

Assessment of Digital and Conventional Radiographic Practice amongst the private dental practitioner of Vadodara City

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ABSTRACT

Aim: To assess the usage of digital or conventional radiography, type of digital radiographic technique and practice regarding the radiation safety amongst the Private Dental Practitioners (PDP) of Vadodara city. **Material and Method:** It was a cross-sectional survey study design which was conducted amongst Private Dental Practitioners Vadodara city Gujarat. PDP was personally contacted and the questionnaire was distributed. They had been asked whether they used digital radiography (DR) or not, if yes then further questions asked like the type of sensors, the number of sensors, infection control measure while taking the DR, and user friendliness of the system. At the end of the survey, they were also asked regarding the radiation protection during their routine dental practice. **Results:** The total 190 PDP had completed questionnaire proformas, out of them 58% of PDP had used digital radiography. CCD sensor was most commonly used. Most of the PDP had only one DR sensor. Most of them also believed that DR is more users friendly and improve their diagnostic ability. The Cost of the sensor was a main limiting factor not to use DR. limited PDP had followed the radiation safety protocol. **Conclusions:** The use of Digital Radiography is not common in all PDP of Vadodara city, cost reduction of the DR sensor may enhance its utilization.

KEYWORDS: Digital radiography, Radiographic practice, Private dental practitioner, Survey

INTRODUCTION

The X-rays was discovered by Roentgen in the year 1895, after that the radiological examination has become an essential part in the field of dentistry. The radiographs play a very important role in the diagnosis, treatment planning, and follow-up of oral and maxillofacial disorders.¹ For diagnostic purposes, conventional film-based radiography has been regularly used in dentistry for several decades. With the increasing incorporation of technology into the dental office, however, more practitioners are replacing their conventional systems with digital radiography.²

The Digital Radiography (DR) has many advantages over the conventional technique. The possible advantages are: decrease radiation dose, reduction of time required between exposure and image display on the computer, eliminate developing process and chemicals, image improvement and ease to data storage. DR also helps to communicate with other practitioners. It is easier to explain the patient by viewing an image on a monitor.³

Depending on a type of the sensor utilized during image capturing, the digital radiography can be divided into 2 categories: (1) direct digital systems; and (2) indirect digital systems. Silicon devices like as complementary metal oxide semiconductor (CMOS) or charge coupled

devices (CCD) are a direct digital system. CMOS or CCD sensors are also known as solid-state detectors. Storage phosphor plates (SPP), also referred as Photostimulable Phosphor Plates (PSP) are example of indirect digital system.⁴

DR is potentially an area where large dose saving may be achieved and ability to manipulate the image to efficiently display the area of interest.⁵ Dölekoğlu et al.⁶ stated that, the main reasons for utilizing the DR by dentist were to the exclusion of the developing process, easy to store images, reduced radiation dose and shorter performance time and.⁶ A study by iData Research in 2010 indicates that DR is a global trend that is considerably driving the rapid implementation of digital technology.⁷ The aim of the study was to check usage of digital or conventional radiography, type of digital radiographic technique and practice regarding the radiation safety amongst the Private Dental Practitioners (PDP) of Vadodara city.

MATERIALS AND METHODS

The study was a cross-sectional survey, conducted amongst the Private Dental Practitioners to assess practice regarding the digital radiography in Vadodara

How to cite this article:

Bargale S, Ardeshana A, Patel N, Karri A, Sikligar S, Tailor B. Assessment of Digital and Conventional Radiographic Practice amongst the private dental practitioner of Vadodara City. *Int J Oral Health Med Res* 2017;3(6):27-30.

city, Gujarat. Private dental practitioners who are willing to participate in the study were included in the study. The dental practitioners who could not be contacted for two times at their clinic and who did not fill complete questionnaire were excluded from the study.

The questionnaire was self-prepared containing 17 questions. For content validation of these questions, a pilot study was done on ten Private Dental Practitioners. All content of questioners along with multiple options are checked by the experts and reliability was 100%. Validated Questionnaire Results is 82% for this study.

The questionnaire was divided into a number of sections. The first information on participants' socio-demographic and practice characteristics. They had been asked whether they used digital radiography, and, if not, why they had chosen conventional technique over DR.

For DR users, further questions asked like the type of sensors, number of sensors, infection control measured while taking the DR, and user friendliness of the system. At the end of the survey they were also asked regarding the radiation protection during their routine dental practice.

Prior scheduled time for the study was obtained from the PDP. Written Information and consent regarding the study were obtained on the first appointment. The questionnaire proformas were distributed on the same appointment amongst the PDP. They had been asked to fill the questionnaire. The questionnaire proformas were collected in the second appointment by the investigator. The data had been entered into excel sheet, and descriptive statistic was used for the evaluation of data.

RESULTS

The total 190 PDP had completed questionnaire proformas from Vadodara city. Figure 1 showing the gender distribution of PDP where 77 % were male and 23% were female PDP participated in the study.

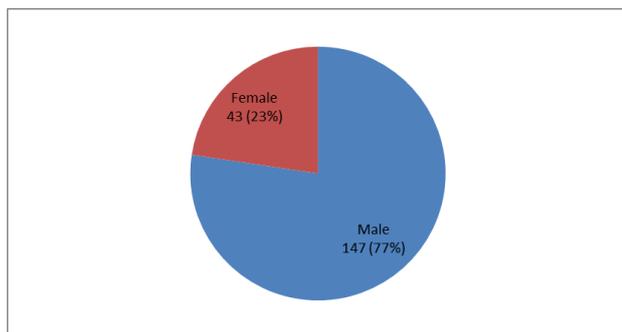


Figure 1: Distribution of gender amongst the PDPs

Figure 2 showing the academic qualification distribution of PDP. Out of 190 PDP, 71% were BDS, and 29% were MDS.

Figure 3 showing the year of practice distribution of PDP. Amongst 190 PDP, 38% PDP were practicing less than five years, 43% were practicing in between five to ten

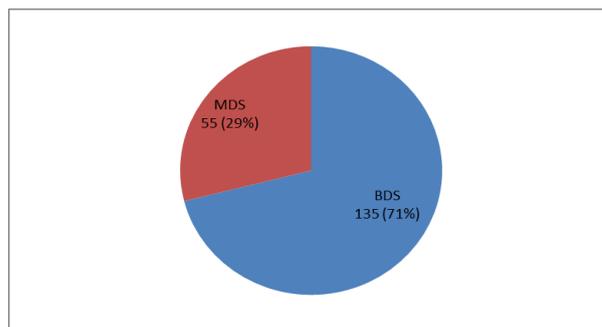


Figure 2: Academic qualification distribution amongst the PDP

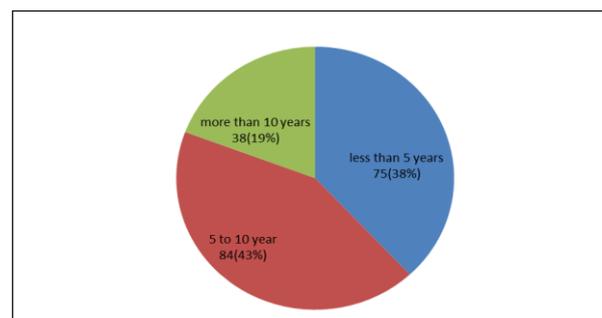


Figure 3: Year of practice distribution amongst PDP

years, and 19% were practicing more than ten years in Vadodara city.

Use of Digital Radiographic System: Out of 190 PDP, 58% of them had used digital radiography while 42% had not used it. Regarding the type of the sensors, Charged Couple Device was most commonly used. 92% of PDP had used CCD compare to PSP which was used by only 8% of PDPs (Table 1)

Charged Couple Device (CCD)	103 (92%)
Photostimulable Phosphor Plates (PSP)	09 (8%)
Both	0
Total	112 (100%)

Table 1: Types of digital radiographic sensor used by PDP system

112 PDP who are using digital radiography, 88% of PDP had used only one sensor while only 12 % had used more than one sensor during their routine dental practice. Regarding the user-friendliness of the digital radiographic system, most of PDP believed that DR was very easy or easy to use (Table 2). PDP also responded that 22% of their patients were very satisfied and 58% of their patients were being satisfied with DR system (Table 3).

Very easy to use	56 (50%)
Easy	42 (38%)
Neutral	14 (12%)
Difficult	-
Very difficult	-

Table 2: User friendliness of the digital radiographic system

Being very satisfied	25 (22%)
Satisfied	65 (58%)
Neutral	22 (20%)
Unsatisfied	-
Very unsatisfied.	-

Table 3: level of overall satisfaction of the patient with digital radiograph

42% of PDP did not use DR, the high cost of DR system (82%) was a most common reason. 15% of PDP had also given the reason that they do not have essential equipment for DR, 3% PDP had believed that DR is hard to perform (Table 4).

Expensive	64 (82%)
Poor image quality	-
I do not have essential equipments	12 (15%)
Hard to perform	2 (3%)

Table 4: Reasons for not using the DR

Dentists were asked about which techniques were employed in the clinics while taking the periapical radiograph. The most preferred technique among the dentists for periapical radiography was the bisecting angle technique which was used by 88% of PDP. The paralleling technique was used by only 12%

92% of PDP had believed that DR increases their diagnostic ability. 60% of PDP had agreed that DR increases the radiographic repetition. 80% PDP had faced difficulty to placed DR sensor in child patient (Table 5). Lead aprons were used by only 23% PDP. Only 13% of PDP used the lead apron and thyroid collars for the patient while taking the radiograph. None of the PDP had the lead barrier in their clinic (Table 5).

Questions	Yes	No
1. Do you think that digital radiograph improve your diagnostic ability?	103 (92%)	9 (8%)
2. Does the usage of digital imaging increase the radiographic repetitions	60 (53%)	52 (47%)
3. Do you think that the placement of digital sensor is difficult in child patient?	90 (80%)	22 (20%)
4. Do you plan to purchase a digital radiography system in future for your own dental practice?	61 (78%)	17 (22%)
5. Do you use a protecting barrier in your practice while taking the radiograph?	45 (23%)	145 (77%)
6. Does your patient wear a lead apron and thyroid collar while being exposed to X-ray?	25 (13%)	165 (87%)
7. Do you have lead barrier in your clinic?	0	190 (100%)

Table 5: showing the questions and their responses of digital radiography usage and radiation safety

DISCUSSION

Radiographs are widely used in dentistry to enhancement the clinical examination of patients.⁸ It is an essential diagnostic tool in dentistry and is one of the key determinants of a successful diagnosis. There are various articles prove the benefits of digital imaging.⁹⁻¹¹ In dental practice, DR is more and more used as a new imaging technology. A rising number of dental practitioners worldwide have favored digital imaging to conventional film radiography.¹²

In the present study, 58% of PDP used digital radiography. Pal et al.¹³ reported that only 8% of dentist in West Bengal are used DR. Shah et al.¹⁴ reported that only 35.62% of dentist used digital radiography primarily in their routine practice. Dolekoglu et al.⁶ reported that 67% of Turkish dentist used DR. According Lee et al.¹⁵

digital sensors were used by 77.2% of the Korean dentists. Still, DR is less popular in Indian dental practitioner compare to developed country.

CCD sensor was most commonly used (92%) by the PDP compare to PSP sensor. Similarly, Brian et al.¹⁶ reported that rigid direct digital receptors (78.3%) were more commonly used by Indiana dentist than PSP systems. PSP sensors have an average life of 100 to 150 exposures, and several plates will be needed for a routine busy practice.² These are the disadvantages might be associate with less use of PSP.

Out of 112 PDP, 88% of PDP had used only one sensor. Similarly, Berkhout et al.⁴ reported that 85% of respondents with a solid-state system use only one sensor size due to high cost. In the present study high cost of the sensor is one of the reasons to use only one sensor by PDP. Regarding the user-friendliness of the digital radiographic system, 56% PDP believed very easy to use, 42 % believed easy to use. The digital radiographic system is more user-friendly because of easier image processing and storage without the need for chemicals.⁴

80% of PDP believed that placement of DR sensors in child patients was more difficult. In this present study, rigid CCD receptors were used most commonly by PDP. It is well documented that rigid receptors are more uncomfortable than plates or film^{4,17} Ting et al.¹⁸ also noted that the size of the sensors used in CCD systems remains an issue.

60% of PDP had agreed that DR increases the radiographic repetition. Similar finding was reported by Chaudhary et al.¹⁹ and Ting et al.¹⁸ Berkhout et al.⁴ also reported that around 65% of digital users take more radiographs to gain greater certainty about the treatment especially during endodontic treatment or to achieve the better diagnosis.

92% of PDP had believed that DR increases their diagnostic ability. Most of the studies have accomplished that the diagnostic value of digital images is adequate; digital images achieve at least as well as conventional radiographs, and sometimes better.²⁰ 78 PDP did not use DR, the high cost of DR system (82%) was a most common reason. 15% of PDP had also given the reason that they did not have essential equipments for DR, 3% PDP had believed that DR was hard to perform. According to Brian et al.¹⁶ cost was the most limiting factor in not incorporating digital radiography by in private dental practitioner (82%) their practice. Similar finding was reported by Dolekoglu et al.⁶

The initial investment for DR is higher compared to conventional radiographic film. But during daily busy practice, if we consider the expenses of conventional film, chemicals, and mounts/hangers, as well as waste disposal for every month and it compare with installment for DR sensor every month, DR actually save monthly expenses compare to conventional radiography.²¹

The most preferred technique among the dentists for

periapical radiography was the bisecting angle technique (88%). The paralleling technique was reported as 12%. A similar result was also observed by Sheikh et al.²² The bisecting angle technique is an old method for periapical radiography.²³ The paralleling technique has the better presentation but appropriate film holders are necessary for utilization of the technique.²⁴ The higher percentage to use of the bisecting technique in the present study may be because the bisecting angle technique is easy to use and is comfortable for the patient.

Lead aprons were used by only 23% of PDP. Only 13% of PDP used the lead apron and thyroid collars for the patient while taking the radiograph. None of the PDP had the lead barrier in their clinic. The study by Ilgu et al.²⁴ shown that lead aprons were used only by 8.7% dentists Chaudhry et al.¹⁹ observed that 31% of dentist in the national capital region using the lead apron while taking the radiography. According to Lee et al.¹⁵ lead apron/thyroid collars were used for patients in 21.7% of the dental offices. All these studies showed the neglect of radiation safety by dental practitioners. In the present study similar result were found regarding the radiation safety by PDP.

CONCLUSION

Digital radiography is not yet popular among all PDP. Among the ones using it, most of them satisfied with DR. However, digital radiography seems to be capable with improving over time in cost reduction and technology will enhance the utilization. Attitude regarding the radiation protection was poor amongst the private dental practitioner. So it is needed to spread awareness regarding the radiation hazards and protection.

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Source of Support: Nil
Conflict of Interest: Nil