

# Evaluation of knowledge of correct prescription of the radiographs among dental juniors in specialized health centers of dentistry in Mosul

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## ABSTRACT

**Background:** The use of x-rays for diagnosis and treatment in dentistry is increasing, so dentists must have adequate knowledge and awareness about correct prescription of the radiographs and the principles of protection against side effects of radiation.

**Aim of study:** To assess the level of knowledge about prescription of radiographs among dental juniors in specialized health centers of dentistry in Mosul.

**Materials and methods:** This was a descriptive cross-sectional study including 150 junior dentists, a self-administered questionnaire was used to assess their level of knowledge in various sections pertaining to correct prescription of dental radiographs based on previously validated and reliable questionnaire and to American Dental Association guide lines.

**Results:** Participants showed high level of knowledge regarding the harm of x-rays, radiographs in pregnancy, decreasing the application of radiographic exposure when it is not indicated, radiation doses, imaging of TMJ soft tissue components, radiographs used for edentulous patients going to implant, and in regard to as low as reasonably acceptable (ALARA) principles, the use of radiographs for detection of caries in primary teeth, root caries detection and generalized aggressive periodontitis they have shown low level of knowledge.

**Conclusion:** Inadequate knowledge among dental juniors could be due to various factors such as lack of previous knowledge, inadequate quality and quantity of educational courses and may be due to inadequate clinical dental work. Thus, dental juniors should receive necessary education and increase their clinical work to ensure their correct prescription of radiographs, circumventing unnecessary exposure to x-rays.

**Key words:** Radiographs, knowledge, dental juniors, specialized dental centers.

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## Introduction

X-rays were discovered by Rontgen in 1895. He called them x-rays because their nature was unknown. They are in fact a form of high-energy electromagnetic radiation and are part of electromagnetic spectrum. X-rays have ability to penetrate human tissues.<sup>(1)</sup>

In medical and dental science, correct treatment is depend on correct diagnosis which cannot be achieved by clinical examination alone. One important method is the use of radiographs.<sup>(2)</sup> While the use of x-rays is increased in the medical diagnosis, the principles of protection against side effects of radiation need special consideration. Avoid application of x-rays when it is not essential considered as one effective method for decreasing possible risks of x-rays.<sup>(3)</sup>

Decision for obtaining radiographic images depends on patient's history and clinical findings. In many cases it is not clear whether to go to the radiological choice or not. In 1980, American Dental Association (ADA) designed a guide lines for prescription of dental radiographs, which was updated by Food and Drug Administration (FDA) and ADA in 2004.<sup>(4)</sup>

A literature searches revealed various studies that focus on the level of knowledge of dentists dealing with dental radiographs.<sup>(2,5,6)</sup>

In one study, there was assessment of level of knowledge about correct prescription of radiographs among specialist and general dentists. It has been concluded that specialist dentists were more knowledgeable than general dentists in prescribing radiographical examinations.<sup>(2)</sup>

A questionnaire cross sectional study on application of cone beam computed tomography(CBCT) in Dental Postgraduate Students, most of the respondents showed inadequate knowledge about CBCT. Hence, there is an urgent need for more training programs on CBCT which would result in better diagnosis and treatment planning.<sup>(5)</sup>

Other study showed necessity to optimize educational courses in order to increase the theoretical knowledge of students and consequently improve clinical application of the knowledge gained. It was shown that the lack of awareness could be due to various factors such as lack of previous knowledge, inadequate quality and quantity of educational courses and so on. Thus, students should receive more education to enhance their correct prescription and to avoid unnecessary exposure to radiographs.<sup>(5)</sup>

The aim of this study is to assess the level of knowledge of correct prescription of radiographs among dental juniors in specialized health centers of dentistry in Mosul city.

### MATERIALS AND METHOD

Across sectional study was conducted on 150 dental juniors in specialized health centers of dentistry in Mosul. The level of knowledge about correct prescription of radiographs was assessed using a close-ended and self-designed questionnaire of 10 questions were given to the respondents in their offices. The questions were based on previously validated and reliable questionnaire and on ADA guide lines for prescription of radiographs which was updated by FDA in 2015.<sup>(7)</sup>

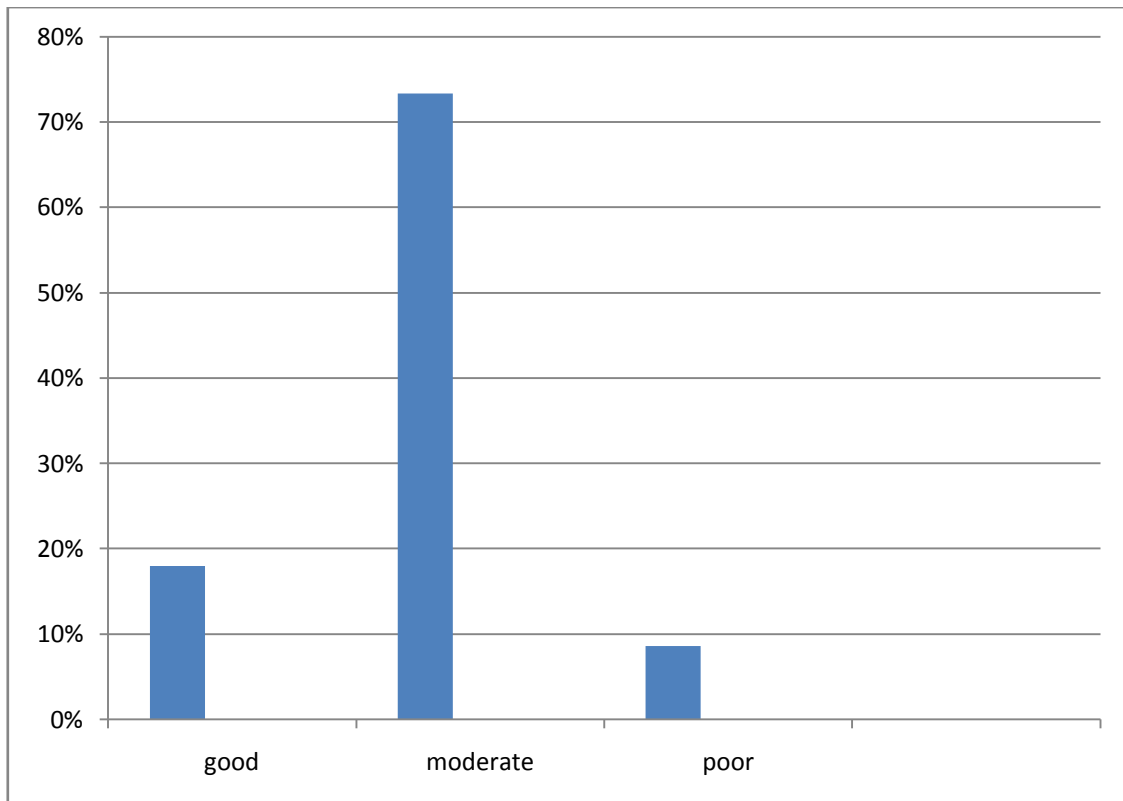
Data entry was done on Excel sheet and analyzed using Statistical Package for the Social Software, version 19. Each correct answer received 1 point and each incorrect received nil, the sum of these points made up the score of knowledge for respondents. The nominal levels of knowledge were considered as: good= more than 50% ,moderate= exactly 50% , and poor less than 50% correct answers.

### RESULTS

All 150 respondents were answered the 10 questions in the questionnaire. The percentages of correct answers of the participants to the questions regarding the harm of x-radiation, radiograph in pregnancy, decreasing the application of radiographic exposure when it is not indicated, radiation doses, imaging of TMJ soft tissue component, radiograph used for edentulous patients going to implant were: 68% , 65.3% 90%, 72.6% 86.6%, 73.3% respectively, and the percentages of incorrect answers about as low as reasonably acceptable (ALARA) principles, the use of radiographs for detection of caries in primary teeth, root caries detection, generalized aggressive periodontitis were 86.6%, 76.6%, 76.6%, 70% respectively (Table 1), 18% of the participants showed high level of awareness (good), 73.3% showed moderate level of knowledge, while 8.6% of them were have poor level of knowledge (Figure 1).

**Table (1): The results of respondents to the questionnaire in %**

| No. | Paragraph  | correct | Percent % | In correct | Percent % |
|-----|--|---------|-----------|------------|-----------|
| 1   | Does x-ray harmful?  | 102     | 68        | 48         | 32        |
| 2   | Are you know ALARA principles of radiographs?  | 20      | 13.3      | 130        | 86.6      |
| 3   | Are dental radiograph absolutely contra indicated in pregnant women?                                 | 98      | 65.3      | 52         | 34.7      |
| 4   | One efficient way of decreasing radiographic exposure is to avoid their application when not needed. | 135     | 90        | 15         | 10        |
| 5   | Radiograph is indicated for detection of caries in primary teeth.                                    | 35      | 23.3      | 115        | 76.6      |
| 6   | Which radiograph has less effective radiation dose?  | 109     | 72.6      | 41         | 27.3      |
| 7   | Detecting root caries by   | 35      | 23.3      | 115        | 76.6      |
| 8   | The radiograph used to image soft tissue component of TMJ  | 130     | 86.6      | 20         | 13.3      |
| 9   | The radiograph used to assess generalized aggressive periodontitis                                   | 45      | 30        | 105        | 70        |
| 10  | The radiograph used for edentulous patient going to implant  | 110     | 73.3      | 40         | 26.6      |



**Figure (1): The level of knowledge of participants in percentage %**

## DISCUSSION

X-radiation is potentially damaging to the humans, this damage may not be manifested for up to 10-20 years, which is called latent period of radiation injury, free radicals produced through interaction with water molecules cause cell damaging, so unnecessary exposure to radiation should be avoided as much as possible and it is mandatory for dentists and health care professionals to have basic knowledge about radiation of x-rays.<sup>(8)</sup> However, in this study, 68% of participants were agreed with this fact and 32% of them disagreed .

Ionizing radiation is the subject of considerable safety legislation designed to minimize the risks to radiation workers and to the patients, so the International Commission on Radiological Protection (ICRP) regularly publishes data and general recommendations, one of these recommendations is that x-rays must be kept as low as reasonably acceptable (ALARA), taking economic and social factors information.<sup>(9)</sup>

Among all respondents only 13.3% knew the ALARA principles of radiation protection and 86.7% of them have no knowledge about this principles. In one study, it has been observed that head and chest diagnostic x-ray exposure of about 0.01 mGy to pregnant women has no effect to the fetus<sup>(10)</sup> , Other studies showed that about 0.4- 0.8 mGy of x-ray exposure to the thyroid may lead to low birth weight baby.<sup>(11)</sup> The National Council on Radiation Protection has stated that the risk of malformations for exposure up to 5 rad is in-significant if compared to other pregnancy risks.<sup>(12)</sup>

In this study, 65.3 % of the participants said that there is no absolute contra indication of dental radiographs in pregnancy and 34.6% of them have no awareness about the use of radiographs in pregnancy .

According to the Food and Drug Association (FDA) guide lines about prescription of radiograph, Atchison et al concluded that using of FDA standards for radiation exposure could reduce patient radiation effects without affecting treatments.<sup>(13)</sup> In this study, 90% of participants agree with this, indicating good knowledge.

In regard to detection of caries in primary dentition, clinical examination does not enough especially in case of proximal and hidden caries.<sup>(14,15)</sup>

According to ADA guide lines, proximal carious lesions may develop after the inter proximal spaces between posterior teeth close. Open contacts in the primary dentition will allow dentist to visually inspect the proximal posterior surfaces, closure of proximal contacts requires radiographic assessment.<sup>(16,17)</sup>

In this study, only 23.3% of respondents said that the radiographic examination is useful for detecting caries in primary teeth, indicating low level of knowledge, this may be due to inadequate exposure to such cases. According to (Table 2), OPG has the lowest effective radiation dose if compared to other radiographical techniques.<sup>(18)</sup>

**Table(2) : Typical effective dose for radiograph**

| S. no.                        | Radiographs                  | Effective dose (µSv) | Equivalent background exposure (days) |
|-------------------------------|------------------------------|----------------------|---------------------------------------|
| <b>Intraoral (full mouth)</b> |                              |                      |                                       |
| 1                             | D speed film                 | 388                  | 46                                    |
|                               | F speed film/PSP             | 171                  | 20                                    |
|                               | CCD sensor                   | 85                   | 10                                    |
| <b>Extraoral</b>              |                              |                      |                                       |
| 2                             | Panoramic                    | 9–24                 | 1–3                                   |
| <b>CBCT</b>                   |                              |                      |                                       |
| 3                             | Large field of view          | 68–1073              | 8–126                                 |
|                               | Medium field of view         | 45–860               | 5–101                                 |
|                               | Small field of view          | 19–652               | 2–77                                  |
| <b>Multislice CT</b>          |                              |                      |                                       |
| 4                             | Head (conventional protocol) | 860–1500             | 101–177                               |
|                               | Head (low dose protocol)     | 180–534              | 21–63                                 |

In this study, the majority of respondents (72.7%) opted OPG, indicating good knowledge. The best method for diagnosis of root caries is by clinical examination, according to a study achieved by Banting<sup>(19)</sup> and according to the ADA guide lines.<sup>(7)</sup> In this study only 23.3% of participants chose clinical examinations for detection of root caries and 76.7% of them chose radiographs, indicating poor knowledge.

Magnetic Resonance Imaging (MRI) should be part of the standard evaluation when an internal structural joint abnormality is suspected because MRI provides high resolution and great tissue contrast. This allows for a detailed evaluation of the anatomy of the joint through open and close mouth imaging.<sup>(20)</sup>

Magnetic Resonance Imaging is an non invasive and considered the gold standard technique for imaging of soft tissue components of TMJ.<sup>(21)</sup> In this study, 86.6% of participants opted MRI, indicating good knowledge.

Studies achieved by Corbet EF and Molander B For assessment of generalized aggressive periodontitis revealed that panoramic radiographs supplemented by selective intraoral radiographs are considered as the best methods.<sup>(22,23)</sup> In this study, 30% of participants opted OPG only, indicating poor knowledge.

In a study, it was confirmed that approximately 63.8% of the dentists prescribed only panoramic radiography for dental implant assessment and 28.9% ordered panoramic with peri-apical radiography and/or conventional tomography and/or computed tomography(CT). only 7.2% of the dentists ordered conventional tomography (CT) as single examination.<sup>(24)</sup> In our study, 73.3% of participants opted panoramic radiograph, indicating an agreement with this study.

### CONCLUSION

According to the obtained results, the knowledge of correct prescription of radiographs among dental juniors 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 causes, such as 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 must receive necessary education on the use and implementation of guidelines for appropriate prescription of radiographs.

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