consistency of the questionnaire revealed that the survey was reliable with the Cronbach's alpha internal consistency score of 0.8. Each question had to be answered by the participants.

The data was gathered by sending the link of the online form via emails and WhatsApp to all the study participants. The study participants were having sufficient time of two weeks to complete the online questionnaire. If any issue surfaced while filling out the questionnaire form, the investigator resolved it immediately during the study duration. The resultant data was tabulated and subjected to statistical analysis to draw the conclusion from the resultant study.

STATISTICAL ANALYSIS

The individual responses obtained from all participants were collated on MS Excel sheet. Statistical analysis was carried out using SPSS software version 20.0 and Chi-square test was utilised to check if there was any significant association between the questionnaire items and the type of practitioner with a significance level of p-value <0.05.

RESULTS

A total of 270 participants filled the questionnaire out of which 147 respondents (54.44%) were postgraduate students, 74 (27.41%) were private practitioners, 28 (10.37%) were teaching faculty, 21 (7.78%) were both; teaching faculty as well as private practitioners [Table/Fig-1].

Comparison of respondents by demographic profile				
Variables	Private practitioner 74 (27.41%)	Teaching faculty and private practitioner 21 (7.78%)	Teaching faculty 28 (10.37%)	Postgraduate student 147 (54.44%)
Gender				
Male	24 (32.43%)	15 (71.43%)	13 (46.43%)	56 (38.10%)
Female	50 (67.57%)	6 (28.57%)	15 (53.57%)	91 (61.90%)
Years of clinical experience				
Less than 5 years	46 (62.16%)	2 (9.52%)	4 (14.29%)	134 (91.16%)
5-10 years	12 (16.22%)	9 (42.86%)	12 (42.86%)	13 (8.84%)
More than 10 years	16 (21.62%)	10 (47.62%)	12 (42.86%)	0
Location of your practice				
Metro city	26 (35.14%)	2 (9.52%)	6 (21.43%)	32 (21.77%)
Urban areas	27 (36.49%)	14 (66.67%)	21 (75%)	80 (54.42%)
Suburban/ Rural areas	21 (28.38%)	5 (23.81%)	1 (3.57%)	35 (23.81%)
Are you a?				
General dental practitioner	61 (82.43%)	10 (47.62%)	5 (17.86%)	32 (21.77%)
Specialised practitioner	13 (17.57%)	11 (52.38%)	23 (82.14%)	115 (78.23%)

[Table/Fig-1]: Demographic details of the respondents.

When asked for which procedure is digital technology is useful in dentistry, most of the respondents (86.67%) said that it was crown and bridge fabrication and 85.56% respondents said it was implant restorations. Some also gave suggestions that it is useful in cephalometrics, 3D model preparation and making provisional restorations for fixed partial dentures, endodontics. One also opined that it is useful in incorporating prescription in brackets and indirect bonding in Orthodontics [Table/Fig-2].

[Table/Fig-3] shows the participants' responses for use of CAD/CAM in dentistry. Coming to the advantages and shortcomings of CAD/CAM, 230 respondents (85.19%) were of the opinion that CAD/CAM fabricated restorations were more precise as compared to those fabricated by conventional methods. Digital dataflow was also one of the major advantages which was agreed on by 68.15% respondents and the values were statistically highly significant (p-value=0.006) [Table/Fig-4]. Respondents also mentioned that with the help of CAD/CAM there would be better shade matching, data can be saved and used for further purpose and future prosthetic rehabilitation.

Immediate data transfer and retrievability of the scan data at any point of time was considered as a major advantage of CAD/CAM in the clinical scenario with a response rate of 87.78% with p-value=0.039 while 78.89% felt that accurate and precise fit of restoration/orthodontic appliance was major advantage [Table/Fig-5].

Lack of knowledge was considered as a major shortcoming of CAD/CAM when compared among two groups (p-value=0.039) [Table/Fig-6].

Knowledge regarding application of CAD/CAM	Type of practitioner (n%)				Total (n, %)	Chi-square	p-value
	Private practitioner (n, %)	Teaching faculty and private practitioner (n, %)	Teaching faculty (n, %)	Postgraduate student (n, %)			
Crown and bridge fabrication	67 (90.54%)	21 (100%)	26 (92.86%)	120 (81.63%)	234 (86.67%)	8.344	**0.039**
Implant restorations	63 (85.14%)	19 (90.48%)	28 (100%)	121 (82.31%)	231 (85.56%)	6.400	0.094
Impression making	41 (55.41%)	12 (57.14%)	19 (67.86%)	99 (67.35%)	171 (63.33%)	3.616	0.306
Maxillofacial prosthesis	41 (55.41%)	13 (61.90%)	19 (67.86%)	101 (68.71%)	174 (64.44%)	4.006	0.261
Surgical reconstruction	46 (62.16%)	11 (52.38%)	21 (75.00%)	94 (63.95%)	172 (63.70%)	2.789	0.425
Smile designing	63 (85.14%)	19 (90.48%)	24 (85.71%)	117 (79.59%)	223 (82.59%)	2.351	0.503
Invisible orthodontics	56 (75.68%)	12 (57.14%)	21 (75%)	93 (63.27%)	182 (67.41%)	5.192	0.158
Others (Please specify)	1 (1.35%)	1 (4.76%)	2 (7.14%)	4 (2.72%)	8 (2.96%)	2.636	0.451

[Table/Fig-2]: Shows the participants' knowledge regarding the applications of CAD/CAM in dentistry.
(p-value <0.05 to be considered significant)

Use of CAD/CAM in dentistry	Type of practitioner				Total (n, %)	Chi-square	p-value
	Private practitioner (n, %)	Teaching faculty and private practitioner (n, %)	Teaching faculty (n, %)	Postgraduate student (n, %)			
Intraoral scanning	36 (48.65%)	12 (57.14%)	20 (71.43%)	66 (44.90%)	134 (49.63%)	7.142	0.068
Digital impressions	39 (52.70%)	14 (66.67%)	18 (64.29%)	69 (46.94%)	140 (51.85%)	5.023	0.170
Shade matching	24 (32.43%)	10 (47.62%)	12 (42.86%)	37 (25.17%)	83 (30.74%)	6.983	0.072
Computer aided designing (by laboratory or specialist milling center)	66 (89.19%)	19 (90.48%)	27 (96.43%)	135 (91.84%)	247 (91.48%)	1.429	0.699
Computer aided manufacturing (by laboratory or specialist milling center)	64 (86.49%)	19 (90.48%)	27 (96.43%)	133 (90.48%)	243 (90%)	2.343	0.504

[Table/Fig-3]: Shows the participants' responses for use of CAD/CAM in dentistry
(p-value <0.05 to be considered significant)

Advantages of CAD/CAM	Type of practitioner				Total (n, %)	Chi-square	p-value
	Private practitioner (n, %)	Teaching faculty and private practitioner (n, %)	Teaching faculty (n, %)	Postgraduate student (n, %)			
Reduced number of appointments	43 (58.11%)	14 (66.67%)	20 (71.43%)	105 (71.43%)	182 (67.41%)	4.206	0.240
Less chairside time	44 (59.46%)	13 (61.90%)	22 (78.57%)	100 (68.03%)	179 (66.30%)	3.815	0.282
More precise as compared to conventional methods	69 (93.24%)	18 (85.71%)	22 (78.57%)	121 (82.31%)	230 (85.19%)	5.744	0.125
Digital data flow	50 (67.57%)	15 (71.43%)	27 (96.43%)	92 (62.59%)	184 (68.15%)	12.528	**0.006**
Any other	2 (2.70%)	0	0	1 (0.68%)	3 (1.11%)	2.505	0.474

[Table/Fig-4]: Shows the participants' responses for advantages of CAD/CAM.
(p-value <0.05 to be considered significant)

Advantages of CAD/CAM in the clinical scenario	Type of practitioner				Total (n, %)	Chi-square	p-value
	Private practitioner (n, %)	Teaching faculty and private practitioner (n, %)	Teaching faculty (n, %)	Postgraduate student (n, %)			
Eliminates the problems associated with impression making	49 (66.22%)	17 (80.95%)	26 (92.86%)	92 (62.59%)	184 (68.15%)	11.685	**0.009**
Can review your preparation and modify it at the same time	55 (74.32%)	17 (80.95%)	24 (85.71%)	100 (68.03%)	196 (72.59%)	4.812	0.186
Immediate data transfer and retrievability of scan data at any point	68 (91.89%)	19 (90.48%)	28 (100%)	122 (82.99%)	237 (87.78%)	8.345	**0.039**
Ease in laboratory authorisation and communication	65 (87.84%)	17 (80.95%)	28 (100%)	115 (78.23%)	225 83.33%)	9.522	**0.023**
Accurate and precise fit of the restoration/orthodontic appliances	63 (85.14%)	20 (95.24%)	26 (92.86%)	104 (70.75%)	213 78.89%)	14.234	**0.003**
Accurate and precise orthodontic tooth movement	45 (60.81%)	11 (52.38%)	15 (53.57%)	55 (37.41%)	126 (46.67%)	11.815	**0.008**

[Table/Fig-5]: Shows the participants' responses towards advantages of CAD/CAM in the clinical scenario.
(p-value <0.05 to be considered significant)

Among the study participants, 96.67% were aware of the use of CAD/CAM in dentistry while 3.33% were unaware of the same with a p-value=0.202 [Table/Fig-7]. Awareness regarding the use of digital technology in dentistry shown in [Table/Fig-8].

A 22.22% were unaware of any CAD/CAM system while majority of the respondents 67.41% had knowledge regarding Chairside Economical Restoration of Esthetic Ceramic (CEREC) system and were aware about it [Table/Fig-9].

Strengthened ceramics like E.Max was regularly used with CAD/CAM according to 39.26% respondents while composite was rarely used. Some also suggested that prefabricated acrylic blocks could also be used with this technology [Table/Fig-10].

Shortcomings of the use of CAD/CAM	Type of practitioner				Total (n, %)	Chi-square	p-value
	Private practitioner (n, %)	Teaching faculty and private practitioner (n, %)	Teaching faculty (n, %)	Postgraduate student (n, %)			
High cost	49 (66.22%)	17 (80.95%)	26 (92.86%)	92 (62.59%)	184 (68.15%)	11.685	**0.009**
Lack of infrastructure	55 (74.32%)	17 (80.95%)	24 (85.71%)	100 (68.03%)	196 (72.59%)	4.812	0.186
Lack of knowledge	68 (91.89%)	19 (90.48%)	28 (100.00%)	122 (82.99%)	237 (87.78%)	8.345	**0.039**
Prefer conventional methods	65 (87.84%)	17 (80.95%)	28 (100.00%)	115 (78.23%)	225 (83.33%)	9.522	**0.023**

[Table/Fig-6]: Shows the participants' response towards the shortcomings of the use of CAD/CAM.
(p-value <0.05 to be considered significant)

Awareness of CAD/CAM technology in dentistry	Type of practitioner				Total (n, %)	Chi-square	p-value
	Private practitioner (n, %)	Teaching faculty and private practitioner (n, %)	Teaching faculty (n, %)	Postgraduate student (n, %)			
No	1 (1.35%)	0	0	8 (5.44%)	9 (3.33%)	4.6210	0.2020
Yes	73 (98.65%)	21 (100%)	28 (100%)	139 (94.56%)	261 (96.67%)		

[Table/Fig-7]: Shows the awareness of CAD/CAM technology in dentistry.
(p-value <0.05 to be considered significant)

Awareness regarding the use of digital technology in dentistry	Type of practitioner				Total (n, %)	Chi-square	p-value
	Private practitioner (n, %)	Teaching faculty and private practitioner (n, %)	Teaching faculty (n, %)	Postgraduate student (n, %)			
No	6 (8.11%)	0	0	14 (9.52%)	20 (7.41%)	5.083	0.1770
Yes	68 (91.89%)	21 (100%)	28 (100%)	133 (90.48%)	250 (92.59%)		

[Table/Fig-8]: Shows the participants' awareness regarding the use of digital technology in dentistry.
(p-value<0.05 to be considered significant)

Awareness regarding the different CAD/CAM systems	Type of practitioner				Total (n, %)	Chi-square	p-value
	Private practitioner (n, %)	Teaching faculty and private practitioner (n, %)	Teaching faculty (n, %)	Postgraduate student (n, %)			
Lava™	25 (33.78%)	14 (66.67%)	20 (71.43%)	44 (29.93%)	103 (38.15%)	25.185	**<0.0001**
Distributed Control System (DCS) Precident	3 (4.05%)	8 (38.10%)	0	12 (8.16%)	23 (8.52%)	28.097	**<0.0001**
Chairside Economical Restoration of Esthetic Ceramic (CEREC)	40 (54.05%)	19 (90.48%)	25 (89.29%)	98 (66.67%)	182 (67.41%)	17.230	**<0.0001**
Procera	24 (32.43%)	14 (66.67%)	17 (60.71%)	86 (58.50%)	141 (52.22%)	16.505	**<0.001**
None	24 (32.43%)	0 (0.00)	2 (7.14%)	34 (23.13%)	60 (22.22%)	14.217	**0.003**

[Table/Fig-9]: Shows the participants' awareness regarding the different CAD/CAM systems.
(p-value <0.05 to be considered significant)

Strengthened ceramics	Type of practitioner				Total (n, %)	Chi-square	p-value
	Private practitioner (n, %)	Teaching faculty and private practitioner (n, %)	Teaching faculty (n, %)	Postgraduate student (n, %)			
E.Max	25 (33.78%)	13 (61.90%)	12 (42.86%)	56 (38.10%)	106 (39.26%)	5.682	0.128
Zirconia	23 (31.08%)	9 (42.86%)	12 (42.86%)	31 (21.09%)	75 (27.78%)	9.235	**0.026**
Metals	18 (24.32%)	10 (47.62%)	13 (46.43%)	26 (17.69%)	67 (24.81%)	16.87	**0.001**
Composite	15 (20.27%)	8 (38.10%)	10 (35.71%)	17 (11.56%)	50 (18.52%)	15.68	**0.001**

[Table/Fig-10]: Shows the participants' awareness towards different materials used with CAD/CAM.
(p-value <0.05 to be considered significant)

Considering the current COVID-19 scenario, when we asked whether digital dentistry would have a role to play for which 83.59% replied positively while 13.70% were not sure [Table /Fig-11].

A 67.04% of the respondents did not attend any training programmes or workshops on CAD/CAM [Table/Fig-11] and a major portion was made up by postgraduate students.

DISCUSSION

Digital dentistry using intraoral scanners, CAD/CAM and 3D printing has gained popularity in the last few decades [5]. Hence, it is important for us as dentists to go along with the trend and have a better understanding and knowledge about the same.

A 70% of patients who received new digital complete dentures claimed their new dentures were "better" than their earlier set of complete dentures, according to a survey done by Saponaro PC et al., [16].

The main importance of knowing about digital technology is its significant advantages which are patient compliance, quick and aesthetic results. Information sharing is nearly effortless which makes it far easier for the dentist to show their work, share their learning experiences and ask for suggestions on cases [17]. According to present study, 87.78% (237 respondents) were of the opinion that immediate data transfer and retrievability of scan data at any point was one of the major advantages of CAD/CAM in the clinical scenario followed by ease in laboratory authorisation and communication. This was a contradicting to a survey carried out by Udhayaraja P et al., where time efficiency (48%) and precise fit (20%) was considered a major advantage [13].

Question and response	Type of practitioner (n%)				Total (n, %)	Chi-square	p-value
	Private practitioner (n, %)	Teaching faculty and private practitioner (n, %)	Teaching faculty (n, %)	Postgraduate students (n, %)			
Highlights the participants opinion if Digital Dentistry would have a role to play in the current COVID-19 scenario							
Yes	53 (71.62%)	20 (95.24%)	27 (96.43%)	123 (83.67%)	223 (83.59%)	14.3970	**0.0260**
No	3 (4.05%)	0	1 (3.57%)	6 (4.08%)	10 (3.70%)		
Not sure	18 (24.32%)	1 (4.76%)	0	18 (12.24%)	37 (13.70%)		
Shows the responses towards attending any training programs on CAD/CAM.							
Yes	17 (22.97%)	17 (80.95%)	19 (67.86%)	36 (24.49%)	89 (32.96%)	45.4330	**<0.0001**
No	57 (77.03%)	4 (19.05%)	9 (32.14%)	111 (75.51%)	181 (67.04%)		
Shows the respondents opinion on the need to increase to knowledge regarding digital dentistry during undergraduate/postgraduate courses							
Yes	74 (100%)	21 (100%)	27 (96.43%)	145 (98.64%)	267 (98.89%)	4.6060	0.5950
No	0	0	1 (3.57%)	1 (0.68%)	2 (0.74%)		
Not sure	0	0	0	1 (0.68%)	1 (0.37%)		
Shows whether participants would be interested in incorporating CAD/CAM in their regular workflow							
Yes	53 (71.62%)	17 (80.95%)	24 (85.71%)	107 (72.79%)	201 (74.44%)	4.7810	0.5720
No	5 (6.76%)	2 (9.52%)	1 (3.57%)	7 (4.76%)	15 (5.56%)		
Not sure	16 (21.62%)	2 (9.52%)	3 (10.71%)	33 (22.45%)	54 (20.00%)		
Highlights whether participants would prefer CAD/CAM over conventional methods							
Yes	48 (64.86%)	18 (85.71%)	22 (78.57%)	100 (68.03%)	188 (69.63%)	5.4010	0.4940
No	7 (9.46%)	0	1 (3.57%)	13 (8.84%)	21 (7.78%)		
Not sure	19 (25.68%)	3 (14.29%)	5 (17.86%)	34 (23.13%)	61 (22.59%)		
Shows the participants practices towards digital dentistry if it would affect their clinical decision making							
yes	39 (52.70%)	16 (76.19%)	20 (71.43%)	79 (53.74%)	154 (57.04%)	9.1200	0.1670
no	12 (16.22%)	3 (14.29%)	5 (17.86%)	30 (20.41%)	50 (18.52%)		
Not sure	23 (31.08%)	2 (9.52%)	3 (10.71%)	38 (25.85%)	66 (24.44%)		
Highlights the participants response if digital dentistry would have a positive impact on our profession and would be the future of dental practice							
Yes	69 (93.24%)	20 (95.24%)	27 (96.43%)	136 (92.52%)	252 (93.33%)	0.7120	0.8700
No	0	0	0	0	0		
Not sure	5 (6.76%)	1 (4.76%)	1 (3.57%)	11 (7.48%)	18 (6.67%)		

[Table/Fig-11]: Responses towards practice based questions.
(p-value<0.05 was considered as statistically significant)

Also, in the current COVID-19 scenario, we asked if digital technology would have a role to play where 223 (83.59%) respondents replied positively, it provides a benefit of infection control, reduced appointment duration and decreased chances of cross contamination.

Digital impressions with intraoral scanners present with an advantage of 3D previsualisation of the preparation and reducing the risk of distortion and material usage during impression making [18]. It also prevents the problems like gagging that are associated with conventional impression making. It is shown to provide superior accuracy as there are no errors associated with contraction or expansion of impression and model materials which was agreed on by the respondents [18].

The CAD/CAM generates visualisations during the course of design process which helps in decision making. Advances in diagnostic capabilities affect the quality of care thereby, providing new solutions to conventional dental problems which was also highlighted in the current study [19].

Considering its significant advantages, there is a slow adaptation of digital technology among Indian dentists, [20] when asked about its shortcomings, 87.78% (237 respondents) agreed that lack of knowledge was one of the main factors rather than high cost which was agreed on by 68.15% (184) respondents. These findings were contradictory to the survey performed by Udhayaraja P et al., where high cost was considered a major factor [13]. This study also revealed that some respondents preferred conventional methods over CAD/CAM which was similar to a survey done among United Kingdom(UK) dentists who felt the lack of perceived advantages over conventional production methods [15].

A survey conducted by Palanisamy S and Hegde C, on the knowledge of CAD/CAM among undergraduate students of an Institute in Karnataka showed that they have only shallow knowledge of the same [21]. About 74% of students were not aware about the materials that can be used to fabricate prosthesis using CAD/CAM technology which was in agreement with the survey done by Kavarthapu A and Suresh V [20]. Hence, it is important to increase the clinical knowledge of the same from the early years of dentistry.

When asked about awareness regarding various CAD/CAM systems some were unaware of any CAD/CAM systems and was highlighted more by private practitioners and postgraduate students.

Total of 67.04% of the respondents did not attend any training programmes or workshops on CAD/CAM and a major portion was made up by postgraduate students, thereby 98.89% of the respondents (267) felt there was a need to increase teaching in the undergraduate and postgraduate courses. This was in accordance with a survey conducted by Tran D et al., which concluded that Continuing Dental Education (CDE) and Continuing Professional Development (CPD) courses do not go hand in hand and to bridge this gap, universities should conduct evidence-based teaching of CAD/CAM technology in these courses[15].

As it was observed in this study, the major study population were postgraduate students who are the future of dental practice. Hence, it is required to have elborative curricular reforms pertaining to the digital dentistry in the curriculum and encourage these students and practitioners to attend CDE, extensive hands on programmes in the field of digital dentistry which was also suggested through a survey conducted by Pandey S et al., in which he put forth that

CDE programs should be conducted for dentists to increase their awareness and to gain more knowledge about the use of digital dentistry procedures [22].

Almost all respondents highlighted the fact that digital dentistry would have a positive impact on our profession which was in accordance with a survey conducted by Tran D et al., among UK dentists.Their survey showed that 89% respondents felt that CAD/CAM will have a significant role to play in the future of dentistry [15]. Hence, we should work towards gaining more knowledge and create a future generation of dentists who will be well-versed with digital dentistry.

Limitation(s)

The smaller sample size among the different type of practitioners was the main limitation of the present study and for better understanding about the perception of knowledge and awareness about digital dentistry and its implications on dental practice a large number of participants can be included from different part of the country.

CONCLUSION(S)

The current practice of dentistry should have specific focus towards application of digitisation in the workflow to meet high standard patient needs. The education on CAD/CAM and their application is essential for postgraduate students and dental practioners. In order to create a shift in digital dentistry and to enhance knowledge and awareness among dentists, we should conduct dental education programs, workshops or hands on courses. This will will be a new era in dentistry providing modern solutions to traditional problems which will be beneficial for both the patients along with the dentists.

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