

## REASONS OF REPEATED RADIOGRAPHS IN A PRIVATE DENTAL TEACHING HOSPITAL: A PREVENTABLE RADIATION HAZARD

<sup>1</sup>SOFIA SHEHZAD, <sup>2</sup>SYED IMRAN SHAH GILLANI, <sup>3</sup>AFAQ FAROOQ, <sup>4</sup>KAMRAN KHAN, <sup>5</sup>MUHAMMAD ASIF, <sup>6</sup>MOHAMMAD SARTAJ

### ABSTRACT

*This study was carried out to assess the frequency and causes of repeated radiography including artefacts, mispositioning and movement in radiology department, Sardar Begum Dental College, Peshawar. It was an audit of six years record carried out from 2015-2020. Total of 98138 films were performed and 7754 were repeated. The data was collected at the end of each year from the records of the radiology department, Sardar Begum Dental College, Peshawar. All the repeated radiographs along with the causes of repetition were included. The permission was taken from the authorities for the collection of data. The data was entered and analysed on SPSS version 26. The total 7754 radiographs were repeated in six years. The most common reason for the repetition of imaging was mispositioning; The most common reasons for the repetition of the radiographs were human error (3346), movement (3097) and lastly due to Artefacts (1311). The repeated radiological image is an important issue that needs to be addressed by the authorities to improve the quality assurance and to reduce cost of the health care delivery.*

**Key Words:** Radiology, Mispositioning, Artefact, Exposure, Human Error

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### INTRODUCTION

The radiography is used to acquire the optimum diagnostic data through the minimum dosage of the radiation. There is need to perform studies on radiographs related to general health of the patients.<sup>1</sup>

Radiographs helps the dentist to provide to get an early diagnosis and develop a better treatment strategy for the patients.<sup>2</sup> Since the discovery of dental radiography, both conventional and digital radiographic techniques have been used. With the development of electronic systems, materials have been utilized to pro-

duce a digital image.<sup>3</sup> Digital imaging has been shown to be beneficial in caries identification,<sup>4,5</sup> periodontal defects,<sup>6,7</sup> restorative treatments, and diagnosis of periapical lesions,<sup>8,9</sup> root fractures,<sup>10</sup> and root resorption.<sup>11</sup> Making digital of intraoral radiography presents numerous benefits over traditional film, namely minimal dosages, quick processing, effectual storage, and radiographs skills.<sup>12,13</sup> Two-dimensional imaging is categories into intraoral imaging and extraoral imaging. Periapical, bitewing, and occlusal projections are intraoral imaging, whereas panoramic and cephalometric projections are extraoral imaging. Computed tomography (CT), magnetic resonance imaging (MRI) in pathology, and reconstructive maxillofacial surgery is well established. Cone beam computed tomography (CBCT) has become a preferred diagnostic tool because to its low radiation dosimetry, higher reliability, and flexibility in its field of view (FOV).<sup>14,15</sup> In the Swedish population, the total number of intraoral radiographs exposed in a patient aged 3 to 19 was 24.4%. Every year, 70 to 80 % of 14-19-year-old-adolescents were subjected to a bitewing examination.<sup>16,17</sup> The usage of traditional intraoral film radiography has declined over time. According to a Norwegian research conducted in 2001, 14 percent of GDPs utilized digital radiography in 2003, and 61 percent in 2004.<sup>18</sup> In UK (2003) 61% dentists accessed the panoramic component.<sup>19,20</sup> A study

<sup>1</sup> **Corresponding Author:** Sofia Shehzad, Professor, Department of Community and Preventive Dentistry, Sardar Begum Dental College, Peshawar Email address: sofia.kabir@gandhara.edu.pk

<sup>2</sup> Syed Imran Shah Gillani, Assistant Professor, Department of Community and Preventive Dentistry, Sardar Begum Dental College, Peshawar Email: imrangilani@hotmail.com Cell # 0321-3784528

<sup>3</sup> Afaq Farooq, Assistant Professor, Department of Periodontology, Sardar Begum Dental College, Peshawar Email: dr.afaqfarooq@gmail.com Cell # 0322-9126008

<sup>4</sup> Kamran Khan, Postgraduate Resident, Department of Prosthodontics, Sardar Begum Dental College, Peshawar Email: Kamranwazir21.kk@gmail.com Cell # 0343-906978

<sup>5</sup> Muhammad Asif, Postgraduation Resident, Department of Orthodontics, Sardar Begum Dental College, Peshawar Email: asifyousafzai10@gmail.com Cell # 0345-8159297

<sup>6</sup> Mohammad Sartaj, Biomedical Engineer, Gandhara University, Peshawar Email: m.sartaj008@gmail.com Cell # 0333-5833357

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conducted by Snell et al, ninety-four per cent of those surveyed had an intraoral radiography, 76 percent to a panoramic unit, and 21 percent to a cephalometric arm. One in every five Belgian dentists appeared to have full access to a cone beam CT scanner. 90 % of all intraoral radiography units used digital sensors, whereas ninety-one percent of panoramic units used digital detectors.<sup>21</sup> Moreover, According to the findings of Ilgüy et al. In Turkey, 14 per cent of dental specialists used digital radiographs.<sup>22</sup> To carry out excellence in radiology department, developing a quality assurance (QA) program in interpretation of correct diagnosis, should be cost-effective, prompt and the quality services, maintenance in providing improved procedures should be accurate, specific and safe.<sup>23</sup> It is important to manage exposure to low level of radiation as possible to avoid harmful effects. The International Commission on Radiological Protection (ICRP) use of conventional filtration, high speed image receptor system, optimum processing quality, culmination to produce the smallest field size and avoidance of repeated imaging.<sup>24</sup> Considering the radiation exposure safety in Pakistan, National Council on Radiation Protection and Measurement (NCRP)<sup>25</sup> has recommended design and devices for standard radiation protection. Furthermore, for acquiring significant and informative images with adequate quality to assist in the diagnostic process, optimum images are important to reduce the probability of the patient exposure to supplementary radiation. The rationale of the study is the reasons for repeated x-rays, to overcome these issues reduced by changing of image procedure and training the technician working in this department to minimize this issue in future. The objective of this study is to assess the reasons related to the repeated x-rays in Sardar Begum Dental Hospital.

## MATERIALS AND METHODS

This is a cross sectional study done from the year

2015-2020. The data was collected from the record section of the radiology department, SBDC, Peshawar. Ethical approval was taken from the ethical committee of Gandhara University. A check list was made, which included variables like total number of radiographs, repeated radiographs and causes for the repetition of radiographs. Parameters like artefacts, mispositioning (radiographer's mistakes) or movement of the patient in the chair during the exposure were also recorded. For this study, the inclusion criteria were only intra oral periapical radiographs. Bitewing, OPGs etc. and those repeated peri apical radiographs in which cause of repetition was not mentioned were excluded from the study. The collected data were entered into SPSS 26. Frequency tables were drawn for descriptive statistics. Chi square test was used to find association between the categorical variables.

## RESULTS

Total of 98138 patients were exposed to radiation in the radiology department in six years, 7754 images were repeated. For details see table 1 and 2.

## DISCUSSION

The technical errors made by the practitioner, would require repeated radiographs as a result they would increase the patient's exposure. Factor that affects the quality of intraoral radiographs.<sup>16</sup> Previous studies regarding repeat radiograph have been reported in the literature, moreover, 49 studies showed frequencies of repetition of x-ray ranging between 3%-15%.<sup>17</sup>

The prevalence of the repeated radiographs provides basic information for quality enhancement process and minimize the exposure of patients to radiation.<sup>19</sup> The radiographs were repeated due to a variety of problems, with positioning error being the most common cause for repeating a radiograph.<sup>20</sup> The other causes were due

TABLE 1: SHOWS TOTAL FREQUENCIES OF RADIOGRAPHS AND REPEATED RADIOGRAPHS.

Year	Total Radiographs	Repeated Radiographs
2015-2016	39190	1380
2017-2018	37099	4095
2019-2020	21849	2280

TABLE 2: SHOWING THE CAUSES OF REPETITION

Year	Causes of Repetition			Total	Chi-Square	P-value
	Artefacts	Mispositioning	Patient Movement			
2015-2016	606 43.9%	246 17.8%	527 38.2%	1379 100.0%	11.79	<0.01
2017-2018	1755 42.9%	686 16.8%	1654 40.4%	4095 100.0%		
2019-2020	916 40.2%	448 19.6%	916 40.2%	2280 100.0%		
Total	3277 42.3%	1380 17.8%	3097 39.9%	7754 100.0%		

to Artefact that are; improper angulation, improper film placement, patient movement, processing error, and incorrect exposure factors.<sup>21</sup> In our study the most common cause was artefacts 3277(42.3 %) the second most common cause was patient movement 3097(39.9 %) during taking radiograph and the least was Mispositioning 1380 (17.8 %). Studies have shown that radiographs with poor diagnostic quality were because of technical errors and inadequate processing. The study gave some gross and basic input into the common problems of quality of radiography service. Repeated radiographs analysis is a procedure of finding sources of error, image faults, and practices.<sup>22</sup> According to the findings, around 12.9 percent of defects were present in the x-ray radiographs obtained by students. The most prevalent technical faults were most of the research (94.9%) was technical, that included Elongation, Cone cut, inappropriate film positioning, and film cut the apex of the X-ray films. Existing Errors in X-rays are present. The use of films reduces the quality of X-ray radiography, and results in reduced ability of dentist in the treatment of patients.<sup>23</sup> In most of the studies the results showed that the reasons behind repeated film screens were processing and exposure problems whereas mispositioning of the patient occurs in the repetition of digitals.<sup>18</sup> Retailers could also make a user-friendly software program to mechanically organise, store and reject images.<sup>23</sup> Repeated and rejected radiographs could lead to redundant patients' exposure along with inadequacy in the imaging process causing waste of time and resources.<sup>24</sup> The movement of the patients, positioning, and artifacts exclusive to the image receptor can also cause the repetition of radiographs. There should be some evaluative policies for the provision of services to enhance its quality and effectiveness. Pre and post analysis of the radiographs can be helpful to figure out the quality and reasons of repetition.<sup>25</sup> The staff guidance and skills enrichment, teaching, and modifications to work training advance amenity and enable cost- effective practice.<sup>26</sup>

## CONCLUSION

The repeated radiological image was an important issue. The exposure due to repeating the images, the ill effects associated with excessive exposure to radiation and to reduce cost of the health care delivery and improve the quality assurance.

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### CONTRIBUTIONS BY AUTHORS

- |                                   |  |
|-----------------------------------|--|
| <b>1 Sofia Shehzad:</b>           | Concept & design, data acquisition, data analysis, drafting manuscript, critical revision, supervision, and final approval |
| <b>2 Syed Imran Shah Gillani:</b> | Drafting manuscript, critical revision, supervision, and final approval  |
| <b>3 Afaq Farooq:</b>             | Data acquisition, data analysis, drafting manuscript, critical revision, and final approval                                |
| <b>4 Kamran Khan:</b>             | Drafting manuscript, critical revision, supervision, and final approval  |
| <b>5 Muhammad Asif:</b>           | Drafting manuscript, critical revision, and final approval   |
| <b>6 Mohammad Sartaj:</b>         | Drafting manuscript, critical revision, and final approval   |

## CORRIGENDUM

Please refer to the article published on Page 76 (Vol 41 (2): June 2021) of "Pakistan Oral & Dental Journal".

The Name & Qualifications of the following authors may be correctly read as under:

- 1 Dr Rehan Ahmad Mughal is MBBS, MPH (Not BDS)
- 2 Dr Shamma Mashhood
- 3 Dr Sehar Tejani