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ORIGINAL ARTICLE

Knowledge of Appropriate Prescription of Dental Radiographs among Interns of Two Dental Institutes of Belagavi City: A Questionnaire Study

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ABSTRACT

Aim: To assess the level of knowledge of appropriate prescription of dental radiographs amongst Interns of two dental institutes of Belagavi city.

Materials and methods: A cross-sectional study was conducted on 120 interns of 2 dental institutes of Belagavi city. The knowledge of appropriate prescription of dental radiographs was assessed using a structured, close ended and self-designed questionnaire.

Results: Knowledge of appropriate prescription of dental radiographs was significantly lower in Institute 1 than Institute 2 (p=0.001*).Only a small % of 33.76 and 38.66 of interns of institutes 1,2 respectively had an above average knowledge. Thus, it is inferred that the awareness level of interns of correct prescription of radiographs is lower than expected.

Conclusion: The lack of awareness could be due to various factors such as a lack of previous knowledge, inadequate quality and quantity of educational courses and so on. Thus, students should receive the necessary education on correct prescription of radiographs to ensure their correct prescription, circumventing unnecessary exposure and their consequent detrimental effects.

Clinical significance: Radiographic examination is an important diagnostic tool used by dentists leading to an increased exposure to radiation. However, unessential exposure may lead to detrimental effects such as mutations, genetic changes and so on. One efficient way of decreasing exposure is to avoid their application when not indicated. Thus, it is the professional duty of a dentist to have adequate and accurate knowledge of prescription of radiographs. The present study shows the necessity to optimize educational tools to increase the theoretical knowledge of students and consequently improve clinical application of the knowledge gained.

Keywords: Dental education, Preventive care, Radiograph prescription, Radiation risks.

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INTRODUCTION

Evidently, there is adequate proof of detrimental consequences of radiation in sufficient doses. At present, there is no evidence of such consequences from doses routinely used in dental practice; however, it has not been manageable to prove the absence of such effects. A study by Claus et al[1] found an association between the use of low-dose examinations and meningiomas. Presently, most specialists acknowledge that there may be a small, hard to determine danger of cancer or genetic mutation from diagnostic exposure in patients. Thus, of crucial concern is the growing utilization of radiation for diagnostic purposes in both medicine and dentistry.

Multiple studies prove that the dose of radiation exposure from dental radiography is so minimal that it is highly doubtful to result in a quantifiable risk. Various national surveys reveal the following mean values from exposure to various radiographs: 1 to 8 mGy in terms of entrance surface air kerma for intraoral radiography, about 100 mGy cm^2 in terms of kerma area product for panoramic radiography, 0.257 mGy in terms of entrance surface air kerma for cephalometric radiography.[2,3] These approximates are statistically quite minor, but the consequences are grave. Thus, these risks cannot be neglected. Hence, proper knowledge of prescription of a dental radiograph is of utmost importance and radiographs should be prescribed only when they are needed.

MATERIALS AND METHODS

This was a cross-sectional study wherein written informed consent was obtained from the participants. The study included 120 dental interns of batch 2014–2015 of two dental institutes of Belagavi city. A total of 105 interns participated in the main study and 5 in the pilot study.

A structured, close-ended, self-designed questionnaire containing 20 questions was developed, based on a previously validated and reliable questionnaire and on

the American Dental Association (ADA) guidelines for prescription of dental radiographs, which was updated by the FDA in 2015[4] and a similar questionnaire used for a study in Iran.[5]

The questionnaire was divided into two sections. The first section included informed consent and demographic details, such as name, age, sex, name of institute, and the second section contained a questionnaire. The questions were segregated based on indications of periapical, bite-wing, occlusal, orthopantomographs (OPGs), and lateral cephalometric radiographs.

Every question had four options with one correct option. The participants were required to select any one correct option. Each correct answer received one point and each incorrect answer received nil points. The sum of these points made up the score out of 20, which denoted the level of knowledge of each respondent. The nominal levels of knowledge were assigned as follows: Good, >50% of correct answers; average, exactly 50% of correct answers; poor, <50% of correct answers.

Statistical Analysis

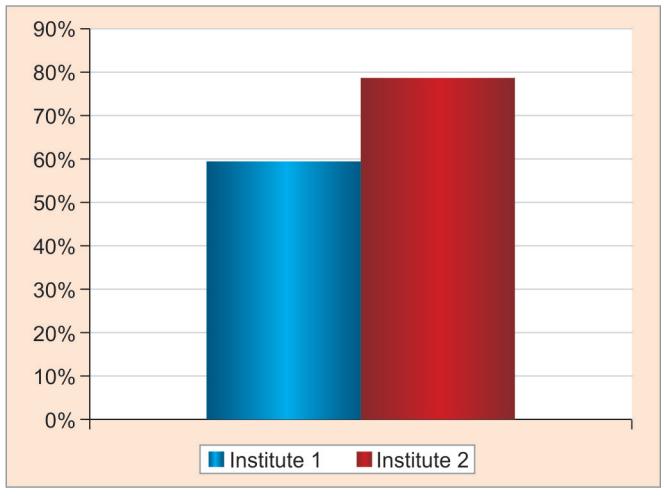
Data entry was done on an Excel sheet and analyzed using Statistical Package for the Social Sciences software, version 16. The knowledge of interns among two dental institutes was compared in each section and the study was analyzed by chi-square test and frequency test. Descriptive statistics was used to represent the data in frequencies and percentages.

RESULTS

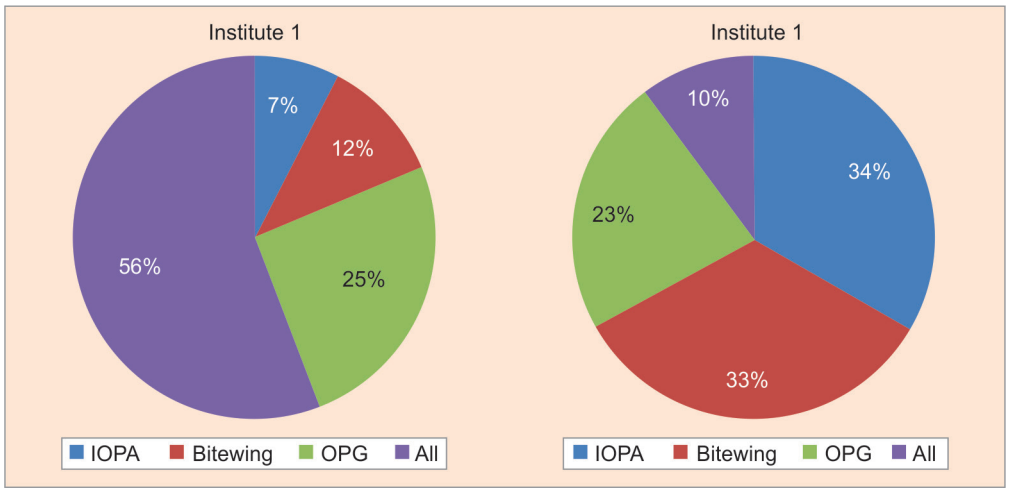
Knowledge of appropriate prescription of dental radiographs was significantly lower in Institute 1 than Institute 2 ($p = 0.001$). The mean knowledge score of dentists in Institute 1 was 59.73% and in Institute 2 was 78.66%. Only 33.76 and 38.66% of interns of Institutes 1 and 2 respectively, had above-average knowledge. Thus, it is inferred that the awareness level of interns of correct prescription of radiographs is lower than expected (Graphs 1 to 6, and Table 1).

DISCUSSION

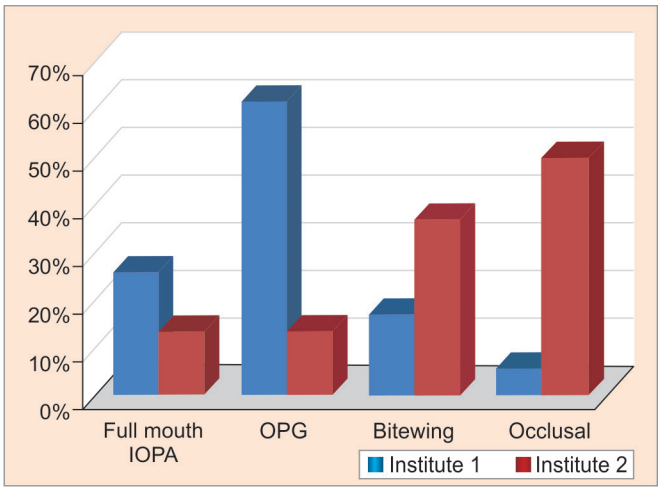
Radiation is potentially damaging. Sadly, the expression of this damage may not be manifested for up to 10 to 20 years, which is the so-called latent period of radiation injury. In humans, free radicals produced through interaction of radiation with water molecules can initiate a cascade of events throughout the cell, damaging cellular macromolecules including deoxyribonucleic acid, proteins, enzymes, lipid, and carbohydrate molecules.[6] Thus unnecessary exposure to radiation must be avoided as much as possible and it is mandatory for dentists and other health care professionals to have basic knowledge of X-ray radiation so that their patients, in particular children and adolescents, are not victims of unnecessary exposure to radiation.



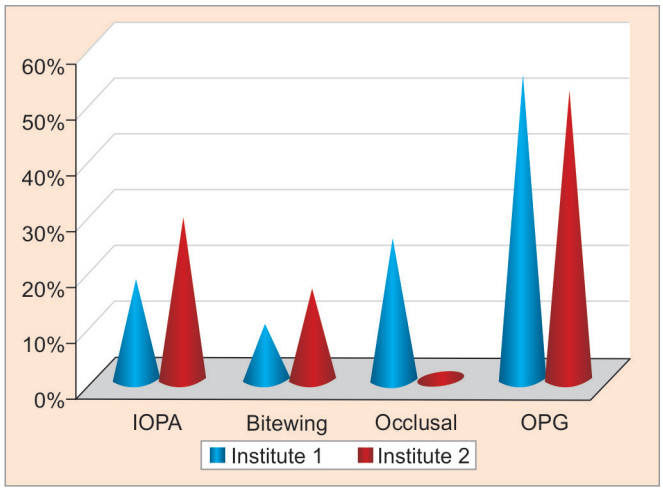
Graph 1: Comparison of knowledge score of interns in institutes 1 and 2



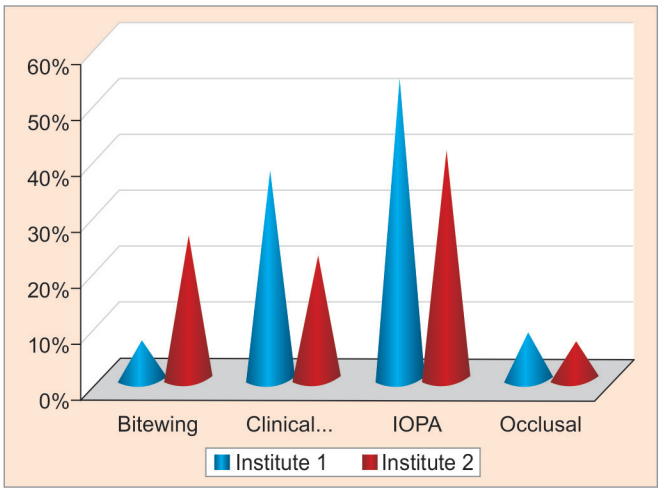
Graph 2: Assessment of knowledge of radiograph prescribed for dentoalveolar trauma



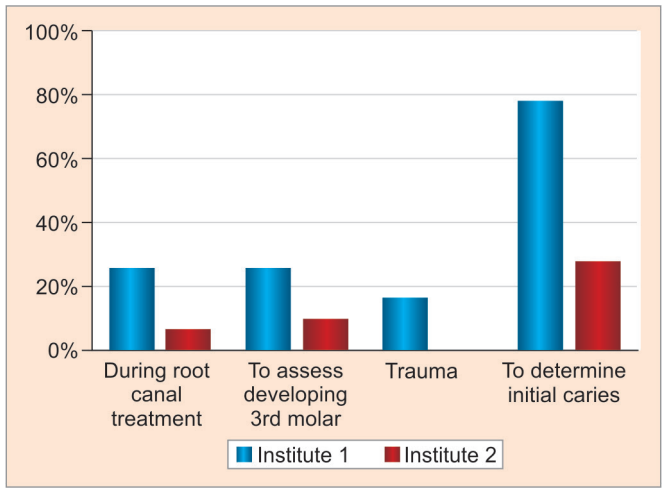
Graph 3: Assessment of knowledge of radiograph prescribed for an edentulous patient going for an implant



Graph 4: Assessment of knowledge of radiograph prescribed for generalized aggressive periodontitis



Graph 5: Assessment of knowledge of preferred method to check for root caries



Graph 6: Assessment of knowledge of prescribing multiple radiographs

Table 1: Overall analysis of the study conducted

Total no. of questions	20
Maximum score	18
Minimum score	3
Above average	66.3%
Below average	33.7%
Mean knowledge score of Institute 1	59.73%
Mean knowledge score of Institute 2	78.66%

In this study, the knowledge of prescription of various dental radiographs was studied among interns of two dental institutes. The mean knowledge score of dentists in Institute 1 was 59.73% and in Institute 2 was 78.66%. There was a statistically significant difference in the knowledge score of the two colleges.

Food and Drug Administration guidelines suggest bitewing examination is the best method for detecting proximal lesions.[4] A study by Akarslan et al[7] showed the highest diagnostic accuracy with bitewing, followed by the periapical and panoramic images. Another study by Kamburoğlu et al[8] on proximal caries detection accuracy using bitewing and panoramic radiography revealed bitewing radiography was superior to panoramic radiography. In the current study, 50.5% of interns of Institute 1 and 23.4% of interns of Institute 2 chose bitewing, indicating a poor knowledge in this area.

The ADA recommends using FDA guidelines for prescription of radiographs, and studies suggesting the benefits of these have been undertaken. In the current study, approximately 50% of interns of Institute 1 and 40% of interns of Institute 2 opted for intraoperative periapical (IOPA) radiographs as the best method for the diagnosis of root caries. A study by Banting[9] on the diagnosis of root caries reveals clinical examination although associated with a large number of uncertainties remains the best method for detection of root caries. Even the ADA guidelines state the same.[4] Interns of both institutes had an inadequate knowledge regarding this, probably due to reduced exposure to such cases.

Radiographic detection of caries is primarily based on the fact that as the caries process proceeds, the mineral content of enamel and dentin decreases.[10] Wenzel[11] claimed that lesions confined to enamel may not be evident radiographically until approximately 30 to 40% demineralization occurs. Yang and Dutra[12] stated that 40 to 60% of tooth decalcification is required for a lesion to be seen radiographically. Thus, radiographs should not be used for diagnosis of early carious lesions. The present study reveals 78 and 28% of interns of Institute 1 and 2 respectively, believed multiple radiographs should not be used for diagnosis of such cases, indicating good knowledge.

Serman[13] suggests, in cases of pain in a tooth with no clinical evidence of caries, a patient may benefit from a bitewing radiograph for detection of interproximal caries. Although no clinical signs exist, the dentist relies on clinical knowledge of the presence of caries to decide that a radiograph has a reasonable possibility to find caries. The present study reveals the interns had just an average knowledge here.

Corbet et al[14] claim that "therapeutic yield" in generalized aggressive periodontal disease can be achieved by panoramic radiographs supplemented by selective intraoral views; 50% of students in both institutes opted for OPG as a tool to assess generalized periodontal diseases, indicating a good knowledge. A study by Molander[15] suggests intraoral radiographs, such as bitewing and periapical are the best when a specific restricted area needs to be studied.

Rushton and Horner concluded that panoramic radiograph was not an appropriate approach for diagnosis of tooth caries and periodontal problems in large number of patients, while bitewing and periapical radiographs were more suitable. In their study, 94% of the dentists answered correctly to this question, the reason could be the increasing usage of this technique by dentists, especially specialists.[16]

A study by Taguchi et al on 64 postmenopausal women concluded that panoramic radiographic findings could serve as a tool for dentists to assess the possibility of latent osteoporosis.[17] Another study in Italy on 45 patients afflicted with chronic renal failure concluded that panoramic radiography is useful in monitoring renal osteodystrophy, especially to assess the response to therapy, such as parathyroidectomy or renal transplantation.[18] The current study reveals a small percent of 31.8 and 7.5 interns of Institute 1 and 2 respectively, opted for OPG. Most interns in both institutes opted for IOPA as a means of diagnosis, indicating poor knowledge in this area. Lack of exposure to such cases may be a contributing factor.

According to the ADA recommendations, before eruption of first permanent molar, radiographic examination to assess growth and development in the absence of any clinical signs and symptoms is unlikely to yield any productive results.[4] Results of the current study, however, were contrary to this. After eruption, the child may have radiographic examination, the reason being that the first molars are the most important teeth. Andrews argumentation for his postulation "First molars are the key to normal occlusion" supports the same.[19]

Cephalometric radiographs are useful for assessing growth and dental and skeletal relationships. This is in correlation to a statement by Salzmann.[20] Lack of exposure to specialist cases may be a contributing factor for a poor knowledge in this area. As per ADA recommendation, occlusal radiographs may be used separately or in combination with panoramic radiographs in case of unsatisfactory panoramic radiographs due to abnormal incisor relationship.[4] In the present study, only 18.7 and 10.3% of interns of Institute 1 and 2 respectively, opted for occlusal radiographs; most interns opted for lateral cephalograms, indicating incorrect views of students. A study conducted by Taylor and Jones[21] concludes the same.

According to an article on diagnosis and management of supernumerary teeth by Shah et al,[22] the most useful radiographic investigation is the rotational tomograph OPG, with additional views in the form of occlusal or periapical radiographs. In case of the possibility of root resorption of a permanent tooth caused by a supernumerary tooth, a long-cone periapical radiographs will be required. In the current study, 7.5 and 3.7% of interns of Institutes 1 and 2 respectively, opted for OPG, indicating poor application of radiographs for diagnosis of supernumery teeth.

A study by Ghosh[23] reveals periapical X-ray view is most suitable to assess the developing 3rd molar as it provides an accurate picture of that region for detail assessment needed. A report by Howe and Poyton shows intraoral periapical X-ray is the best radiograph to predict the relationship of the inferior dental canal and the root of the third molar. However, the disadvantage of this view is the inability to obtain the X-ray in cases of trismus. Lateral oblique X-ray is considered to be a suitable substitute for periapical X-ray in such conditions, though this X-ray does not give an accurate picture.[24] Panoramic radiographs can also be used, but they have limitations; 72% of interns in both institutes chose the option of occlusal radiograph in our study, indicating false perceived knowledge.

One efficient way of decreasing exposure is to avoid their application when not indicated. Thus, it is the professional duty of a dentist to have adequate and accurate knowledge of prescription of radiographs. Thus, dental students should be trained in the right way.

LIMITATIONS

The current study has not considered advanced imaging methods like cone beam computed tomography. The lower dose of radiation exposure and better image quality make it necessary for dentists to be aware of various advanced and better imaging techniques available.

CONCLUSION

With respect to the obtained results, the knowledge of correct prescription of radiographs among the interns assessed was not at a desired level. It can be inferred that the awareness level of dentists for correct prescription of radiographs is lower than expected. This low level could be due to various factors, such as a lack of previous knowledge, inadequate quality and quantity of educational courses in the university or in continuing education courses, and so on. Sometimes, though the students are aware theoretically, clinical application of knowledge is seldom practiced. It is recommended that dentists receive the necessary education on use and implementation of guidelines for appropriate prescription of radiographs.

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REFERENCES

1. Claus EB, Calvocoressi L, Bondy ML, Schildkraut JM, Wiemels JL, Wrensch M. Dental x-rays and risk of meningioma. Cancer 2012 Sep 15;118(18):4530-4537.
2. United Nations Scientific Committee on the Effects of Atomic Radiation. Sources and effects of ionizing radiation: sources. United Nations Publications; 2000.
3. European Commission (2004). Radiation Protection 136. European Guidelines on Radiation Protection in Dental Radiology. Luxembourg: Office for Official Publications of the European Communities. Available from http://ec.europa.eu/energy/nuclear/radioprotection/publication/doc/136_en.pdf (accessed July 4, 2016).
4. American Dental Association Council on Scientific Affairs, U.S. Department of Health and Human Services Public Health Service Food and Drug Administration. Dental radiographic examinations: recommendations for patient selection and limiting radiation exposure. Available from: www.ada.org; accessed on July 2, 2016.
5. Ezoddini AF, Sarayesh V. Knowledge of correct prescription of radiographs among dentists in Yazd, Iran. J Dent Res, Dent Clin, Dent Prospects 2007 Dec;2(3):95-98.
6. Lam EW. Considerations for the use of ionizing radiation in dentistry. Dispatch Mag 2011 August/September;25:1-2.
7. Akarslan ZZ, Akdevelioğlu M, Güngör K, Erten H. A comparison of the diagnostic accuracy of bitewing, periapical, unfiltered and filtered digital panoramic images for approximal caries detection in posterior teeth. Dentomaxillofac Radiol 2008 Dec;37(8):458-463.
8. Kamburoğlu K, Kolsuz E, Murat S, Yüksel S, Özen T. Proximal caries detection accuracy using intraoral bitewing radiography, extraoral bitewing radiography and panoramic radiography. Dentomaxillofac Radiol 2012 Sep;41(6):450-459.
9. Banting DW. The diagnosis of root caries. J Dent Educ 2001 Oct1;65(10):991-996.
10. Önem E, Baksi BG, Şen BH, Söğüt Ö, Mert A. Diagnostic accuracy of proximal enamel subsurface demineralization and its relationship with calcium loss and lesion depth. Dentomaxillofac Radiol 2012 May;41(4):285-293.
11. Wenzel A. Dental caries. In White SC, Pharoah MJ, editors. Oral radiology: principles and interpretation. Oxford, UK: Mosby Elsevier; 2008. p. 270-281.
12. Yang J, Dutra V. Utility of radiology, laser fluorescence, and transillumination. Dent Clin North Am 2005 Oct31;49(4):739-752.
13. Serman N. Guidelines for prescribing radiographs, Aug. 2000. W&P. p. 241-253. Available from www.columbia.edu (accessed July 2, 2016).
14. Corbet EF, Ho DK, Lai SM. Radiographs in periodontal disease diagnosis and management. Aust Dent J 2009 Sep1; 54(s1):S27-S43.
15. Molander B. Panoramic radiography in dental diagnostics. Swed Dent J 1995 Dec;119:S1-S26.
16. Rushton VE, Horner K. The use of panoramic radiology in dental practice. J Dentist 1996 May31;24(3):185-201.
17. Taguchi A, Tanimoto K, Suei Y, Wada T. Tooth loss and mandibular osteopenia. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 1995 Jan;79(1):127-32.
18. Ganibegović M. Dental radiographic changes in chronic renal disease. Medicinski Arhiv 1999 Dec;54(2):115-118.
19. Andrews LF. The six keys to normal occlusion. American journal of orthodontics. 1972 Sep;62(3):296-309.
20. Salazman J. Practice of orthodontics. 1996, Philadelphia: Lippincott.
21. Taylor NG, Jones AG. Are anterior occlusal radiographs indicated to supplement panoramic radiography during an orthodontic assessment? Br Dent J 1995 Nov;179(10):377-381.
22. Shah A, Gill DS, Tredwin C, Naini FB. Diagnosis and management of supernumerary teeth. Dent Update 2008 Oct 1;35(8):510-520.
23. Ghosh PK. Synopsis of oral and maxillofacial surgery: an update overview. New Delhi: Jaypee Brothers Medical Publishers (P) Lt; 2008 Nov 1.
24. Howe GL, Poyton HG. Prevention of damage to the inferior dental nerve during the extraction of mandibular third molars. Br Dent J 1960 Nov;109(5):353-363.