



RESEARCH ARTICLE

EFFECTIVENESS OF A HEALTH EDUCATION TOOL IN ASSESSING THE KNOWLEDGE, ATTITUDE AND PRACTICE OF RADIATION PROTECTION AMONG DENTAL PRACTITIONERS IN MADURAI CITY

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ABSTRACT

Background: Radiology has turned into a noteworthy field in diagnostic application in both medicine and dentistry. There are various dental maladies that can be diagnosed by the utilization of radiography. Since dental specialists and students operate dental x-ray unit on visit premise in their everyday clinical practice, there is a high likelihood among them to be exposed to x-rays on consistent premise.

Aim: The aim of the study was to evaluate the effectiveness of a health education tool about radiation protection among dental practitioners of Madurai city.

Objectives: To assess the Knowledge, Attitude and Practice of radiation protection among registered dental practitioners of Madurai city followed by educate the dentist and to reassess the Knowledge, Attitude and Practice of radiation protection among registered dental practitioners of Madurai city.

Materials and Methods: It is an Interventional Study to assess Knowledge, Attitude and Practice of radiation protection amongst Madurai dentists before and after using a Health education tool. Dentists who met inclusion criteria (n=115) were assessed about Knowledge, attitude and practice of radiation protection through a validated, Self-Administered questionnaire and health education was given to all the participants by Pamphlets. After the intervention, the questionnaire was completed by the participants. Paired t test was used for statistical analysis at a significance level of 0.05.

Results: At the end of the study, the change of scores in the knowledge, attitude and practice of radiation protection among dentists was statistically significant ($P < 0.05$).

Conclusion: Educational Intervention lead to change in the score of knowledge of dentists about radiation protection which was statistically significant (0.007) but the attitude and practice of ergonomics did not show any significant improvement.

INTRODUCTION

Ever since the discovery of X-rays in the year 1895, 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. Intra oral radiography is a very commonly used imaging modality in dentistry (Galav *et al.*, 2017). Radiological examination is an integral part of clinical dental practice, offering incalculable benefits to the clinicians and patients. Its roles range from diagnosis, treatment planning, treatment guidance, prediction of prognosis to monitoring of treatment outcome (Agbor and Azodo, 2016). Radiographic investigations in medicine cause radiation exposure to both the patient and the radiographer, and care is to be taken to protect both (Aravind *et al.*, 2016). In this modern era there is an increased awareness of the oral health amongst pregnant women and knowledge of dental surgeons of taking radiographs during pregnancy is also an utmost important factor.

The key principles and safety of taking radiographs of the pregnant women should be known along with the most appropriate radiographic technique. These ionizing radiations emitting from these radiographs have biological damaging effects on the cell directly or indirectly and produces free radicals that causes damage to DNA (Wali *et al.*, 2017). Biological hazards are categorized into: Non-stochastic and Stochastic effect. Non-stochastic or deterministic effects are those effect in which above threshold dose cell injury starts to appear. In stochastic effect there is no determined dose that could lead to biological damage and damage to cells occurs at any level of doses. High dose ionizing radiation is having both deterministic and stochastic effects but low doses radiations have predominantly stochastic effects (Prasad *et al.*, 2016). These effects can cause irreversible side effects such as malfunctions in cellular pathways (like metabolism, growth, and cellular division) and/or genetic changes. Risks of low dose X-ray exposure include carcinomas, mutations and inborn growth defects (Ardakani and Sarayesh, 2008). Though the radiation doses encountered in dentistry are minimal, they entail stochastic effects, that is, an all-or-none phenomenon (Binnal *et al.*, 2013).

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However, the hazards caused by dental radiography are relatively small; some epidemiological studies report a higher prevalence of thyroid and breast cancer in female dentists and of melanomas in male dentists. Although radiation doses in dental practice are relatively low, but the cumulative effect of repeated exposure should be kept in mind. In India, diagnostic radiation facilities are governed by Atomic Energy Regulatory Board (AERB). The role of the 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 manufactures of diagnostic X-ray machines to obtain a license for sale in India by AERB (Agrawal *et al.*, 2015). However, the ALARA principle is not always followed, as could be shown in a number of studies. Dental radiological examinations should only be performed on individual indications, meaning that, for example, bitewing examinations should not be performed unless there are reasons to do so. This is not always followed, which may indicate lack of knowledge (Svenson *et al.*, 2017). The methods of radiation protection are usually taught during undergraduate training, and dentists are expected to follow them in private practice. In some countries, such as Belgium, dentists are required to undergo certificate courses in radiation protection apart from their undergraduate training, and a permit is required for the use of radiographic equipment in the dental office. In India, however, no separate training is required in this regard despite the fact that more than 25,000 students graduate each year from more than 300 dental colleges. In India, studies on this topic have been conducted in the states of Karnataka, Punjab, Maharashtra and Haryana, but no study has been conducted in the state of Tamilnadu (Kasat *et al.*, 2017). Therefore, the present study evaluated the knowledge, attitude and practice regarding radiation protection among dental practitioners in Madurai, Tamilnadu, India. This also aimed to evaluate the effectiveness of health education tool about radiation protection among dental practitioners.

MATERIALS AND METHODS

It is an interventional study conducted among dental practitioners in Madurai, Tamilnadu in the month of September to October 2017. The pilot study was conducted for a period of 1 week in the month of August 2017. After analysis of the Pilot research, the necessary changes were done in the questionnaire. The final questionnaire which comprises of 30 questions in English was used to assess dental practitioner's knowledge, attitude and practice regarding radiation protection. Institutional ethical committee approval was obtained from the institutional review board of Best Dental Science College. Dentists who are register under state dental council of India and dentists who are willing to participate in the study were included. 115 practitioners were selected by purposive sampling method. The questionnaires were distributed to these 115 dental practitioners by visiting their dental clinics. All the participants were given 30 min to fill the questionnaire in those dental clinics where dentists were willing to return the questionnaires. All subjects provided written informed consent to participate in the study. The participation was voluntary, and confidentiality was assured. A

few questions were objective in nature with "yes" or "no" options, whereas most of the questions had multiple choices. Questions to assess knowledge, attitude and practice were related to type of X-ray equipment, effects which are caused by x-radiation, the film speed, the method of holding the film, use of a lead apron, the position-and-distance rule, the radiographic technique, and performing radiographs of pregnant women. Health education pamphlet was prepared according to the results obtained from the baseline data which was distributed among the study participants 15 days after collection of baseline data. The pamphlet contained information about radiation reduction techniques, radiation protection barriers, distance position rule, x-ray during pregnancy and maintenance of x-ray machine and 15 days after the educational intervention, again the questionnaires were distributed to these 115 dental practitioners by visiting their dental clinics and collected.

Statistical Analysis

The information collected regarding all the selected cases was recorded in a Master Chart. Data analysis was done with the help of computer using Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, version 22.0 for Windows). Paired t test was used to test the significance of difference between quantitative variables and 'p' value less than 0.05 will denote significant relationship.

RESULTS

A total of 115 participants were included in this study. Among the 115 respondents, 50.4% were male and 49.6% were female dentists. 62.6% and 27.8% were 20- 30 years and 30- 40 years followed by 7.0% and 2.6% were 40- 50 years and 50- 60 years respectively (Graph 1). Of the 115 respondents, 47.8% identified themselves as non-specialist and 52.2% as specialist. Out of 115 dentists, 55.7% and 18.3% were practicing for 1- 5 years and 5- 10 years followed by 16.5% and 9.5% were practicing for 10- 15 years and more than 15 years respectively (Graph 2). 60% and 33% participants were respectively aware about the harmful effect of the dental x- ray and AERB guidelines for radiation exposure room shielding. After the educational intervention, it was increased by 90% and 95%. Nearly one third of the respondents (36.5%) were aware of ALARA principle and it increased by 83% after the educational intervention. Most of the participants (60%) were aware that the digital radiography requires less exposure than conventional and it was increased by 90.4% after the educational intervention. A total of 44.3% participants were aware that paralleling technique gives more accurate image and lowers the exposure dose to Thyroid glands and lens of eye and it was increased by 80.9% after the educational intervention. More than half of the dentists (67%) were aware that the dental radiographs are relatively contraindicated in pregnant patients. After the educational intervention, it was increased by 72.2. About 35.7 % of the subjects were aware of the ideal distance and angulations of an operator should stand while dental radiographic exposure and it was increased by 84.3% after the educational intervention (Table 1). When the dental practitioners were enquired about the attitude towards radiation safety 54.8% of the study subjects prefer to regularly use lead aprons and 81.7% of the participants are willing to stick on to the AERB, ICRP and ALARA principles. After the educational intervention it was increased by 80% and 87% respectively (Table 2).

Table 1. Knowledge related to radiation protection before and after giving health education

Knowledge related to radiation protection	Response	Before health Education (%)	After health Education (%)
Is Dental X-ray harmful?	(a) Yes	60	90
	(b) No	40	10
Are you aware of AERB guidelines for radiation exposure room shielding?	(a) Yes	33	95
	(b) No	67	5
Are you aware of ALARA principle?	(a) Yes	36.5	83
	(b) No	43.7	12
	(c) don't know	19.8	5
Does digital radiography requires less exposure than conventional?	(a) Yes	60	90.4
	(b) No	8	5
	(c) don't know	32	4.6
Which of the following technique gives more accurate image and lowers the exposure dose to Thyroid glands and lens of eye?	(a) Paralleling Technique	44.3	80.9
	(b) Bisecting Angle Technique	24.6	8.7
	(c) I don't Know	31.1	10.4
How far is the dental radiographs are contraindicated in pregnant patients?	(a) Absolutely contraindicated	67	72.2
	(b) Relatively contraindicated	8	6
	(c) I don't know	25	21.8
The ideal distance and angulation of an operator should stand (position distance rule) while dental radiographic Exposure is?	(a) 4 feet and 90°- 135°	14	0
	(b) 4 feet and 60°-90°	8	0
	(c) 6 feet and 90°- 135°	35.7	84.3
	(d) 6 feet and 60°- 90°	42.3	15.7

Table 2. Attitude related to radiation protection before and after giving health education

Attitude related to ergonomics	Response	Before health education (%)	After health education (%)
Do you prefer to regularly use lead aprons?	(a) Yes	54.8	80
	(b) No	45.2	20
Do you like to stick on to the AERB, ICRP and ALARA principles?	(a) Yes	81.7	87
	(b) No	18.3	13

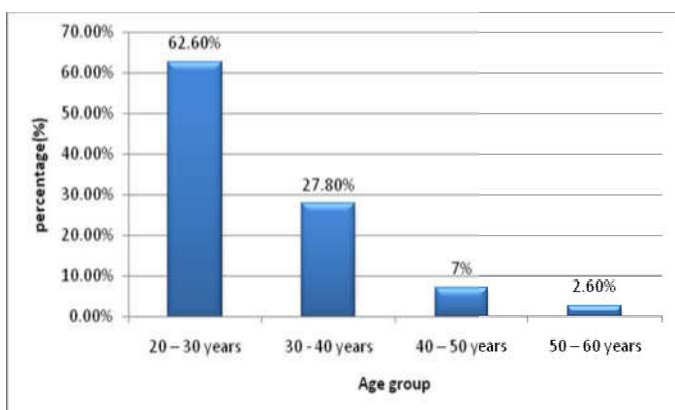
Table 3. Practice related to radiation protection before and after giving health education

Practice related to radiation protection	Response	Before health education (%)	After health education (%)
Do you hold the film in your hand during exposure?	(a) Yes	65	61.8
	(b) No	35	38.2
Which technique do you follow in your clinic?	(a) Paralleling Technique	43.5	46.1
	(b) Bisecting Angle Technique	56.5	53.9
Which type of X-ray film do you use for periapical radiography?	(a) D	0	0
	(b) E	60.5	51.7
	(c) F	3	10
	(d) Others (RVG)	36.5	38.3

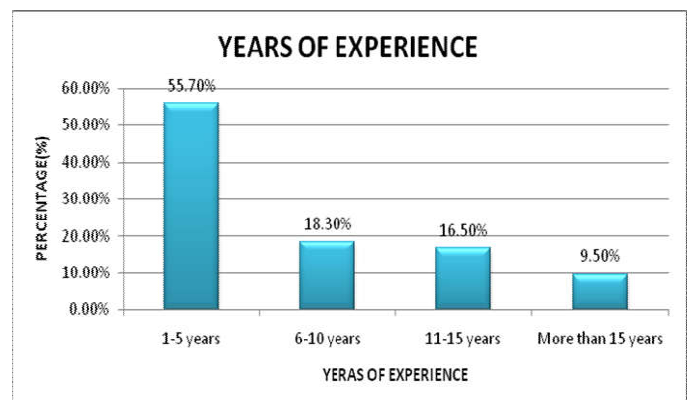
Table 4: comparison of knowledge and attitude before and after intervention

Variables	Pre (MEAN±SD)	Post (Mean±SD)	p Value
Knowledge	8.0870 ± 2.90	13.017 ± 1.008	0.007*
Attitude	6.521 ± 0.93	7.113 ± 0.65	0.095
Practice	28.0087±0.17	28.0609±.17	0.109

Paired t- test was used. *statistically significant at p <0.05; Not statistically significant p >0.05



Graph 1. Shows distribution of dentist according to their age



Graph 2. Distribution of number of years practiced by dentist

About 35% study subjects hold the film in their hand during exposure and it was decreased by 61.8% after the educational intervention. 43.5% participants were using paralleling technique in their practice while carrying out the radiographic exposure and it was increased by 46.1%. About 36.5% study subjects were using radiovisinography (RVG) which is increased by 38.3% after the educational intervention (Table 3). Data analysis for the mean knowledge, attitude of study subjects at baseline and after the intervention. There is an over-time change in knowledge, of study participants and statistically significant development in knowledge ($p < 0.007$). With respect to attitude ($p = 0.095$) and practice ($p = 0.109$) towards radiation protection no statistically significant results were observed for study subjects at the follow-up (Table 4).

DISCUSSION

The present study was conducted with the aim to assess the effectiveness of a health education tool in assessing the Knowledge, Attitude and Practice of radiation protection among dental practitioners of Madurai city. Majority of the studies were from North India and very few studies were conducted from this part of the country. The result of the present study demonstrated that the majority (60%) of the studied population were aware that dental x-ray is harmful which was similar to the results obtained by Rouwan Elfatih Hussein, Nada Tawfig Hashim, Elhadi Mohieldin Awooda, 2016, Lingam Amara Swapna *et al.* in 2017, Harsh Shah *et al.* in 2014. All these studies were concluded that 51.5%, 59%, 75% were aware that dental x-ray is harmful respectively. Previous other study conducted by MPV Prabhat, S Sudhakar, B Praveen Kumar, Ramaraju in 2011 Eluru result showed that 100% of the participants were aware that dental x-rays are harmful. The results of the present study were contradictory with findings of MPV Prabhat, *et al.* which noted that majority of the participants were aware about the harmful nature of dental X-rays. This stresses the fact that awareness about the harmful nature of the x-rays decreased with increase in qualification of the participants. According to the AERB, safety code for the installations of medical diagnostic X-ray equipment mentions that all X-ray using institutions should have a separate X-ray room and specific instructions for the particulars in the room. In the present study, 33% of dentists were aware of AERB guidelines for radiation exposure room shielding. This result was similar to the results obtained by Lingam Amara Swapna *et al.* in 2017 Vikarabad showed that around 41.6% of the students were aware of AERB guidelines for radiation exposure room shielding. Since 1977, the International Commission on Radiological Protection started to implement risk/benefit concept. All radiation exposure done in medicine must be based on the ALARA principle. In the present study, as far as radiographic safety guidelines are concerned, 36.5% of the study populations were aware of ALARA principle. However, this result was similar to the results obtained by Rouwan Elfatih Hussein, Nada Tawfig Hashim, Elhadi Mohieldin Awooda in 2016 and Lingam Amara Swapna *et al.* in 2017 and these studies concluded that only 26.1%, 55.1% of the respondents knew that aware of ALARA principle. It indicates that for reducing any unnecessary radiation, attempts should be made to improve dentist's knowledge about radiation dose reduction techniques. In the present study, 60% subjects were aware that the digital radiography requires less exposure than conventional. However, this result was similar to the results obtained by Lingam Amara Swapna *et al.* in 2017 and Sonia Behalin 2016

showed that around 53.5% and 68.52% of the students believed that digital radiography requires less exposure than conventional radiography and other study which was conducted by Prabhat, Sudhakar, Praveen Kumar, Ramaraju in 2011 and Harsh Shah *et al.* in 2014 and result of these studies showed that 75.1% and 92.76% of the participants were aware that digital radiography requires less exposure than conventional radiography which was contradictory with findings of present study. In the present study, Almost 44.3% of participants have stated that paralleling angle technique gives more accurate image and lowers the exposure dose to thyroid gland and lens of eye. Previous other studies conducted by Lingam Amara Swapna *et al.* in 2017 Vikarabad showed that 53.52% of participants have stated that paralleling angle technique gives more accurate image and lowers the exposure dose to thyroid gland and lens of eye.

In the present study, the majority 67% recognize that dental radiography is not an absolute contraindication in pregnant women. This result is similar to that result obtained by Rouwan Elfatih Hussein, Nada Tawfig Hashim, Elhadi Mohieldin Awooda, 2016, Lingam Amara Swapna *et al.* in 2017, Prabhat, Sudhakar, Praveen Kumar, Ramaraju in 2011. These studies resulted that 74.3%, 70.23%, 70.47% of the participants were recognizes that dental radiography is not an absolute contraindication in pregnant women. Thus, about 33% of the participants were not ready to treat pregnant patients regardless of their pregnancy semester, the level of emergency and regardless the different precautions available. Hence, it was concluded that the studied population of dentists does not seem to have the sufficient knowledge regarding the diagnostic dental radiation risk during pregnancy. Distance in radiation protection refers to distance from the source and the individual. As the distance increases, radiation exposure reduces. According to position distance rule, radiographer position should be at least 6 feet from the source at an angle of 90 to 135° to the central ray of X-ray beam. The results of the present study demonstrated that the majority of the studied population 35.7% of dentists were aware of the ideal distance and angulations of an operator should stand (position distance rule) while dental radiographic Exposure. This result was similar to the results obtained by Lingam Amara Swapna *et al.* in 2017 Vikarabad. The results also showed that 18.09% of the respondents were aware of the ideal distance and angulations of an operator should stand (position distance rule) while dental radiographic Exposure. It indicates that, attempts should be made to improve dentist's knowledge about position distance rule. After the educational intervention knowledge of the participants about radiation protection has improved as follows 90% aware that dental x-ray is harmful, 95% aware of AERB guidelines, 85% aware of ALARA principle, 84.3% aware of position distance rule, 90.4% aware that digital radiography requires less exposure and 80.9% aware that paralleling technique lowers the radiation exposure to the thyroid gland and lens of eye. In the present study, about 65% of the participants were preferred to regularly use lead aprons. Previous studies conducted by Sonia Behal in 2016, Lingam Amara Swapna *et al.* in 2017, MPV Prabhat, Sudhakar, Praveen Kumar, Ramaraju in 2011 resulted that 75.03%, 34.92%, 45.83% of the participants were preferred to regularly use lead aprons. Various reasons were given by the participants for not wearing lead apron like non availability of apron, increased weight of apron and common apron used by everyone. Some participants preferred to follow position-distance rule rather than wearing lead apron. After the

educational intervention, participants were preferred to regularly use lead aprons (80%). In the present study, 81.7% of the participants were willing to stick on to the AERB, ICRP and ALARA principles. Previous studies were conducted by MPV Prabhat, Sudhakar, Praveen Kumar, Ramarajuin 2011, Sonia Behal in 2016 resulted that 83.8% and 61.59% of the participants were willing to stick on to the AERB, ICRP and ALARA principles. Hence, some of the factors that stay as obstacles are space availability, financial constraints and personal interest prevail above protocol adherence. In the present study, 35% study subjects hold the film in their hand during exposure. The results of the present study were similar with findings of Vikrant Kasat *et al.* in 2016. The result showed that 48.0 % of cases, either the dentist or assistant held the X-ray film while taking the radiograph. The percentage was higher in female than male dentists. In the present study, 43.5% participants were using paralleling technique in their practice while carrying out the radiographic exposure and 56.7 % of the participants were using bisecting angle technique in their practice while carrying out the radiographic exposure. The results of the present study were similar with findings of Vikrant Kasat *et al.* in 2016. The result showed that 69.2 % of the participants were using bisecting angle technique in their practice while carrying out the radiographic exposure. In the present study, 36.5% study subjects were using radiovisinography (RVG). Previous study conducted by Rashmi Gangavati *et al.* in 2016 and Vikrant Kasat *et al.* in 2016 resulted that 23% and 55.1% of the participants were using radiovisinography (RVG). International recommendation for radiological protection also recommends using RVG by which radiation exposure can be reduced by 60% as compared to E-speed intraoral films. After the educational intervention, there is no significant change in the practice of the dentists. The general poor knowledge and practices regarding radiation protection may lead some dentists and patients to receive considerably higher radiation doses than those recommended by the International Commission on Radiology protection unknowingly. To our knowledge this was the first study in India to perform interventional study in dental practitioners with respect to knowledge, attitude and practice in radiation protection. The knowledge (0.007) showed statistically significant difference. But no statistical significant result was obtained with respect to attitude (0.095) and practice (0.109). This might be due to short duration of the study with less intervention.

Conclusion

The results showed that sex and years of clinical practice have minimal influence on the knowledge, attitude and practice of dentists regarding radiation protection measures. The dentist's knowledge, attitude and practice about radiation protection were not satisfactory. After Educational Intervention, there was a statistically significant (0.007) in dentists about radiation protection. But the attitude (0.095) and practice (0.109) of radiation protection did not show any significant improvement. By adapting simple measures, significant reduction in radiation exposure can be achieved. Hence, there is a need to improve dentist's attitude and practice about radiation dose reduction techniques.

Limitations

Subjectivity of responses can be a limitation. Decreased sample size limits the generalizability of findings. Duration and intervention of the study was less.

Recommendation

Greater emphasis about radiation protection among dental students must inculcated through by incorporating radiation safety methods and radiation reduction techniques in dental curriculum. Periodical continuing dental education program for dentist about radiation protection must be conducted.

Public Health Significance

There is a need for the Dentists to pay attention on practicing Radiation protection in their routine clinical practice to avoid major Radiation induced health problems. Hence Dental radiation protection should be considered as a rule, which must be respected in order to protect health care providers, patients, and the environment.

REFERENCES

- Agbor AM, Azodo CC. 2016. Radiation Protection Awareness and Practices in Cameroon Dental Health Care Facilities. *Indian Journal of Oral Health and Research*, 1; 2(1):17.
- Agrawal B, Dosi T, Hazari A, Maheshwari C, Rajput R, Yadav N. 2015. Evaluation of Radiation Protection Awareness amongst General Dental Practitioners of Western Rajasthan in India. *Journal of International Oral Health*, 1;7(12):51.
- Aravind BS, Joy ET, Kiran MS, Sherubin JE, Sajesh S, Manchil PR. 2016. Attitude and awareness of general dental practitioners toward radiation hazards and safety. *Journal of Pharmacy and Bioallied Sciences*, 8(Suppl 1):S53.
- Ardakani FE, Sarayesh V. 2008. Knowledge of correct prescription of radiographs among dentists in Yazd, Iran. *Journal of dental research, dental clinics, Dental Prospects*, 2(3):95.
- Awooda E, Hussein R, Hashim N. 2016. Knowledge, Awareness and Practice of Sudanese Dentists Towards Oral Radiology And Protective Guidelines.
- Behal S. 2016. Perception of dental undergraduates and interns on radiation protection safety protocol-A questionnaire based cross-sectional study.
- Binnal A, Rajesh G, Denny C, Ahmed J, Nayak V. 2013. Insights into the state of radiation protection among a subpopulation of Indian dental practitioners. *Imaging Science in Dentistry*, 1;43(4):253-9.
- Galav A, Borah M, Sugandhi C, Rathod R, Satija N, Chauhan M. 2017. Attitude and practice of dental professionals towards using of advance radiographic technique: a cross-sectional descriptive study. *Journal of Research in Dentistry*, 4;4(5):134-9.
- Gangavati R, Baad R, Vibhute N, Varma S, Kamte W, Sankpal S. 2016. An insight into the Radiographic Practice among the Dentists of Karad City, India. *JPMR*, 3:368-73.
- Kasat VO, Ladda R, Joshi S, Giri PA, Pandya M, Shaikh S. 2017. Knowledge and practice regarding safety standards of oral radiology among dental practitioners in western Maharashtra, India. *Oral Radiology*, 1;33(1):1-7.
- Prabhat MP, Sudhakar S, Kumar BP. 2011. Knowledge, attitude and perception (KAP) of dental undergraduates and interns on radiographic protection-A questionnaire based cross-sectional study. *Journal of Advanced Oral Research*, 15;2(3):45-50.
- Prasad M, Gupta R, Patthi B, Singla A, Pandita V, Kumar JK, Malhi R, Vashishtha V. 2016. Imaging More Imagining less: An Insight into Knowledge, Attitude and Practice

- Regarding Radiation Risk on Pregnant Women among Dentists of Ghaziabad–A Cross Sectional Study. Journal of clinical and diagnostic research: *JCDR*, 10(7):ZC20.
- Shah HG, Patel S, Patel K, Patel V, Sodani V, Savant S. 2014. Knowledge and practices of interns, graduates and post-graduates of Ahmedabad Dental College and Hospital, Ahmedabad, Gujarat regarding radiographic protection. *Int J Res Health Sci.*, 2:787-91.
- Svenson B, Ståhltnacke K, Karlsson R, Fält A. 2017. Dentists' use of digital radiographic techniques: Part I–intraoral X-ray: a questionnaire study of Swedish dentists. *Acta Odontologica Scandinavica*, 10:1-8.
- Swapna LA, Koppolu P, Takarji B, Al-Maweri SA, Velpula N, Chappidi V, Ch L. 2017. Knowledge on Radiation Protection & Practice among Dental Students.
- Wali A, Siddiqui TM, Hameed HA, Kath H. 2017. Knowledge, attitude, practice of dental surgeons regarding dental radiographs in pregnant women in the city of Karachi.
