

Original Research Article

The knowledge of general dentists in Tabriz about using of digital radiography in dentistry

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Abstract

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In dental practice, digital radiography is increasingly used as a new imaging system due to the advantages like time savings, radiation dose reduction, and image enhancements. The present study assessed the knowledge of general dental practitioners practicing at Tabriz City about using digital radiography systems. In this descriptive cross-sectional trial, 106 general dentists (33 females; 73 males) were selected and studied by a questionnaire. The questions comprised demographic items and knowledge about different aspects of the digital radiography. The validity and reliability of the questionnaire were examined before to their distribution. The answers collected with the scale of more, moderate, little and no idea; for them, scores of 3 to 0 were allocated. The data were analyzed using descriptive methods, Pearson coefficient test and Mann-Whitney U test. The mean scores of knowledge about digital radiography were 27.52 with the standard deviation of 10.65 (range: 6-57) among dentists. Spearman's correlation test showed negative significant correlations between knowledge scores of digital radiography and age ($r=-0.49$, $p<0.0001$) and years practicing dental profession ($r=-0.51$, $p<0.0001$). Mean knowledge scores of females and males were 30.8 (± 12.26) and 25.81 (± 9.41) respectively being significantly higher in females ($p<0.04$). However, more dentists showed moderate knowledge about digital radiography; this level is not adequate due to the necessary of using digital radiographic systems to inform patients with the advantages. Therefore, more educations should be developed for the general dentists in the form of continuous or formal courses in this field.

Key words: Dentists, Digital radiography, Knowledge, Practice

INTRODUCTION

Traditional film is being exchanged via digital imaging in the private practice dental agencies and academic organizations to educate dental experts. Digital imaging decreases exposing the radiation time to the patient and suggests quick, suitable image taking, viewing and saving and reduces process of darkroom which leads to several film-based errors. Introduction of the digital dental radiology start in France in 1984. Digital radiography is known as a very attractive substitute to traditional imaging. The most frequently mentioned positive cause is reducing the radiation dose. Intraoral digital imaging

receptors prepared equal or more dose reduction in comparison with F speed film (White and Pharoah 2014). Greater dose decrease can be reached when repeats of imaging were reduced and the number of further images is limited (Wenzel and Møystad 2010) (Association 2004).

Other noticeable benefits include the elimination using of the darkroom, chemistry process and the errors linked with unsuitable darkroom maintenance, chemical handling and solution replacement (Button, Moore et al., 1999; Yakoumakis, Tierris et al., 2001). Other

Table 1. Frequency of the different aspects of the using digital radiography (DR) in dentistry

Question	no idea	little	moderate	more
knowledge about advantage of the DR	0	18 (17%)	54(50.9%)	34 (32.1%)
knowledge about disadvantage of the DR	1 (0.9%)	50 (47.2%)	34 (32.1%)	21(19.8%)
knowledge about type of image receptors	1 (0.9%)	51 (48.1%)	40 (37.3%)	14 (13.2%)
knowledge about advantage of the CCD image receptors	4 (3.8%)	50 (47.2%)	40 (37.3%)	12 (11.3%)
knowledge about disadvantage of the CCD image receptors	6 (5.7%)	56(52.8%)	35 (33%)	9 (8.5%)
knowledge about advantage of the CMOS image receptors	12 (11.3%)	47 (44.3%)	37 (34.9%)	10 (9.4%)
knowledge about disadvantage of the CMOS image receptors	13 (12.3 %)	53 (50%)	32 (30.2%)	8 (7.5%)
knowledge about advantage of the Flat panel image receptors	18 (17%)	53 (50%)	23 (21.7%)	12 (11.3%)
knowledge about disadvantage of the Flat panel image receptors	24 (22.6%)	51 (48.1%)	26 (24.5%)	5 (4.7%)
knowledge about process of the image captureby CCD	21 (19.8%)	49 (46.2%)	27 (25.5%)	9 (8.5%)
knowledge about process of the image captureby CMOS	21 (19.8%)	50 (47.2%)	30 (28.3%)	5 (4.7%)
knowledge about process of the image captureby flat panel	30 (28.3%)	54(50.9%)	17 (16%)	5 (4.7%)
knowledge about imaging characteristics by CCD	22 (20.8%)	50 (47.2%)	26 (24.5%)	8 (7.5%)
knowledge about imaging characteristics by CMOS	20 (18.9%)	53 (50%)	25 (23.6%)	8 (7.5%)
knowledge about imaging characteristics by flat panel	25 (23.6%)	62 (58.8%)	12 (11.3%)	7 (6.6%)
knowledge about process of the image captureby CBCT	8 (7.5 %)	38 (35.8%)	46 (43.4%)	14 (13.2%)
knowledge about imaging characteristics by CBCT	12 (11.3%)	40 (37.3%)	40 (37.3%)	14 (13.2%)
knowledge aboutCBCT	1 (0.9%)	21 (19.8%)	58 (54.7%)	26 (24.5%)
knowledge about difference between CBCT and CT	4 (3.8%)	32 (30.2%)	38 (35.8%)	32 (30.2%)

advantages is ability to see the image more rapidly, increase the image capturing besides the ease of saving, recovery, reduplication and transmission (Berkhout, Sanderink et al., 2002).

Dental digital radiography instruments can be shared into storage phosphor plates (SPP), also named photostimuable phosphor plates (PSP), and silicon devices such as charge coupled devices (CCD) or complementary metal oxide semiconductors (CMOS) (van der Stelt, 2000).1±3

In the phosphor crystals aSPP as latent image is deliver by a laser scanner, the sizes of plates are similar and are wideness in comparison with conventional dental X-ray film. Solid-state sensors are bulkier and linked to a cable with a various exposure protocol in comparing to film.

The most studies assessed the performance of the digital radiography in laboratory conditions. Recently many studies have been reported about digital radiography in dental practice (Berkhout, Sanderink et al., 2002, Van der Stelt 2008, Berkhout, Sanderink et al. 2014, Brian and Williamson 2014, Wenzel 2014). The aim of this research was to assay the knowledge of general dentists in Tabriz about using of digital radiography in dentistry.

MATERIAL AND METHODS

In this descriptive cross-sectional study, 106 general dentists (33 females; 73 males) were selected and studied by a questionnaire in 2012. Inclusion criteria were having a work experience in dental clinic and be a

member of the Tabriz medical council. Also, the dentist who did not want to take a part in the study was removed.

Samples were selected according to the Cochran's sample size formula for an alpha level a priori at 0.05, $t=1.96$, $p=q=0.5$, population size from 930 private dentist. Required sample size was calculated about 272 but after using questionnaire totally 106 dentists were participated and response rate was 38.9 %.

The questions comprised demographic items (age, gender, number of working years as dentist) and knowledge about different aspects of the digital radiography. The validity and reliability of the questionnaire were examined before to their distribution and concluded that if more than 25% of the questions was without answer, the questionnaire excluded from the final analysis.

Evaluation of the questionnaire items was done by Cronbach's alpha with 20 questionnaires (the values range between 0 and 1). In this study the values were above 0.8 and be acceptable.

The answers valued with the scale of more, moderate, little and no idea; for them, scores of 3 to 0 were allocated. The data were analyzed using descriptive methods, Pearson coefficient test and Mann-Whitney U test by SPSS.18 ($P < 0.05$).

RESULTS

In this study, 106 active dentists was participated and evaluated which among them 31.1% were female and 68.9% were male. The Mean (\pm SD) age of the participants was 39.2 (± 6.65) years old. The age range was 25 to 56 years old. Moreover, Mean (\pm SD) of

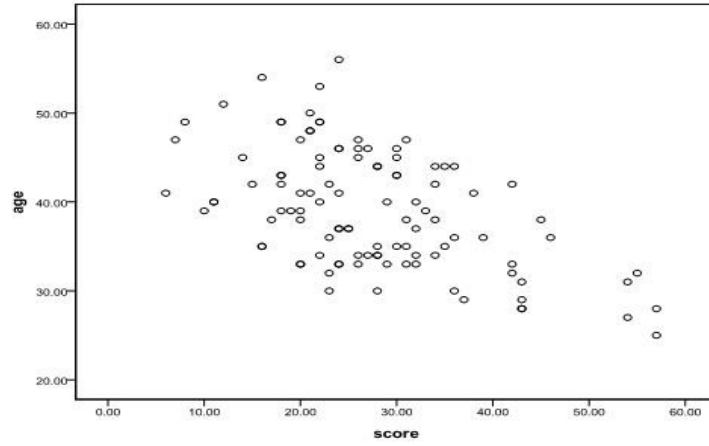


Figure 1. Correlation between knowledge and age with respect to using digital radiography

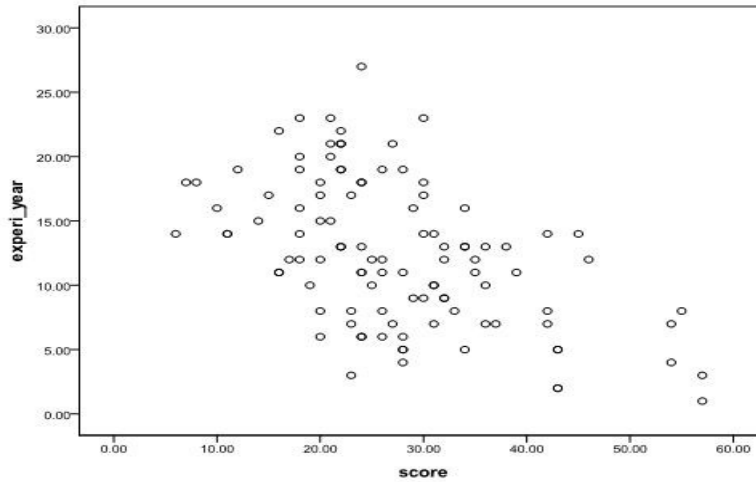


Figure 2. Correlation between knowledge and years of working experience with respect to using digital radiography

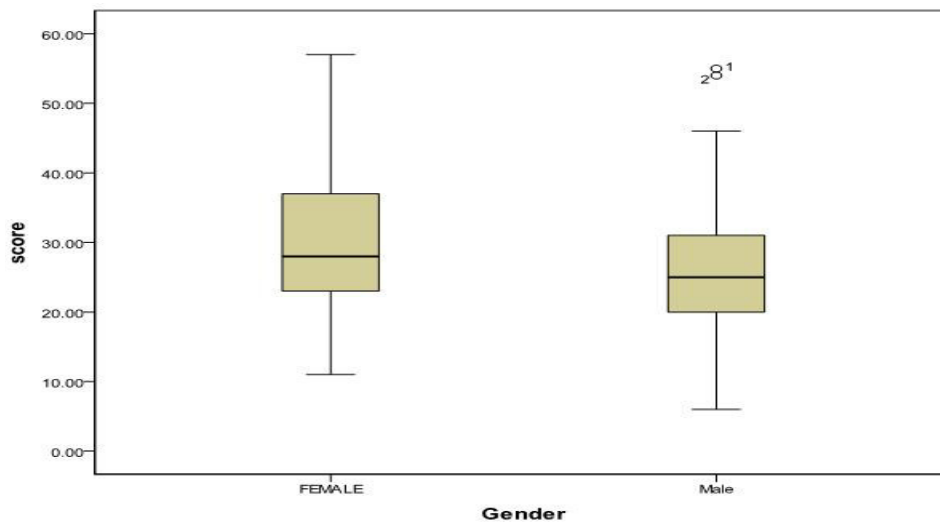


Figure 3. The knowledge of using digital radiography in general female and male dentist

experience in dentistry was 12.45 (\pm 5.63) year (min= 1 year and max = 27 years). The results of different aspects of the using digital radiography (DR) in dentistry are dedicated in Table 1.

The mean (SD) knowledge score of the using digital radiography in dentistry was 27.52 (10.65)(range: 6-57).

According to the Spearman's coefficient, a negative significant correlation was observed between the scores of knowledge with age ($p < 0.0001$, $r = 0.49$) (figure 1) and years of working experience ($p < 0.0001$, $r = 0.51$) (figure 2) with respect to use digital radiography.

The mean (\pm SD) knowledge score of the using digital radiography in dentistry in female was 30.8 (\pm 12.26) and for male was 25.81(\pm 9.41) which was significantly more in the female than male (Mann-Whitney U test: $p < 0.04$) (figure 3).

DISCUSSION

The knowledge about the advantages of digital radiography in this study was acceptable because almost more than half of dentists had positive response (responserate: 38.9%). While, the awareness of the disadvantages of these systems was low, so that the majority of dentists (47.2%) had few information about disadvantages of the digital radiography.

By introducing the digital receptors in dental radiography, general dentists have switched imaging from conventional film radiography to DR due to the advantages of DR. The two technology platforms accessible in DR are CCD (Charge Coupled Device) and Flat Panel detectors. Advances in this technology and reduction costs of digital sensors could allow application of this imaging process in the medical field mainly in the intraoral imaging by general dentists. In this research response rate about advantage of using digital radiography in dentistry was satisfied (more than 50%). Several studies reported using of DR among the general dentists and discussed its advantage (Ting, Broadbent et al. 2013, Berkhout, Sanderink et al. 2014, Brian and Williamson 2014, Alcaraz, Velasco et al. 2015, Chong, Miller et al. 2015, Narayanaraopeta and Alshwaimi 2015, Kanagasingam, Hussaini et al. 2016). Hellen et al. determined differences in image quality among conventional film radiographs and DR (4863 images) by questionnaire study between Sweden dentists. The quality of images obtained from DR was significantly lower in comparison with film radiographs. The response rate to questionnaire items was 94%. Several general dentists had experienced numerous problems (65%), and 40% of the digital systems experienced various type of quality control. The main technical challenge of DR related to the monitorto obtains best quality of imaged via setting of brightness and contrast of the monitors. In conclusion, several problems with dental DR were recognized. Moreover, knowledge of

DR techniques and optimizing of the system to achieve great radiographic quality must be developed (Hellen-Halme 2007). Dolekoglu et al. evaluated the prevalence of using DR by 383 Turkish dentists. Among them, 33% of dentists did not work with DR. 60% of dentists did not use DR owing to cost but 67% of dentists applied DR. 55.9% of dentists and 79.1% of academicians had information about CBCT. They concluded that Turkey users for applying the DR are increasing and levels of information of CBCT and knowledge of radiation safety also are increased (Dolekoglu, Fisekioglu et al. 2011). Paurazas et al. compared E-speed film (70 images) and digital images (140 images) with a CCD sensor and a CMOS-APS for detecting of periapical bone lesions by six endodontists and two radiologists. The results showed that no statistically significant differences were found between three systems film, CCD, and CMOS-APS. Digital imaging needed 50% less radiation in comparison with film to acquire the same diagnostic evidence (Paurazas, Geist et al. 2000). In the other study, the adoption of using DR and main factors for using this technology was assessed among the 1000 general dental practitioners in the Netherlands. The response rate to the questionnaire on paper and online were 65.1% and 34.9%, respectively. High technology handlers more frequently had a special knowledge, were younger on average, and used more hours per week in comparison with low technology users, and participated more hours per year in expert activities than intermediate users. Using of high technology was more common for dentists who were worked in practices with many numbers of patients each year and with more staff (van der Zande, Gorter et al. 2015). In our study, by increasing the age and dental experience working, response rate was low. An important advantage of DR is its time-saving (Wenzel and Moystad 2001). However, in some study, imaging time recognized as the least main aspect for imaging by DR (Li, Stelt et al. 2006).

CONCLUSION

However, more dentists showed moderate knowledge about digital radiography; this level is not adequate due to the necessary of using digital radiography systems to inform patients with the advantages. Therefore, more educations should be developed for the general dentists in the form of continuous or formal courses in this field.

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