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## Research Article

### KNOWLEDGE, AWARENESS AND PRACTICE REGARDING RADIOGRAPHIC TECHNIQUES AND RADIATION PROTECTION AMONG GENERAL DENTAL PRACTITIONERS IN PIMPRI-CHINCHWAD CITY: A QUESTIONNAIRE-BASED CROSS-SECTIONAL SURVEY

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#### ABSTRACT

**Aims and objectives-** The aim of the study was to assess the knowledge of radiographic techniques used by different practitioners, the awareness regarding radiation hazards and radiation safety measures taken and the practice of radiation protection measures followed by the dental practitioners. **Methods and methodology:** A cross sectional questionnaire based study was conducted using a pre-tested and pre- validated self-administered questionnaire containing 24 items to be answered. The questionnaire was hand-delivered to 227 dentists working as private practitioners in Pimpri- Chinchwad city, a list of which was obtained from the Indian Dental Association (IDA), Pimpri-Chinchwad branch. Out of 227 dentists registered in the IDA Pimpri-Chinchwad, 68 dentists were specialists, 9 were academicians, 17 dentists refused to participate in the study and 15 dentists did not return the questionnaire even after 3 consecutive visits, hence were excluded from the study. 118 dentists returned the questionnaire duly answered and hence were included in the study. **Results:** Out of the 118 dentists who responded, 97.5% (115) dentists used intraoral radiographic machine with 72.1% (83) using a digital sensor as image receptor and only 27.8% (32) dentists used films. 72.9% (86) dentists use bisecting angle technique, only 12.7% (15) use paralleling cone technique while the rest used both. 47.5% (56) dentists never use lead aprons and 81.4% (96) dentists never used thyroid shields. **Conclusion:** The results of the study clearly reflect that the awareness and practice of radiation protection is unsatisfactory. The knowledge regarding the radiographic equipment used is also disappointing. Hence all the dentists should attend educational programs on basic imaging and radiation protection on regular basis and practice dental radiology in an ethical manner making X-rays safer for patients and themselves.

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#### INTRODUCTION

The radiographic examination is one of the principal diagnostic methods used in all fields of medical services and contributes to the promotion of the health, both individually and nationally. Radiographic examination plays an essential part of dental practice. Because a certain amount of radiation is inevitably delivered to patients, it should be as low as reasonably achievable (ALARA). (Okano and Sur, 2010; Shahab et al., 2012)

Even if it could be assumed that radiation dose levels in dental practice are relatively low, one should consider the cumulative effect of repeated exposures. There should be a striving for the implementation of the proper decision and selection criteria for radiography in private dental clinics for radiological quality assurance. (Jacobs et al., 2004)

**The regulatory bodies:** International Commission for Radiation Protection (ICRP) is the regulatory body which lays down norms for radiation protection at the international level. In India, it is the Atomic Energy Regulatory Board (AERB), which provides the norms for radiation protection. **Role of AERB** is to ensure that use of ionizing radiation and nuclear energy in India does not cause undue risk to the health of people and the environment. It is mandatory to register all diagnostic radiation facilities in e-Licensing of Radiation Application (eLORA) system of AERB. From December 1st, 2013, it is compulsory for dental practitioners and dental institutions to register in eLORA and obtain a license to operate dental X-ray units, panoramic machines, and cone beam computed tomography. It is also necessary for manufacturers of diagnostic X-ray machines to obtain a license for sale in India by AERB. (Agarwal et al., 2015)

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Though registering to AERB is of utmost importance, most of the dentists are not aware of it. X-rays are invisible but its effects are not. (Lee and Ludlow, 2013). The effects of x-rays on humans are the result of interactions at atomic levels. These biological effects can be divided into two broad categories: Deterministic and stochastic effects. Deterministic effects are those effects in which the severity of the response is proportional to the dose. These effects occur in all people when the dose is large enough. Deterministic effects have a dose threshold below which response is not seen. By contrast, stochastic effects are those for which the probability of occurrence of the change, rather than its severity, is dose dependent. The stochastic effects thus lay the patient's and the operating personals in a high risk zone as it does not have dose thresholds. Knowing this, dental radiographs should be prescribed to the patients when its benefits are more than the risks involved. (White and Pharoah, 2004, 5<sup>th</sup> edition)

The imaging of pregnant women presents a unique challenge to radiologists because of the concern about the radiation risk to the embryo or fetus. Radiographic, fluoroscopic, and CT examinations in areas of the body other than the abdomen and pelvis deliver minimal radiation doses to the fetus. These doses rarely exceed 25mGy. The absolute risk to the fetus is small at doses of 100mGy while negligible at less than 50mGy. (McCollough et al., 2007; Kusama and Ota, 2002)

The amount of radiation exposure from dental radiographs depends on many variables such as film speed, exposure factors, the techniques used, collimation and use of protective barriers. (Lee and Ludlow, 2013) Use of these variables in accordance with the set guidelines is important to make the X-rays beneficial to the patients outweighing the risks associated. The present study is undertaken as a need was felt to assess the knowledge, awareness and practices amongst practicing BDS doctors in Pimpri-Chinchwad, as this may play a pivotal role in providing safe dental treatment to the patients exposed to radiation which if not followed meticulously may lead to deleterious effects both to the patient and the dentist. A need was also felt to conduct this study in this population as there was a paucity of available literature.

## **MATERIALS AND METHODS**

### ***Necessary Permission and Ethical Considerations***

The survey was conducted after obtaining permission from the Scientific Research Board and Institutional Ethical committee of Sinhgad Dental College and Hospital, Pune.

### **METHODOLOGY**

A cross-sectional study was conducted using a structured, close-ended, interviewer-administered questionnaire consisting of 24 questions by distributing the questionnaire amongst the practicing dentists of Pimpri-Chinchwad city.

The questionnaire was pilot tested and validated prior to the start of the study. Pilot testing was done by distributing the questionnaire to 15 randomly selected dentists working in Pune. Necessary changes were incorporated in the questionnaire based on the results of pilot study. These dentists were not included in the main study.

### ***Study population***

Private practitioners of Pimpri-Chinchwad area selected from list obtained from Indian Dental Association (IDA), Pimpri-Chinchwad branch, India.

### ***Sampling Procedure***

A list of dentists was obtained from IDA branch of Pimpri-Chinchwad area. The total number of dentists in Pimpri-Chinchwad city according to the list obtained was 227. Private practitioners registered under IDA Pimpri-Chinchwad having a BDS degree with dental clinics having radiographic armamentarium were included in the study. Dentists who were specialists and academicians, not consenting to participate in the study and not responding even after 2 consecutive visits were excluded from the study.

### ***Data Collection Procedure***

The questionnaire was hand-delivered to dental practitioners in their clinics. The dentists were given participant information sheet and were required to fill the necessary consent form. The questionnaire was collected back from them immediately on completion.

### ***Statistical Analysis***

The data obtained from the completed questionnaires was entered in Microsoft excel (version: Microsoft Office 2013). Descriptive analysis was done in order to determine the frequency and number of responses. The statistical analysis was done using the Statistical Package for Social Sciences software (SPSS version 21 for windows 8).

## **RESULTS**

The questionnaire was given to 227 dentists. Out of 227 dentists registered in the IDA Pimpri-Chinchwad, 68 dentists were specialists, 9 were academicians, 17 dentists refused to participate in the study and 15 dentists did not return the questionnaire even after 3 consecutive visits, hence were excluded from the study. 118 dentists returned the completed questionnaire. Thus a total of 118 questionnaires were analyzed. Out of 118 dentists, 54 were males and 64 were females. All the 118 dentists were university graduates (BDS). Amongst the dentists who answered the questionnaire, 41(34.7%) had less than 5 years of experience, 46(39%) had 6-15 years of experience, 30(25.4%) had 16-25 years of experience and 1(0.8%) had more than 25 years of experience. It was noted that around 6 dentists (5.1%) advised radiographs to the patients based on the history given by them, 111 dentists (94.1%) advised radiographs after examination of the patients and 1 dentist (0.8%) advised radiographs routinely. The majority of the dentists, that is around 115 (97.5%) have an intraoral radiographic machine, while 3(2.5%) have both intraoral as well as extraoral radiographic machines. Out of 115 dentists who have an intraoral radiographic equipment, radiographic receptor used by almost 86(74.7%) dentists is a digital sensor and around 32 (27.8%) dentists use radiographic films. Amongst the 32 dentists using radiographic films, 24(75%) use E-speed films and 8(25%) dentists have no idea about the speed of the film. Amongst the 86 dentists using the digital sensor, 49(56.9%) dentists use CCDs, 3(3.4%) use PSP while 36(41.3%) dentist have no idea about the type of digital

sensor they are using. Out of the 3 dentists having the extraoral radiographic equipment, all 3 used digital sensors. Only 1(33.3%) out of the 3 dentists knew that the digital sensor he/she have been using is a CCD, rest 2 had no idea about it. Out of the 118 dentists, 31(26.3%) dentists take the help of the patient's finger to place the receptor in the patient's mouth, 58(49.2%) ask their assistants to hold the receptor with their finger in the patient's mouth and only 29(24.6%) dentists use film holder to place the receptor in the patient's mouth. Amongst these 118 dentists, 31(26.3%) dentists place the receptor directly in the patient's mouth without covering it while the rest 87(73.7%) use a plastic cover to cover the receptor while placing the receptor in the patient's mouth. Around 2(1.7%) dentists use a kilovoltage of less than 60kvp for their intraoral radiographic machines, 66(60%) use 60-80kvp, 21(17.8%) use more than 80kvp while 29(24.6%) dentists have no idea about the kilovoltage of their machine. Around 45(38%) dentists use a tube current in the range of 8mA-10mA, 36(30.5%) use 12mA while the rest 37(31.4%) have no idea about the tube current of their intraoral radiographic machine. The shape of the collimator (tube head) used by 24(20.3%) dentists is rectangular, 88(74.6%) dentists use pointed collimator, only 1(0.8%) use cylindrical collimator while 5(4.2%) dentists have no idea about the shape of the collimator used. The average exposure time of the intraoral radiographic machine used by 11(9.3%) dentists is less than 0.5 seconds, 59(50%) use in the range of 0.5-0.8 seconds, 30(25.4%) dentists use an exposure time in the range of 0.9 to 1.2 seconds while the rest 18(15.3%) dentists have no idea about the exposure time used. The average number of intraoral periapical radiographs taken per week by 2(1.7%) dentists is less than 10, 83(70.3%) dentists is in the range of 10-29 radiographs, 25(21.2%) of the dentists take 30-49 radiographs in a week while 8(6.8%) dentists take more than 50 radiographs per week. 71(60.2%) dentists advise 1 bitewing or occlusal radiograph in a week, 8(6.8%) dentists advise 2 bitewing/occlusal radiographs in a week, 1(0.8%) of the dentist advises more than two of these radiographs per week while around 38(32.2%) of the dentists advise none. The number of extraoral radiographs including OPG,PNS, LAT CEPH etc advised per week by 51(43.2%) dentists is 1, 30(25.4%) dentists is 2, 24(20.3%) dentists is more than 2 while 13(11%) dentists advise none of these radiographs to their patients. The number of patients wearing lead aprons and thyroid shield is given in Figure 1. From the 118 dentists, 115(97.5%) dentists find it important to stand behind a protective lead wall during exposure while 3(2.5%) do not. Many of the dentists were completely unaware of the position and distance rule. Only 26.3% (31) answered correctly (>6feet), 20.3% had no idea and the rest had answered wrongly. Similarly, only 41.5% knew the correct angulation (90-135 ) while 24.6% had no idea about the angulation and the rest respondents answered wrongly. Awareness regarding radiation protection during pregnancy was good. 89.8% (106) participants said X-rays should be done only in an emergency and 91.5% (108) considered the second trimester to be safest for taking radiographs. The number of dentists wearing lead aprons while exposing the patients to x-rays is given in Figure 2. Number of dentists aware about Atomic Energy Regulatory Board (AERB) and dentists registered under AERB is given in Figure 3. The different radiographic techniques used by dentists is given in Figure 4.

From the 32(27.8%) who used radiographic films as receptors, 4(13.5%) use an automatic type of film processing technique while the rest 28(87.5%) used manual method.

The frequency of changing the processing solutions by the dentists is given in Figure 5.

Amongst the 118 dentists, none of them use a dosimeter to measure the radiation dose.

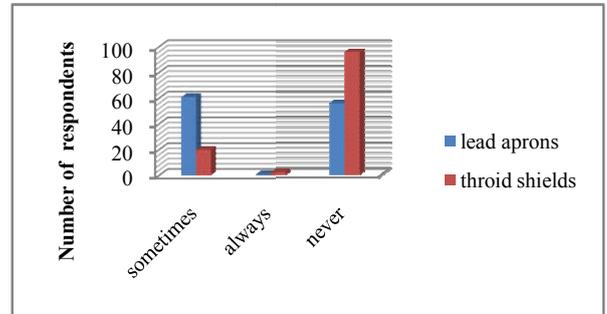


Fig 1 Distribution of number of patients wearing lead aprons and thyroid shields during exposure.

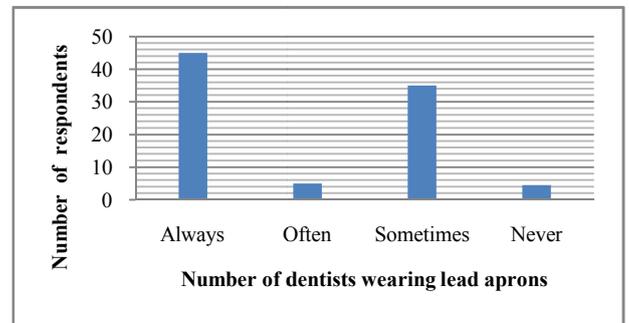


Fig 2 Distribution of number of dentists wearing lead aprons during exposure to X-rays.

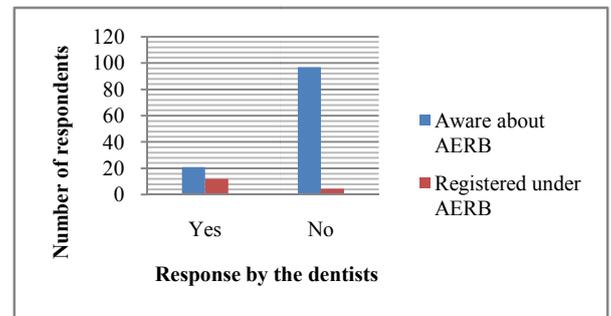


Fig 3 Distribution of dentists aware about Atomic Energy Regulatory Board (AERB) and dentists registered under AERB

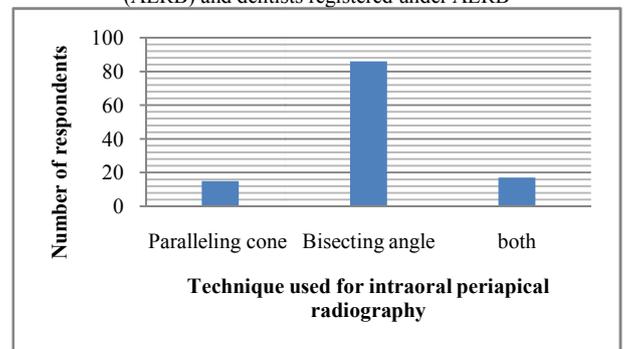


Fig 4 Distribution of different techniques used by dentists for intraoral periapical radiography.

Around 28(23.7%) get their x-ray equipment calibrated periodically, 57(48.3%) get it check only in case of necessity, while the remaining 33(28%) never get their equipment calibrated.

Out of the 28 dentists using manual processing technique for processing of films, majority of them 24(85.7%) dispose their solutions in the sewage drains and discard the lead foils into the dustbins, 3(10.7%) of them do not have the idea of method of disposal while only 1(3.5%) disposes the solutions by electrolytic separation and recycling of lead foils.

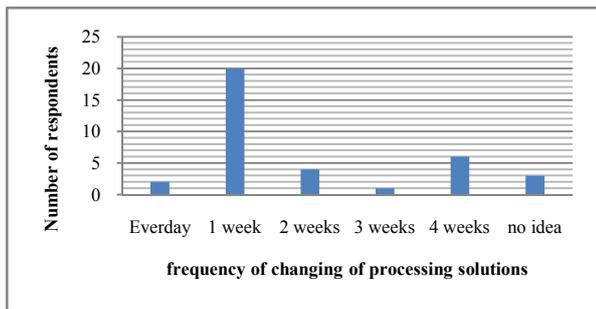


Fig 5 Distribution of frequency of changing of processing solutions by dentists

## DISCUSSION

Majority of the dentists, 94% (111), advice radiographs to the patients after examination of the oral cavity.

Around 97.5% dentists use the intraoral radiographic machine while the rest 2.5% used both intraoral as well as the extraoral radiographic machine.

The most sensitive intra-oral film generally used in dental practice is E-speed which results in a dose reduction of 40-50% when compared with D-speed film. Dentists should be encouraged to shift from D and E speed films to the faster F-speed film to reduce 20% radiation dose to their patients (Math et al., 2013). About 27.8% dentists use radiographic films out of which 75% use E-speed films which is consistent with study done by (Shaheb et al., 2012) which is 62%, 75% in Germany (Anissi and Geibel, 2014), 65% by (Ilgüy et al., 2005), 75% by (Math et al., 2013), 67.5% by (Sitra et al., 2008) while study done by (Bohay et al., 1994) shows low results which are 25%.

It has been determined that digital imaging for intraoral radiography requires about half the exposure of E-speed film and produces images largely comparable with the film images and thus is an acceptable alternative (Ilgüy et al., 2005). In the present study, 74.7% (86) dentists using digital sensor consistent with study done by (Agarwal et al., 2015) is 74.2%, results of other studies being lower with only 2 dentists in study conducted by (Salti and Whaites, 2002), 2% in study done by (Shahab et al., 2012), 35.62% in (Shah et al., 2014), 36% in Germany by (Anissi and Geibel, 2014), 10% by (Sitra et al., 2008), 8.9% by (Pal et al., 2015), 14% in (Math et al., 2013) using digital radiography.

Out of the 74.7% dentists using digital radiography, around 56.9% dentists used charged couple device (CCD) as the digital image receptor, phosphor storage plate (PSP) was used by only 3.4% while the rest had no idea about the sensor used by them.

In a study done in Germany (Anissi and Geibel, 2014), 23% used PSP while 13% used CCD and study by (Sitra et al., 2008) showed 8% use of CCD. Number of radiographs have to be taken while using CCD systems due to detector size and positioning errors of the X-ray detectors which are difficult to eliminate. Despite a slight increase of radiographs taken with CCD systems, there is a significant dose reduction as compared to film users (Kusama and Ota, 2002).

Only 24.6% dentists used film holders. Film holders should be used at all times (Salti and Whaites, 2002), which prevents the repetition of exposure and thus aids in radiation protection (Ilgüy et al., 2005). A remarkably higher results were obtained by (Asha et al., 2015) which was 78%, by (Sitra et al., 2008) was 50%, by (Jacobs et al., 2004) and (Salti and Whaites, 2002) were 60% and 43% respectively while (Shahab et al., 2012) gave a lower response of 12% dentists using film holders.

In our study, the majority of the practitioners, 73.7%, used a plastic cover to cover the image receptor while placing it in the patient's mouth. This is very important to prevent cross-infection between the patients and to maintain a sterile environment for the patient.

Increasing the kilovoltage much beyond 70 kVp results in a spectrum ill-matched to the optimal sensitivity of dental film (Okano and Sur, 2010) With respect to radiation protection of the patients, radiographic units with a voltage capacity between 60 kV and 70 kV are recommended (Kusama and Ota, 2002). In our survey, it was found that around 60% of dentists reported that their dental X-ray machines operate between 60 and 70kVp and only 24.6% were having no idea about what kVp their equipment was working. The results were found to be similar to study done by (Math et al., 2013) where 27.7% dentists and (Sitra et al., 2008) where 20% dentists were unaware of the kVp of their radiographic equipment. Whereas the results of studies carried out by (Salti and Whaites, 2002), (Pal et al., 2015) and (Agarwal et al., 2015) were totally contradictory with 64%, 82.3%, and 89% dentists respectively being unaware of the kVp of their radiographic equipment.

In our study, 31.4% dentists had no idea about the tube current of their equipment while 30.2% dentists used tube current in the range of 8-10mA while a higher results were obtained by study done by (Asha et al., 2015) where 54.4% population did not know the tube current of their equipment.

About 50% of the study population thought 0.5-0.8sec as ideal exposure time which is consistent with the study done by (Pal et al., 2015) which was also 50%. About 25.4%(30) dentists in the present study used higher exposure time.

Use of rectangular collimator reduces the dose about 5 times in comparison to the circular cone (Lee and Ludlow, 2013). In our study, 20.3% of the dentists used rectangular collimator, which is similar to results by (Pal et al., 2015) which were 27% while are slightly higher than other studies (Math et al., 2013) which was 7%, Belgium (Jacobs et al., 2004) was 6%, Turkey (Ilgüy et al., 2005) was 5.5%, (Sitra et al., 2008) was 7%, (Asha et al., 2015) was 6.3%, Canada (Bohay et al., 1994) was 8%. A total absence in the use of rectangular collimator was found in the Damascus survey by (Salti and Whaites, 2002). The dentists

should be informed about the use of a rectangular position indicating device (PID) attached to radiographic tube housing, which reduces the effective dose by almost 50% (Okano and Sur, 2010)

In spite of the majority of the dentists using patient's or assistant's finger to hold the film during exposure, around 97.5% (115) dentists knew that it is important to stand behind lead barriers during exposure. 20.3% dentists were completely unaware of the position distance rule to be followed in case of lack of barrier. Only 26.3% of the responders knew correct distance to stand during exposure (>6 feet), similarly only 41.5% knew the correct angulation (90-135 ) to stand to avoid being in the direction of primary and secondary radiation.

As the gonadal doses and even doses to the embryo is not significant in dental radiography, the use of lead aprons has been recommended on the grounds of patient reassurance (Okano and Sur, 2010). 47.5% (56) dentists in our study did not use lead aprons. Attention should be given to the results obtained by other studies where 98.16% in a study conducted by (Agarwal et al., 2015), 65% of Iranian dentists (Shahab et al., 2012) and the majority of the dentists from Germany (Anissi and Geibel, 2014) did not use lead aprons.

The thyroid gland, one of the most radiosensitive organs in the head and neck region, is frequently exposed to scattered radiation and occasionally to the primary beam during dental radiography (Okano and Sur, 2010). Thyroid skin exposure can be reduced by 33-84% in adults and 63-92% in children by using thyroid shield. Therefore, thyroid shielding can be applied to patients especially children as an adjunct to the use of rectangular collimation and paralleling technique (McCullough et al., 2013). The present study gives a strikingly high number of the dental practitioners not using thyroid collar which is 81.4% (96 dentists). Similar results were obtained from other studies with none of the dentists using thyroid shields in (Math et al., 2013) and (Agarwal et al., 2015) while only 3.7% dentists in (Ilgüy et al., 2005).

26.3% (31) of the dentists themselves never wear lead aprons during exposure while 38% (45) always wear lead aprons. A higher result was found in studies done by (Math et al., 2013) which was (88%) and by (Sitra et al., 2008) was (94%).

Most dentists do not take radiographs irrespective of the necessity if the patient is pregnant due to the fear of exposure of radiation to the fetus. Nevertheless, a study by (Kusama and Ota, 2002) showed no direct radiation to the fetus in head and chest diagnostic exposures and that the absorbed dose was <0.01 mGy. Threshold radiation dose for pregnancy termination is only above 25 rads (McCullough et al., 2007). Dose above 0.2 Gy may lead to the development of congenital defects, growth retardation, and abortion (McCullough et al., 2007). The first trimester of pregnancy is the most susceptible period to radiation-induced damages (Stewart and Bushong, 2004). The radiographic procedure can be carried out in pregnancy only in utter necessity exercising entire precautions to lessen the radiation dose (White and Pharoah, 2009) Only 2.5% dentists advised radiographs in pregnancy regularly while 89.8% recommended the use of radiographs only in case of emergencies. 91.5% (108) considered the second trimester to be safest. In a study done by (Asha et al., 2015) 40.6% dental

practitioners considered X-rays safe while 43.85 considered it unsafe.

The use of standard and accurate techniques reduces the number of retakes and indirectly reduces patients' unnecessary exposure (Shahab et al., 2012). 72.9% (86) dentists used bisecting angle technique, 12.7% (15) preferred paralleling cone technique while the rest used both. Similar results were found in (Ilgüy et al., 2005) which was 62%, by (Shahab et al., 2012) was 88%, and by (Agarwal et al., 2015) was 98.8%.

Out of the ones using films, about 87.5% used manual processing technique. Results are in good agreement with (Ilgüy et al., 2005) which was 85%, in (Pal et al., 2015) was 87.3%, and (Math et al., 2013) was 92%. Automatic processing has a number of advantages, the most important one being the time saved (Ilgüy et al., 2005). The number of dentists using automatic processor was 13.5% which is slightly higher than results obtained with (Ilgüy et al., 2005) which were 10.7%, (Math et al., 2013) was 4% and (Pal et al., 2015) was 3.8%. This may be because automatic processing equipment is very expensive, needs running water and electricity supply and must be cleaned frequently (Ilgüy et al., 2005).

85.7% dentists of those using manual processing throw the processing solutions in sewage drains and lead foils into dustbins indicating that set of guidelines of biomedical waste management are not being followed. Results are similar to findings by (Pal et al., 2015) which were 83.3%. Regarding this issue, there is considerable environmental pollution imposed by the dental community through dental radiographic procedures. Dentists can be persuaded to recycle silver and lead through selling used fixer solutions and lead foils to the local vendors and scrap metal dealers (Shahab et al., 2012)

None of the dental practitioners in the study have dose monitoring device, results are concurrent with (Asha et al., 2015) with 96.9% and (Pal et al., 2015) with 93.6%. A lesser rate was found by (Math et al., 2013) 60%. The best way to ensure that personnel is following recommended safety protection measures is with the use of personal monitoring devices (White and Pharoah, 2004, 6<sup>th</sup> edition). Several types of dosimeters including the thermoluminescence dosimeter, photoluminescence glass dosimeter, or optically stimulated luminescence dosimeter could be used to measure the exposure (McCullough et al., 2007).

To ensure the optimum exposure condition, quality assurance tests of dental X-ray units should be performed. In India, AERB mandates that quality assurance tests of dental X-ray units should be carried out every 2 years by certified professionals (Asha et al., 2015) Despite this fact our study shows only 17.8% (21) of dentists were aware of this, out of which only 10% (11) dentists were registered under AERB. Slight higher results were found in a study done by (Agarwal et al., 2015) which was 36.8%. This lack of awareness may be attributed to lacunae in teaching curriculum regarding maintenance of X-ray equipment and relatively recent AERB mandates about which all dental practitioners are not aware.

The majority of the dentists (48.3%) called maintenance professionals only in case of necessity or when a problem arises in the x-ray machine. According to the study done by (Shahab et al., 2012) 61% dentists did not have regular

maintenance check-ups of their X-ray machines. 28% dentists of our study did not calibrate their machines, results being lower as compared to study done by (Asha et al., 2015) a very high number of responders (78.1%) did not calibrate their machine. A study done by (Math et al., 2013) shows 43% dentists get their machines checked regularly and is inconsistent with a study done by (Jacob et al., 2004).

## CONCLUSION

The awareness and practice of radiation protection measures is found to be unsatisfactory. Though some dentists have adopted newer and better radiographic techniques, attitude towards minimizing radiation hazards is disappointing. All the dentists should attend educational programs on basic imaging in dentistry and radiation protection on a regular basis. Certification of X-ray machines and regular calibration of the machine is mandatory. Every dentist should practice dental radiology in an ethical manner by following the ALARA principle and making it safe for the patients and themselves.

## References

- Agrawal, B., Dosi, T., Hazari, A., Maheshwari, C., Rajput, R. and Yadav, N. (2015): Evaluation of Radiation Protection Awareness amongst General Dental Practitioners of Western Rajasthan in India. *Journal of International Oral Health.*, 7(12):51.
- Anissi, H.D. and Geibel, M.A. (2014): Intraoral Radiology in General Dental Practices – A Comparison of Digital and Film-Based X-Ray Systems with Regard to Radiation Protection and Dose Reduction. *Fortschr Röntgenstr.*, 186: 762–67.
- Asha., Veena, S.N., Krupashankar, R., Kavitha, A.P., Shobha, R., Jijin, M.J. and Yogesh, P. (2015): Awareness towards radiation protection measures among dental practitioners in Coorg district: A Questionnaire Study. *Int J Dent Health Sci.*, 2(6):1460-1465.
- Bohay, R.N., Kogon, S.L. and Stephens, R.G. (1994): A survey of radiographic techniques and equipment used by a sample of general dental practitioners. *Oral Surg Oral Med Oral Pathol.*, 78:806-10.
- Ilgüy, D., Ilgüy, M., Dinçer, S. and Bayirli, G. (2005): Survey of dental radiological practice in Turkey. *Dentomaxillofac Radiol.*, 34:222-7.
- Jacobs, R., Vanderstappen, M., Bogaerts, R. and Gijbels, F. (2004): Attitude of the Belgian dentist population towards radiation protection. *Dentomaxillofac Radiol.*, 33:334-9.
- Kusama, T. and Ota, K. (2002): Radiological protection for diagnostic examination of pregnant women. *Congenit Anom (Kyoto).*, 42:10-4.
- Lee, B.D. and Ludlow, J.B. (2013) Attitude of the Korean dentists towards radiation safety and selection criteria. *Imaging Sci Dent.*, 43:179-84.
- Math, S.Y., Murugesappa, D.G., Annigeri, R. and Kalra, D. (2013): Compliance of Indian dentists with oral radiology safety measures. *J Oral Maxillofac Radiol.*, 1:104-10.
- McCullough, C.H., Schueler, B.A., Atwell, T.D., Braun, N.N., Regner, D.M., Brown, D.L. and LeRoy, A.F. (2007): Radiation exposure and pregnancy: When should we be concerned? *Radiographics.*, 27:909-17.
- Okano, T. and Sur, J. (2010): Radiation dose and protection in dentistry. *Jpn Dent Sci Rev.*, 46:112-21
- Pal, S., Bhattacharya, P.T. and Sinha, R. (2015): Radiation protection in dentistry - Do we practice what we learn? *J Adv Clin Res Insights.*, 2:155-159.
- Salti, L. and Whaites EJ. (2002): Survey of dental radiographic services in private dental clinics in Damascus, Syria. *Dentomaxillofac Radiol.*, 31:100-5.
- Shah, T.N., Pagare, S.S., Shetty, N. and Vahawala, S. (2014): Digital Radiography- A cutting edge in the dental practice: A survey. *Indian journal of Contemporary Dentistry.*, 2(1):73
- Shahab, S., Kavosi. A., Nazarinia. H., Mehralizadeh, S., Mohammadpour, M. and Emami, M. (2012): Compliance of Iranian dentists with safety standards of oral radiology. *Dentomaxillofac Radiol.*; 41:1
- Sitra, G., Daniel, M.J., Srinivasan, S.V. and Prashad, K.V. (2008): Radiation protection protocol observed amongst dentist population in the union territory of Puducherry. *J Indian Acad Oral Med Radiol.*, 20:45-8
- Stewart, C. and Bushong, S.C. (2004): Radiologic Science for Technologists. 8th ed. St. Louis: Mosby. 531-56
- White, S.C. and Pharoah, M.J. (2004) Chapter 2: Radiation biology in Oral Radiology Principles and Interpretation, Fifth edition. Mosby, St. Louis., 25 – 46
- White, S.C. and Pharoah, M.J. (2004): Radiation safety and protection. In: Oral Radiology: Principles and Interpretation. 6th ed. China: Mosby Elsevier., 25-46
- White, S.C. and Pharoah, M.J. (2009): Oral Radiology: Principles and Interpretation. 6th ed. St. Louis: Mosby. 30-44. 59-64.

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