

**ORIGINAL ARTICLE****ASSESSMENT OF IMPLICATIONS ASSOCIATED WITH REPEATING OF X-RAY FILMS: INSTITUTION BASED STUDY**

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**ABSTRACT:**

**Background:** Radiography is one of the useful tools employed in the dentistry for the purpose of diagnosis. Adverse health effects may occur due to clinically, un-indicated, avoidable repeat; un-optimized examinations and might require serious optimization. Film reject analysis is an important tool for identification of factors associated with suboptimal radiographic images and subsequent rectification. Hence; we planned this study to assess the reasons responsible for the rejection of radiographs through a repeat film analysis. **Materials & methods:** The present study included assessment of reasons responsible for repeat of radiographic films (both intra-oral and extra-oral). Collection of data of the repeat radiographic film of one year was done from the record room of the department and assessed. Radiographs showing all the anatomic details with optimum contrast and density and no distortion were considered as excellent. The rejected films were analyzed each day, and the reason for rejection and the type of examination were recorded. Information was recorded about the operator to allow classification into groups according to experience. All the data were recorded and analyzed. **Results:** Wrong angulations were prevalent in 27.2 percent of the cases. Prevalence percentage for error in radiography and wrong placement of radiographic films was 3.9 and 12.8 respectively. As far as machine error and error in positioning of tube head was 4.2 and 39.2 respectively. 5.2, 7.6 and 5.7 was the percentage prevalence of error in processing of radiographic film, movement of patient and other errors respectively. **Conclusion:** For the achieving higher improvements in the repeating rates of dental x rays, alterations in the teaching techniques should be done.

**Key words:** Radiograph, Repeat, X-ray

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**I**NTRODUCTION

One of the useful tools employed in the diagnosis and treatment planning of various oro-facial pathologies is radiography. Changes in the quality of radiographs may lead to misinterpretation, resulting in incorrect diagnosis and treatment planning.<sup>1</sup> In cases without enough diagnostic quality, radiographs have to be retaken, which results in receiving unnecessary radiation by the patients.<sup>1</sup>

Adverse health effects may occur due to clinically, un-indicated, avoidable repeat; un-optimized examinations and might require serious optimization. Film reject analysis is an important tool for identification of factors associated with suboptimal radiographic images and subsequent rectification. It can provide relevant information to help achieve a reduction in cost and radiation exposure to the patient. For the better understanding of quality assurance (QA) issues, in dental schools and institutions, this information's can be of great help.<sup>2,3</sup>

For all the radiographic procedures, it is possible to conduct QA audit, so that any systemic weaknesses can

be rectified. The advantage of such an audit would be not only the reduction in reject radiographs and patient exposure, but also inculcating good radiographic practices among the students which would be carried over into their professional life.<sup>4</sup>

Hence; we planned this study to assess the reasons responsible for the rejection of radiographs through a repeat film analysis.

**MATERIAL & METHODS**

The present study was conducted in the department of Oral and Maxillo-facial radiology of the dental institute and included assessment of reasons responsible for repeat of radiographic films (both intra-oral and extra-oral). Collection of data of the repeat radiographic film of one year was done from the record room of the department and assessed. Kodak intra-oral films were used for the taking intraoral radiographs. E/F speed film-Kodak E/F speed film Kodak insight dental film was used to take all the intra-oral radiographs and Kodak T mat film was used for extraoral radiographs. All intra-oral radiographs were taken by bisecting angle technique

unless specified. Standard protocol in patient positioning and tube head positioning was followed while taking the radiographs. Rectangular collimator was used to restrict the beam to the size of periapical and bitewing films so that the radiation dose to the patient was minimized. A kilovolt peak setting of between 60 and 70 was used for all radiographs made. Radiographs were processed either manually or using the automatic processor. All films were examined on a mounting desk where there was adequate and continuous peer review. All dental team members had the requisite training and credentials to take radiographs of dental patients. Ethical approval was taken from institutional ethical committee and written consent was obtained from the subjects after explaining in detail the entire research protocol. The criteria for these three categories are:

1. Excellent - No errors of exposure, positioning or processing;
2. Diagnostically acceptable - Some errors of exposure, positioning or processing, but which do not detract from the diagnostic utility of the radiograph and
3. Unacceptable - Errors of exposure, positioning, or processing which render the radiograph unacceptable.

Radiographs showing all the anatomic details with optimum contrast and density and no distortion were considered as excellent. Radiographs with cone-cut or elongation and tooth of interest clearly seen light or dark radiographs, where a diagnosis can still be made, were considered as diagnostically acceptable.

In doubtful cases, the decision to repeat a radiograph was made by a member of the faculty and the referring doctor was consulted. The “repeat rate” was defined as the

proportion of rejected films in relation to the total number of films exposed. Recording of all the records of date, area of interest, method of processing (manual or automatic processor), the error in the radiograph, and the cause of the error were done. The rejected films were analyzed each day, and the reason for rejection and the type of examination were recorded. Information was recorded about the operator to allow classification into groups according to experience. During the 6-month study period, the observer made a note of all the radiographs that were repeated along with the cause of the error. All the results were analyzed by SPSS software. Chi-square test and multivariate regression curve was used for the assessment of level of significance.

**RESULTS**

**Table 1** and **Graph 1** show the frequency of occurrence of different intra-oral radiographs. Wrong angulations were prevalent in 27.2 percent of the cases. Prevalence percentage for error in radiography and wrong placement of radiographic films was 3.9 and 12.8 respectively. As far as machine error and error in positioning of tube head was 4.2 and 39.2 respectively. 5.2, 7.6 and 5.7 was the percentage prevalence of error in processing of radiographic film, movement of patient and other errors respectively. **Table 2** and **Graph 2** Repeat rates in extra-oral radiography. OPG, Lateral cephalogram and paranasal sinus were the common type of radiographs used extra-orally. Repeat rates among OPG, lateral cephalogram and paranasal sinus were 41.2, 26.8 and 12 respectively.

**Table 1:** Frequency of occurrence of different intra-oral radiographs

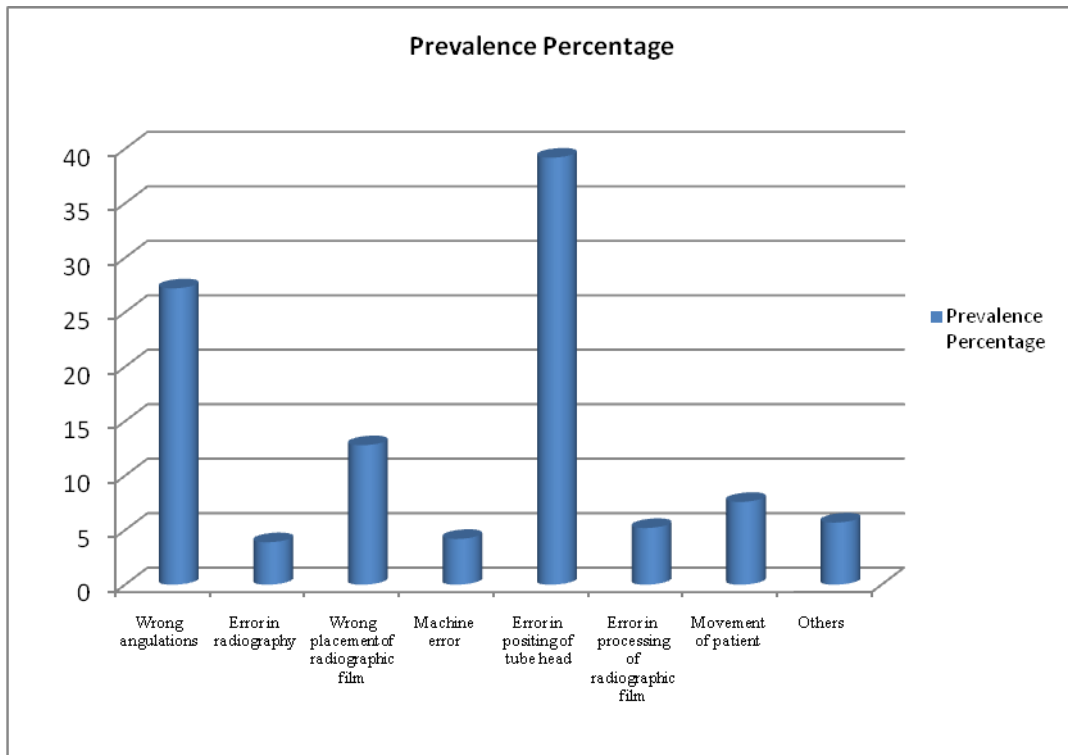
Standard error	Prevalence Percentage
Wrong angulations	27.2
Error in radiography	3.9
Wrong placement of radiographic film	12.8
Machine error	4.2
Error in positing of tube head	39.2
Error in processing of radiographic film	5.2
Movement of patient	7.6
Others	5.7

**Table 2:** Repeat rates in extra-oral radiography

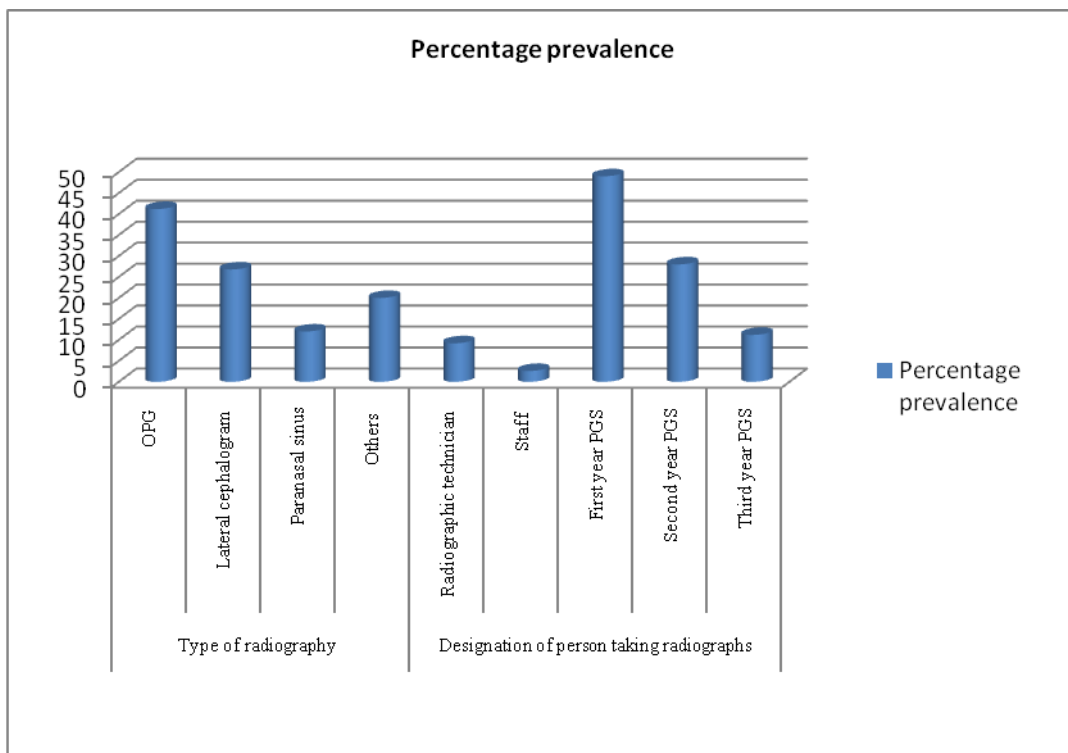
Variable	Percentage prevalence	
Type of radiography	OPG	41.2
	Lateral cephalogram	26.8
	Paranasal sinus	12
	Others	20
Designation of person taking radiographs	Radiographic technician	9.2
	Staff	2.6
	First year PGS	49
	Second year PGS	28
	Third year PGS	11.2

PGS: Post graduate student

**Graph 1:** Frequency of occurrence of different intra-oral radiographs



**Graph 2:** Repeat rates in extra-oral radiography



**DISCUSSION**

For the diagnosis and treatment in dentistry, radiographs have become inseparable parts. As a dental surgeon, he/she should be aware of taking and processing radiographs.<sup>7</sup> Even though digital revolution is going on

in this field, proper positioning and angulations have to be done manually.<sup>8</sup> For this, they have to be trained thoroughly in the radiographic techniques during their course itself.<sup>9</sup> Hence; we planned this study to assess the

reasons responsible for the rejection of radiographs through a repeat film analysis.

In the present study, we observed that overall, repeat of radiographs occurred in less than 10 percent of the cases (intra-oral radiographs). A number of problems were responsible for the repeating of the radiographs, with positioning error being the most common cause for repeating a radiograph. Acharya et al conducted an observational study conducted for describing the reasons for radiograph rejections through a repeat film analysis. During a 6-month study period, a total of 9,495 intra-oral radiographs and 2339 extraoral radiographs taken in the Radiology Department were subjected to repeat film analysis. The results showed that the repeat rates were 7.1% and 5.86% for intraoral and extraoral radiographs, respectively. Among the causes for errors reported, positioning error was the most common, followed by improper angulations, and improper film placement for intra-oral radiographs. The study found that the maximum frequency of repeats among extraoral radiographs was for panoramic radiographs followed by lateral cephalogram, and paranasal sinus view. It was also observed that repeat rate of intraoral radiographs was highest for interneers, and undergraduate students. The study pointed to a need for more targeted interventions to achieve the goal of keeping patient exposure ALARA in a dental school setting.<sup>10</sup>

Kaviani et al assessed the common radiographic errors on panoramic radiographs in a radiology department. 250 panoramic radiographs (100 male and 150 female; mean age, 24.3) taken at the Department of Oral and Maxillofacial Radiology were evaluated. Radiographs were categorized into five groups according to the type of errors (patient positioning errors, darkroom errors, failure to remove metallic accessories, equipment setup errors, and patient movement during exposure). There were 19 error-free radiographs. The number of radiographs with errors was 231, of which 26 were unacceptable and had to be retaken. Errors of patient positioning were observed in 78% of cases, film development in 69.2%, equipment setup in 3.2%, failure to remove metallic accessories in 3.2% and patient movement during exposure in 2.4% of cases. The errors seen on panoramic radiographs were relatively high with errors in patient positioning being the most frequent error.<sup>11</sup> Elangovan et al assessed the ability of taking and processing of intraoral periapical radiographs (IOPA) by the dental college undergraduate students and also to evaluate the impact of teaching on their skills. This study was conducted in the OMRD department. Final year students (52) and interns (41) of 2014 were included in this study. In this 1 year study, 13104 IOPAs were taken and manually processed by these students. These radiographs were evaluated by two senior faculties of the department separately. Of 13104 IOPAs, 3538 were considered as faulty radiographs, of this 26.1% cone cut which occupies the first position and was followed by improper vertical angulation (25.2%), film position error (23.2%), improper horizontal angulation (13.1%), processing errors (9.5%), and miscellaneous such as

reversed film, film bending (2.9%). Considering the statistical analysis by increasing experience, students make fewer numbers of errors.<sup>12</sup> Goren et al conducted a updated self-assessment exercise for the dental team with intention to produce the highest quality diagnostic radiographs while keeping patient exposure as low as is reasonably achievable. To continue to provide the best radiographic services to patients, those involved in dental radiography need to be aware of the latest changes and advances in dental radiography and need to use them in their practice.<sup>13, 14</sup>

## COCNLUSION

From the above results, the authors conclude that for the achieving higher improvements in the repeating rates of dental x rays, alterations in the teaching techniques should be done.

## REFERENECES

1. Bolas A. Quality assurance in dental radiography: Intra-oral image quality analysis. *J Ir Dent Assoc.* 2008;54:274–8.
2. White S, Pharoah MC, editors. *Oral Radiology, Principles and Interpretation.* 5th ed. St. Louis: Mosby; 2004. Intraoral radiographic examinations; p. 122.
3. National Radiological Protection Board. Guidelines on Radiology Standards for Primary Dental care Report by the Royal College of Radiologists and the National Radiological Protection Board. Documents of the NRPB: No 3. 1994:5.
4. Chilton: NRPB; 2001. National Radiological Protection Board/Department of Health. Guidance Notes for Dental Practitioners on the Safe Use of X-ray Equipment.
5. National Radiological Protection Board. Guidelines on Radiology Standards for Primary Dental care Report by the Royal College of Radiologists and the National Radiological Protection Board. Documents of the NRPB: No 3. 1994:5.
6. 8. Chilton: NRPB; 2001. National Radiological Protection Board/Department of Health. Guidance Notes for Dental Practitioners on the Safe Use of X-ray Equipment.
7. El-Ashiry EA, Abo-Hager EA, Gawish AS. Genotoxic effects of dental panoramic radiograph in children. *J Clin Pediatr Dent* 2010;35:69–74.
8. Scherer G, Richter E. Biomonitoring exposure to environmental tobacco smoke (ETS): a critical reappraisal. *Hum Exp Toxicol* 1997;16:449–459.
9. Hayakawa Y, Shibuya H, Ota Y, Kuroyanagi K. Radiation dosage reduction in general dental practice using digital intraoral radiographic systems. *Bull Tokyo Dent Coll.* 1997;38:21–5.
10. Acharya S, Pai KM, Acharya S. Repeat film analysis and its implications for quality assurance in dental radiology: An institutional case study. *Contemporary Clinical Dentistry.* 2015;6(3):392-395.
11. Kaviani F, Johari M, Esmaili F. Evaluation of Common Errors of Panoramic Radiographs in Tabriz Faculty of Dentistry. *Journal of Dental Research, Dental Clinics, Dental Prospects.* 2008;2(3):99-101.
12. Elangovan S, Mahabob MN, Jaishankar S, Kumar BS, Rajendran D. Faulty radiographs: A cross-sectional analysis among dental college students in Namakkal District, Tamil Nadu, India. *Journal of Pharmacy & Bioallied Sciences.* 2016;8(Suppl 1):S116-S118. doi:10.4103/0975-7406.191938.

Vohra P. Repeating of X-ray films.

13. Goren AD, Lundeen RC, Deahl ST 2nd, Hashimoto K, Kapa SF, Katz JO et al. Updated quality assurance self-assessment exercise in intraoral and panoramic radiography. American Academy of Oral and Maxillofacial Radiology, Radiology Practice Committee. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2000 Mar;89(3):369-74.
14. Oxford: Pergamon Press; 1992. International Commission on Radiation Protection. Recommendation of International Commission on Radiological Protection. ICRP Publication-60.

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