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Awareness and Application of Newer Technologies in Dentistry

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Abstract

Dentistry is getting advanced with newer technologies currently, but the awareness and application among dental professionals and clinicians is much less. Proper application of newer technologies can bring a revolution in dentistry. This study is conducted to check the awareness of the newer technologies in dentistry as well as its application in the clinical practice among the dental professionals, practitioners and postgraduates. A structured questionnaire of 15 questions was prepared. A total of 112 subjects were selected. The subjects were asked to fill the questionnaire. The complete data was assembled and entered into Microsoft Excel sheet and statistical analysis was done. Out of total 112 subjects, 54 were postgraduates and 58 were clinicians.

Out of 15 questions, there was statistically significant difference in answers of question number 1,3,4,5,10 and 15 when compared between postgraduates and clinicians

Out of 112 subjects 59 were having experience of less than 5 years, 18 having experience of 5-10 years, 13 having 10-15 years and 22 were having more than 15 years of experience.

Out of 15 questions, there was statistically significant difference in answers of question number 3,7,10 and 15 while comparing clinicians/practitioners and postgraduates based on their experiences. In the present

study we found out that many postgraduate students as well as dental clinicians have the general idea of newer technologies in dentistry but these people are aware of very less newer technologies and its application.

Keywords: Newer technologies, CAD-CAM, Teledentistry, Application of technologies.

Introduction

The newer technologies are increasing in dentistry day by day with the advancement in science. Many developed countries have initiated newer technologies to bring a change in the older methods. Proper application of the newer technology can bring a revolution in dentistry. Technologies are increasing in the developing countries but due to the lack of awareness among the clinicians and practitioners, they are not used in the clinical practice. The proper use can lead to easy and short dental treatment by causing minimum complications and also results in shorter appointments thereby increasing the patient's compliance.

Subjects and Methodology

A structured questionnaire of 15 questions was prepared. It was based on the awareness of newer technologies in dentistry and their applications. The questionnaire was validated by the professor having 20 years of experience in the field of dentistry.

A total of 112 subjects were selected who were the postgraduate students and the dental clinicians/practitioners in the Ahmedabad city of Gujarat state. The subjects were asked to fill the questionnaire based upon their knowledge about newer technologies and the application of the same in their clinical practice.

The complete data was assembled and entered into Microsoft Excel sheet and statistical analysis was done with Pearson's Chi-Square test.

Results

The first table (Table 1, Bar Chart 1) shows comparison of answers given by postgraduate students and clinicians/practitioners. Out of total 112 subjects, 54 were postgraduate students and 58 were clinicians. Out of 15 questions, there was statistically significant difference in answers of question number 1,3,4,5,10 and 15 (P value 0.035, 0.034, 0.016, 0.008, 0.003 and 0.01 respectively). In questions 1,5,10 and 15 most practitioners answered YES while few postgraduates answered NO. In questions 3 and 4 most postgraduates answered YES while few practitioners answered NO. There was no statistically significant difference in answers of question number 2,6,7,8,9,11,12,13 and 14 out of which question number 2,6,7,8,11 and 14 were answered NO by most of the dentists while question number 9,12 and 13 were answered YES by most of dentists regardless of their being postgraduate student or clinician.

The second table (Table 2, Bar Chart 2) shows comparison of answers given based on experience of dentists.

Out of total 112 subjects, 59 were having experience of less than 5 years, 18 having 5-10 years, 13 having 10-15 years and 22 were more than 15 years of experience.

Out of 15 questions, there was a statistically significant difference in answers of question number 3,7,10 and 15 (P value 0.004, 0.026, 0.007 and 0.001 respectively).

In the question number 3 and 15, most dentists having less than 5 years of experience answered YES while few dentists having more than 15 years of experience answered NO or MAYBE.

In questions 7 and 10, most dentists having less than 5 years of experience answered NO while few dentists having more than 15 years of experience answered YES.

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There was no statistically significant difference in answers of question number 1,2,4,5,6,8,9,11,12,13 and 14. Out of which question number 1,4,5,9 and 12 were answered YES by most dentists while question number 2,6,8,11,13 and 14 were answered NO by most dentists regardless of their years of experience.

Discussion

Many advancements have been made in the technologies that can bring a revolution in the field of dentistry but many of the practitioners are unaware about it. More than 5 questions of newer technologies in the questionnaire were answered with a NO by majority of the practitioners. With the increase in the awareness, there would be an enhancement in the step towards digitalization and advancement will increase in a growing and developing country like India. This study has been solely focused to bring the awareness of the newer technologies in the dentistry among the postgraduate students as well as clinicians and its application.

In a study done by Arjunkumar *et al*[1] in 2018, they concluded that 96% of the dentists were aware that lasers were used in dental practice and only 35% of the dentists had practiced laser dentistry. In the present study we found out that 97% of the dentists were aware about the dental laser system and 71% of the dentists use dental laser system in their clinical practice.

In a study done by Pradeep P *et al*[2] in 2021, it was observed that 93.3% orthodontic practitioners had knowledge regarding teledentistry.77.3% believed that teledentistry can save dentist's time and 71.3% responded that the new technology can be helpful in reducing the cost of treatment for patients. In the present study we found out that 48% dentist perform teledentistry while 69% dentist think it is beneficial to patients.

In a study done by Parikh Maitry *et al*[3] in 2019, 83% practitioner think 3D printing has advantages over other digital imaging modalities. In the present study we found out that 96% of the practitioners were aware about the 3D printers while 64% of the practitioners use intraoral scanners in clinical practice.

In a study done by Siddhesh *et al*[4] in 2020 the study indicated that only 55.6% of respondents have come across the relatively concept of digitalized health care provision with only 43% being aware of modalities that can be used for the same. Despite multiple benefits of teledentistry in various aspects of the field of dental practice and education, it is still limited to relative unawareness. In the present study we found out that for the question about teledentistry beneficial to patient, the p-value came significant (0.034) in which out of 112 subjects, 74 subjects said YES to the question while 38 subjects said NO for the same. In a study done by Avhad *et al*[5] in 2019, they concluded that 93.6% of the students stated that they had knowledge about dental laser systems, only 6.4% reported that they did not have any information on this subject. In the present study we found out that 97% of the dentists were aware about the dental laser system and 71% of the dentists use dental laser system in their clinical practice.

In a study done by MIYAZAKI *et al*[6] in 2008, they concluded that the application of dental CAD/CAM systems is promising, not only in the field of crowns and FPDs but also in other fields of dentistry, even if its contribution is limited at present. In the present study out of 112 subjects, 108 subjects said YES to the question of awareness of 3D printers and CADCAM technology while 4 subjects said NO for the same.

In a study done by Mohammed M Jawad *et al*[7] in 2011, they reviewed Laser applications in dentistry. It is widely used in different dental fields and treatments that

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give good results compared with traditional treatments. However, it still needs time to be better accepted by dentists and require further studies to explore more of its advantages. In the present study we found out that out of 112 subjects 111 subjects are aware of laser in dentistry and 79 subjects said YES to the question of use of Laser in their clinical practice while 33 subjects said NO for the same.

In a study done by A Dawood*et al*[8] in 2015 they concluded that 3D imaging, modeling, and CAD technologies are hugely impacting on all aspects of dentistry. The technology is already widely used in orthodontics and maxillofacial and implant surgery. In the present study we concluded that out of 112 subjects, 108 subjects said YES to the question of awareness of 3D printers and CADCAM technology while 4 subjects said NO for the same.

In a study done by Ramya *et al*[9] in 2016, they concluded that 3D printers have many promising areas of potential future application. New 3D printing processes have reduced the time it takes for designers and engineers to conceptualize, create, and test prototypes. Researchers are just starting to experiment with the idea of creating artificial bones with 3-D printers. In the present study we found out that out of 112 subjects, 108 subjects said YES to the question of awareness of 3D printers and CADCAM technology while 4 subjects said NO for the same. In a study done by Victor Diaz-Flores *et al*[10] in 2022 they concluded that with the limitations of the present study, the intraoral scanner showed promising levels of specificity and sensitivity to be used as a diagnostic tool for the measurement of tooth wear. Volunteer satisfaction with the True Definition Scanner intraoral scanner, both in terms of intraoral recording technique and usefulness as a method of communication with the patient, was positive in all cases.

In the present study we found out that for the question of using intraoral scanners in dental practice, the p-value came significant (0.008) in which out of 112 subjects, 70 subjects said YES to the question while 42 subjects said NO for the same.

In a study done by Cicciu *et al*[11] in 2019, they concluded that The VELscope® is an excellent tool for diagnosing oral mucosa lesions. Unfortunately, this instrument does not have the capacity to discern between a benign lesion, a malignant one, or a simple acute inflammation. However, it has proved to be an excellent tool to guide surgery and has good sensitivity results. The gold standard for the diagnosis of these injuries is always the biopsy, and so the early diagnostic phase should instead be conducted by a clinician, with a conventional intraoral visit, and VELscope® use could represent a useful tool. In the present study we found out that for the question of awareness of VELscope in dentistry, the p-value came significant (0.026) in which out of 112 subjects, 50 subjects said YES to the question while 62 said NO for the same.

In a study done by Camile S *et*al[12] in 2011 they concluded that VELScope examination alone showed a sensitivity of 30% and a specificity of 63%. Its accuracy at identifying dysplasia was 55%. In the present study we found out that for the question of awareness of VELscope in dentistry, the p-value came significant (0.026) in which out of 112 subjects, 50 subjects said YES to the question while 62 said NO for the same. For the question of idea of application of VELscope in detection of early form of cancer we found out that out of 112 subjects, 40 subjects said YES to the question while 72 subjects said NO to the question.

In a study done by Mamatha *et al*[13] in 2015, it was found that the knowledge and awareness about teledentistry was very low among post-graduates (7.23%) and interns

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(9.38%) when compared to I & II BDS while most of them agreed that teledentistry is a practice of dentistry through various media options with limited application in dentistry without a legal issue. In the present study we found out that for the question about teledentistry beneficial to patient, the p-value came significant (0.034) in which out of 112 subjects, 74 subjects said YES to the question consisting of 41(75.9%) postgraduate students and 33(56.9%) clinicians/practitioners while 38 subjects said NO for the same consisting of 13(24.1%) postgraduate students and 25(43.1%) clinicians / practitioners.

In a study done by Md Refat Readul *et al*[14] in 2022, they concluded that currently advanced medical equipment and instruments have made teledentistry a more convenient way to reach patients on a large scale by providing teleconsultation support at any time and place through internet-based media platforms. Teledentistry plays a vital role in serving patients with a dynamic management strategy and fulfils the needs of the patient's treatment in the best possible way. In the present study we found out that for the question about teledentistry beneficial to patient, the p-value came significant (0.034) in which out of 112 subjects, 74 subjects said YES to the question while 38 subjects said NO for the same.

Conclusion

In the present study we found out that many postgraduate students as well as dental clinicians have the general idea of newer technologies in dentistry but these people are aware of very less newer technologies and its application.

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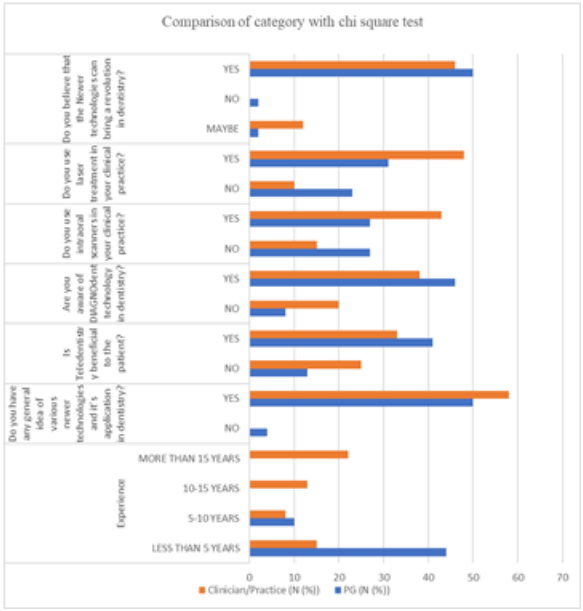
Legend Table and Graph

	Categories	N	Category		Chi square	P value
			PG (N (%))	Clinician/Practice (N (%))		
Experience	LESS THAN 5 YEARS	59	44 (81.5)	15 (25.9)	49.397	<0.001
	5-10 YEARS	18	10 (18.5)	8 (13.8)		
	10-15 YEARS	13	0 (0)	13 (22.4)		
	MORE THAN 15 YEARS	22	0 (0)	22 (37.9)		
Do you have any general idea of various newer technologies and it's application in dentistry?	NO	4	4 (7.4)	0 (0)	4.455	0.035
	YES	108	50 (92.6)	58 (100)		
Do you perform Teledentistry in your in your practice?	NO	59	33 (61.1)	26 (44.8)	2.974	0.085
	YES	53	21 (38.9)	32 (55.2)		
Is Teledentistry beneficial to the patient?	NO	38	13 (24.1)	25 (43.1)	4.517	0.034
	YES	74	41 (75.9)	33 (56.9)		
Are you aware of DIAGNOdent technology in dentistry?	NO	28	8 (14.8)	20 (34.5)	5.769	0.016
	YES	84	46 (85.2)	38 (65.5)		
Do you use intraoral scanners in your clinical practice?	NO	42	27 (50)	15 (25.9)	6.952	0.008
	YES	70	27 (50)	43 (74.1)		
Do you have any idea of Shape Trios Scanner and iTero Element 5D Scanner?	NO	56	28 (51.9)	28 (48.3)	0.143	0.705
	YES	56	26 (48.1)	30 (51.7)		
Are you aware of VELscope in dentistry?	NO	62	32 (59.3)	30 (51.7)	0.642	0.423
	YES	50	22 (40.7)	28 (48.3)		
Do you have any idea of application of VELscope in detection of early form of cancer?	NO	72	35 (64.8)	37 (63.8)	0.013	0.91
	YES	40	19 (35.2)	21 (36.2)		
Are you aware of Laser in dentistry?	NO	1	0 (0)	1 (1.7)	0.939	0.332
	YES	111	54 (100)	57 (98.3)		
Do you use laser treatment in your clinical practice?	NO	33	23 (42.6)	10 (17.2)	8.648	0.003
	YES	79	31 (57.4)	48 (82.8)		
Do you have any idea about the QuickSleeper technology of painless injections of anaesthesia?	NO	66	27 (50)	39 (67.2)	3.435	0.064
	YES	46	27 (50)	19 (32.8)		
Are you aware of the 3D printers and CADCAM technology?	NO	4	2 (3.7)	2 (3.4)	0.005	0.942
	YES	108	52 (96.3)	56 (96.6)		
Are you aware of the Dolphin Imaging Software for the treatment planning?	YES	1	0 (0)	1 (1.7)	2.036	0.361
	NO	55	24 (44.4)	31 (53.4)		
	YES	56	30 (55.6)	26 (44.8)		
Do you or your orthodontist use the Dolphin Imaging Software for the treatment planning?	NO	74	36 (66.7)	38 (65.5)	0.016	0.898
	YES	38	18 (33.3)	20 (34.5)		
Do you believe that the Newer technologies can bring a revolution in dentistry?	MAYBE	14	2 (3.7)	12 (20.7)	9.178	0.01
	NO	2	2 (3.7)	0 (0)		
	YES	96	50 (92.6)	46 (79.3)		

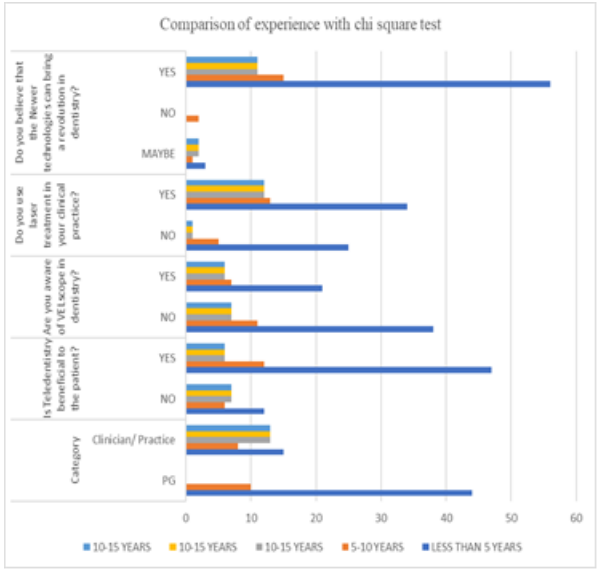
Table 1: Comparison of category with chi-square test



Graph 1:

	Categories	N	Experience				Chi square	P value
			LESS THAN 5 YEARS (N (%))	5-10 YEARS (N (%))	10-15 YEARS (N (%))	MORE THAN 15 YEARS (N (%))		
Category	PG	54	44 (74.6)	10 (55.6)	0 (0)	0 (0)	49.397	<0.001
	Clinician/ Practice	58	15 (25.4)	8 (44.4)	13 (100)	22 (100)		
Do you have any general idea of various newer technologies and it's application in dentistry?	NO	4	3 (5.1)	1 (5.6)	0 (0)	0 (0)	1.894	0.595
	YES	108	56 (94.9)	17 (94.4)	13 (100)	22 (100)		
Do you perform Teledentistry in your in your practice?	NO	59	35 (59.3)	7 (38.9)	6 (46.2)	11 (50)	2.703	0.44
	YES	53	24 (40.7)	11 (61.1)	7 (53.8)	11 (50)		
Is Teledentistry beneficial to the patient?	NO	38	12 (20.3)	6 (33.3)	7 (53.8)	13 (59.1)	13.378	0.004
	YES	74	47 (79.7)	12 (66.7)	6 (46.2)	9 (40.9)		
Are you aware of DIAGNOdent technology in dentistry?	NO	28	10 (16.9)	4 (22.2)	6 (46.2)	8 (36.4)	6.731	0.081
	YES	84	49 (83.1)	14 (77.8)	7 (53.8)	14 (63.6)		
Do you use intraoral scanners in your clinical practice?	NO	42	25 (42.4)	7 (38.9)	1 (7.7)	9 (40.9)	5.65	0.13
	YES	70	34 (57.6)	11 (61.1)	12 (92.3)	13 (59.1)		
Do you have any idea of Shape Trios Scanner and iTero Element 5D Scanner?	NO	56	33 (55.9)	5 (27.8)	5 (38.5)	13 (59.1)	5.806	0.121
	YES	56	26 (44.1)	13 (72.2)	8 (61.5)	9 (40.9)		
Are you aware of VELscope in dentistry?	NO	62	38 (64.4)	11 (61.1)	7 (53.8)	6 (27.3)	9.23	0.026
	YES	50	21 (35.6)	7 (38.9)	6 (46.2)	16 (72.7)		
Do you have any idea of application of VELscope in detection of early form of cancer?	NO	72	39 (66.1)	11 (61.1)	10 (76.9)	12 (54.5)	1.977	0.577
	YES	40	20 (33.9)	7 (38.9)	3 (23.1)	10 (45.5)		
Are you aware of Laser in dentistry?	NO	1	1 (1.7)	0 (0)	0 (0)	0 (0)	0.906	0.824
	YES	111	58 (98.3)	18 (100)	13 (100)	22 (100)		
Do you use laser treatment in your clinical practice?	NO	33	25 (42.4)	5 (27.8)	1 (7.7)	2 (9.1)	12.114	0.007
	YES	79	34 (57.6)	13 (72.2)	12 (92.3)	20 (90.9)		
Do you have any idea about the QuickSleeper technology of painless injections of anaesthesia?	NO	66	32 (54.2)	11 (61.1)	8 (61.5)	15 (68.2)	1.387	0.709
	YES	46	27 (45.8)	7 (38.9)	5 (38.5)	7 (31.8)		
Are you aware of the 3D printers and CADCAM technology?	NO	4	3 (5.1)	1 (5.6)	0 (0)	0 (0)	1.894	0.595
	YES	108	56 (94.9)	17 (94.4)	13 (100)	22 (100)		
Are you aware of the Dolphin Imaging Software for the treatment planning?	YES	1	0 (0)	0 (0)	1 (7.7)	0 (0)	9.374	0.154
	NO	55	27 (45.8)	10 (55.6)	5 (38.5)	13 (59.1)		
	YES	56	32 (54.2)	8 (44.4)	7 (53.8)	9 (40.9)		
Do you or your orthodontist use the Dolphin Imaging Software for the treatment planning?	NO	74	37 (62.7)	14 (77.8)	8 (61.5)	15 (68.2)	1.56	0.668
	YES	38	22 (37.3)	4 (22.2)	5 (38.5)	7 (31.8)		
Do you believe that the Newer technologies can bring a revolution in dentistry?	MAYBE	14	3 (5.1)	1 (5.6)	2 (15.4)	8 (36.4)	25.691	<0.001
	NO	2	0 (0)	2 (11.1)	0 (0)	0 (0)		
	YES	96	56 (94.9)	15 (83.3)	11 (84.6)	14 (63.6)		

Table 2: Comparison of experience with chi-square test



Graph 2:

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