ISSN (Online): 2350-0530
ISSN (Print): 2394-3629

International Journal of Research -GRANTHAALAYAH
June 2020, Vol 8(06), 126 – 132
DOI: https://doi.org/10.29121/granthaalayah.v8.i6.2020.446

ASSESSMENT OF THE DEGREE OF KNOWLEDGE OF DENTISTS REGARDING THE USE AND DISPOSAL OF RADIOGRAPHIC MATERIAL

Caio Vinicius G. Roman-Torres [*1], Fernanda Pasquinelli [1], Nilton Rodrigues A. P. Domingues [1], Luiz Alberto Placido Penna [2]

[1] Department of Dentistry, University Santo Amaro, São Paulo, Brazil
[2] Dentistry Specialization Coordinator, University Metropolitan of Santos, São Paulo, Brazil

DOI: https://doi.org/10.29121/granthaalayah.v8.i6.2020.446

Article Type: Research Article

Article Citation: Caio Vinicius G. Roman-Torres, Fernanda Pasquinelli, Nilton Rodrigues A. P. Domingues, and Luiz Alberto Placido Penna. (2020). ASSESSMENT OF THE DEGREE OF KNOWLEDGE OF DENTISTS REGARDING THE USE AND DISPOSAL OF RADIOGRAPHIC MATERIAL. International Journal of Research -GRANTHAALAYAH, 8(6), 126-132. https://doi.org/10.29121/granthaalayah.v8.i6.2020.446

Received Date: 01 May 2020

Accepted Date: 22 June 2020

Keywords:
Radiology
Dentistry
Environmental Health

ABSTRACT

Concern about the risks of radiation and the quality of the radiographic image has led many researchers and public agencies to carry out studies on the subject, which have found the existence of a series of problems in the practice of dental radiology. Based on the above, the objective of this study was to evaluate the knowledge and attitudes of dental surgeons regarding biosafety and the use of devices and materials used throughout the radiographic process in dental offices. 200 Dentists were interviewed with offices in some cities in the Baixada Santista region in the State of São Paulo, Brazil, variables such as age, gender, time since graduation, professional specialty, were only identified at the time of the interview. During the visit, the researcher assessed, by means of a questionnaire, components related to the radiological practice in the offices and about the attitudes during the radiological practice and, consequently, about the radiological protection rules adopted, either for the patients or professionals involved. When the questionnaire was applied, a statistically significant difference was observed in relation to the concept of biosafety 98% of the interviewees answered yes, that they know what biosafety is. If there are notices in the office warning about the x-ray equipment, 89% responded that they do not. The viewing of radiographs taken previously by the patients was indicated by 97.5% of the interviewed dentists, and 95% use breast and thyroid protection with a lead apron. More than half of the dentists, 52%, discard the substances used in the revelation process in the office sink. The results observed in our study are not encouraging, either due to the ignorance of the current legislation, the use of the devices inappropriately and the processing carried out with real chances of contamination of the environment, we believe that an increase in teaching and control of biosafety in dental radiology is necessary.

1. INTRODUCTION

Biosafety consists of a set of actions aimed at the prevention, reduction or elimination of risks inherent to research and service provision activities, which risks may compromise the health of the environment, animals or individuals. Despite the awareness of dentists, there is still a great concern with Dental Radiology (Chaudhry et al.,

2016), which, because it is not usually associated with sharp instruments and blood droplets, is therefore not related to need for infection control. However, the transmission of infectious diseases is possible due to the contamination of materials and equipment used to obtain intra and / or extra-oral radiographs. It is of fundamental importance that, even knowing that health workers are not at risk during the radiographic examination, as this is considered a non-invasive procedure, this should not be a reason for neglect regarding the protection rules for infection control and protection of the environment, since it is possible to infect patients by infections transmitted directly or indirectly and the materials and substances used during radiographic processing if disposed of inappropriately (White 2012)

One item that should be observed in clinics is the need for patient protection, and having knowledge about the calibration of the device, milliamperage, filtration and the use of open cylinders in order to improve the functioning of the x-ray equipment is part of this protection (Praveem 2013). The use of lead coat for thyroid and other sensitive organs, the use of quick films that where the image can be visualized with a lower dose of radiation and having an office properly prepared to have x-ray equipment is also essential for patient safety (Hart 2013; Singh et al. 2018)

The potential that ionizing radiation has to cause somatic and / or genetic changes to humans has led to the appearance of essential preventive means to prevent professionals, patients and staff from being at risk (White 2001, Roman torres 2017). It is emphasized that many laws and Ordinances were created, in order to minimize the doses resulting from exposures in diagnostic radiology (Rout 2012). It is extremely important that government and association guidelines are duly followed regarding the use and protective measures when using x-rays (Okano, 2012; Ihle 2019, Tsipaki 2017, Coelho Silva 2020, Aamahameid 2020).

In Brazil, the law on radioprotection was only published in 1998, which explains the scarcity of studies on the subject. The Brazilian Guidelines for Dental Education10 encourage a more active learner-centered learning. (brazil 2012). Education systems worldwide are undergoing remarkable changes, as courses and programs are being designed in new ways, moving away from the passive teacher-centered to a more active learner-centered learning.

Several authors (Tugnait 2003; Praveen et al., 2013, Snel 2018, svenson 2018) have evaluated the attitudes of dental professionals in relation to radiological protection in many countries. However, there is a shortage in the survey literature in Brazil. Given this observation and the importance of the subject for the health of patients and professionals involved in performing radiographic examinations, it was deemed necessary and important to develop a study that verifies whether professionals in dental offices are following the law that governs radiological protection. in Brazilian cities. Concern about the risks of radiation and the quality of the radiographic image has led many researchers and public agencies to carry out studies on the subject, which have found the existence of a series of problems in the practice of dental radiology.

Based on the above, the objective of this study was to evaluate the knowledge and attitudes of dental surgeons regarding biosafety and the use of devices and materials used throughout the radiographic process in dental offices.

2. METHODOLOGY

This cross-sectional observational study was approved by the Research Ethics Committee in Brazil 291,494. 200 Dentists were interviewed with offices in some cities in the Baixada Santista region in the State of São Paulo: Santos, Cubatão, São Vicente and Praia Grande. The researcher responsible for the interview was blinded as to the information related to the professional to be interviewed. Variables such as age, gender, time since graduation, professional's specialty, were only identified at the time of the interview. The number of 200 professionals was considered statistically sufficient from a sample calculation.

To be included in the study, dental surgeons should agree to participate by signing a Free and Informed Consent Form and have at least one X-ray machine in the office. When one of these inclusion criteria was not met, the practice was excluded from the sample and replaced by another one on the CRO-SP list that was located in the region. During the visit, the researcher assessed, by means of a questionnaire (annex 1), components related to the radiological practice in the offices and about the attitudes during the radiological practice and, consequently, about the radiological protection rules adopted, either for the patients or professionals involved.

During the evaluation of the office and the interview, the researchers filled out a form that did not have identification of the professionals, in order that the information was kept confidential. In cases of disrespect to Ordinance 453 of the Ministry of Health, the professional received clarifications from the researcher about the

correct rules for protection against X radiation and about the possible damage caused to him, to patients and to the environment due to its misuse.

3. RESULTS

The questionnaire was applied to 200 dentists. According to Table 1, 77 men and 123 women, aged between 22 and 65 years. It was observed as to the time since graduation that the sample was composed by 45 individuals with less than 5 years of graduation, 54 individuals with graduation time between 5 and 10 years, 68 individuals had between 10 and 15 years since graduation, 25 individuals between 15 25 years and 8 individuals more than 25 years since graduation. Regarding qualification 101 were general practitioners, 98 specialists and only 1 with PhD.

When the questionnaire was applied, a statistically significant difference was observed in relation to the concept of biosafety 98% of the interviewees answered yes, that they know what biosafety is. If there are notices in the office warning about the x-ray equipment 89% answered that they do not. The visualization of the patient's external radiography is performed by 97.5% of the interviewed dentites, and 95% use breast and thyroid protection with a lead apron. More than half of the dentists, 52%, discard the substances used in the revelation process in the office sink. And the majority (87%) know that improper disposal can compromise the environment.

4. DISCUSSION

Biosafety in radiology in infection control or radiation control, should be better monitored by Organs competent bodies during professional practice in public and private offices. It is very important and even fundamental the knowledge of dentists about the risks to which they are exposed and how to prevent themselves, becoming able to contribute to the promotion of health and well-being of all. Not only is the use of x-ray devices a concern, but also the correct use and disposal of substances used in radiographic processing (Azevedo).

Researches are carried out in several places in the world, such as: Korea (19), Turkey (16), England (13), India (Chaudhry et al., 2016), and all with the same concerns; that is, the correct use and protection of all involved during the radiological practice. In our country the law that determines the procedures is the Ordinance of the Secretariat of Sanitary Surveillance (SVS) nº. 453, of June 1, 1998, which establishes the “Guidelines for Radiological Protection in Medical and Dental Radiodiagnosis” throughout the national territory (Brazil, 1998) (Brazil 2012).

The purpose of this observational study in the form of questionnaires, was to observe the conduct adopted in our region and we chose to apply the questionnaire personally, ensuring that the interviewed professional would not carry out any research or consultation during the completion of the same. Studies in the form of a questionnaire can often present some bias in relation to the answers given when the researcher is not present during the completion of the questionnaire.

When asked about Ordinance 453, 56% of respondents said they did not know. The results show ignorance by more than half of the evaluated professionals, being necessary a greater knowledge of the professionals so that the determinations are applied correctly. When assessing the requirement for guidance on dental protection, it was observed that 89% of professionals do not have it.

The use of lead protection in patients was questioned and we observed that 95% use it correctly and constantly in all patients. Salineiro and collaborators (12) observed that 57.4% of professionals used lead protection properly. Melo et al. (3) assessed that 98.1% of professionals use protection appropriately. In a study conducted in Korea (19), it was observed that only 22% of professionals constantly use lead aprons in patients. A study carried out in 2016 in India found the correct use in 64.8% of the dentists observed (Chaudhry et al., 2016).

The choice and proper use of the devices are also of fundamental importance in relation to the radiation dose that should reach the patients, and in our study we observed that 32% of the evaluated professionals do not know the kilovoltage of the device and 90.5% do not know the milliamperage used. In the study by Melo et al. (3) observed that 51.5% did not know the kilovoltage and 57.3% did not know the milliamperage. There are several factors and situations that can contribute to the acquisition of an adequate image and with a lower dose of radiation received by the patient (Tugnait, 2003)

The disposal of materials and substances used in radiological practice deserves special attention, lead coverslips, developer and fixer can contaminate the soil and sometimes the water table. It is the duty of professionals to know about disposal and how to do it properly, but what we observe is the opposite, lack of knowledge and

disregard for the situation by the organs that should be concerned with the disposal of substances that may come to harm the environment.

The results obtained were that 87% think that the disposal does not cause any damage to the environment, showing that more than half of the interviewees at least have knowledge of the substances they use daily and the danger they cause to the environment. When asked how to discard the developer and fixer used, 54% reported discarding in the sink, this fact surprised us and showed how worrying ignorance is. The removal of substances as a developer and fixer should be the responsibility of the municipal public bodies, which should carry out and report on the collection and disposal of substances. Unfortunately in our region, 72% of the professionals interviewed showed that they did not know about the collection of these substances used. In a study by Shahab et al. (17). They observed that only 1% of the interviewed dentists correctly dispose of the toxic substances used in radiographic processing. The tendency is that digital radiography solves this problem regarding the disposal of substances, developers and fixers will no longer be used, in a 2018 study in Belgium it showed that 90% of dentists use Snel digital radiography, 2018, in Sweden 98% (svenson, 2018), and 67% in Turkey (Dölekoğlu 2011) but this is unfortunately not the reality in Brazil and in most countries below the Equator.

How can we admit nowadays that such harmful substances can be discarded in the environment without any concern of professionals? The substances used in the process of developing radiographs are discarded by the common sewage by the individuals who answered this questionnaire, this result surprised everyone because we expected that nowadays the awareness about harmful effects to the environment would be based on everyone's attitudes. Awareness campaigns are needed before it is too late.

The realization of several radiographic takes from the same place is also a concern and to keep the films in ideal conditions of viewing for a long time, it is essential that the processing is carried out properly, we observed that 56% usually observe yellowish spots on the radiographs previously taken , forcing the patient to be exposed to a new radiographic shot using more developer and fixer for further processing.

Most dental radiology books guide the means of prevention for both the patient and the professional and the team, as well as in relation to the work environment. There is a unanimous need to take care with the calibration of the device, filtration, collimation, use open cylinders, ultra-fast films and the use of lead protectors (Jacobs et al., 2004, Hart 2013). Knowledge of the technique and its good performance, in addition to the care with developing and fixing the film are essential procedures to avoid repetition. Most dentists are not concerned with the quality of the radiographs, making them overexposed or under-processed and thus leading the patient to receive an unnecessary dose of radiation (Okano 2012).

Table 1: Characteristics of the individuals included in the study

Question	male	female			
Gender	77 (38,5%)	123 (61,5%)			
	<29 years	30-39 years	40-49 years	50-59 years	>60 years
Age	62 (31%)	67 (33,5%)	50 (25%)	18 (9%)	3 (1,5%)
	<5 years	5-10 years	10-15 years	15-25 years	>25 years
Years of graduated experience in dental practice	45 (22,5%)	54 (27%)	68 (34%)	25 (12,5%)	8 (4%)
	Bachelor of Dental Surgery	Postgraduate degree	PhD		
Highest qualification?	101 (50,5%)	98 (49%)	1 (0,5%)		

Table 2: Questionnaire applied to participants

1- Concern about biosafety		(196 / 98%) *Y	(04 / 2%) N
2- Do you know ordinance 453 on radiation protection?		(88 / 44%) Y	(112 / 56%) N
3- Are there signs in the room where the X-ray equipment is located?		(64 / 32%) Y	(136 / 68%) N
4- Is there a guidance framework on radiation protection?		(22 / 11%) Y	(178 / 89%) *N
5- Do you check for previous radiographs of the patients?		(195/ 97,5%) *Y	(05 / 2,5%) N
6- Do you use lead apron on the chest and thyroid region in patients?		(190 / 95%) *Y	(10 / 5%) N
7- What protective measures do you take during the exhibition?	(72 / 36%) Get away	(126 / 63%) Stay behind the wall	(02 / 1%) None
8- What is the format of the locator?	(184 / 92%) Cylindrical	(10 / 5%) Conical	(6 / 3%) Do not know
9 - Where do you discard the developer and fixing solution used in processing?		(104/52%) In the sink drain	(96/48%) In isolated container
10- Does the improper disposal of these materials damage the environment?		(174 / 87%) *Y	(26 / 13%) N
11- Do you know the existence in your city of the removal of the material used in radiology?		(56 / 28%) Y	(144 / 72%) *N
12- How is the radiography drying step performed?	(156 / 78%) Natural drying	(36 / 18%) Drying with the aid of a triple syringe	(8 / 4%) In electric greenhouse
13-Do the radiographic images taken usually become yellowish after some time?		(112 / 56%) Y	(88 / 44%) N

Biosafety in radiology in infection control or radiation control must be better demanded of students in dentistry courses, as well as by Organs competent bodies during professional practice in public and private offices (Roman torres 2017, Almahamed 2020). Since it is very important, and even fundamental, the knowledge of dentists about the risks to which they are exposed and how to prevent them, becoming able to contribute to the promotion of health and well-being of all, l clinical protocols for the use of x-ray devices and the handling of materials related to radiographic sockets, they must be institutionalized, aiming to optimize the biosafety of professionals and patients.

The results observed in our study are not encouraging, either due to the ignorance of the current legislation, the use of the devices inappropriately and the processing carried out with real chances of contamination of the environment, we believe that an increase in teaching and control of biosafety in dental radiology is necessary.

SOURCES OF FUNDING

None.

CONFLICT OF INTEREST

None.

ACKNOWLEDGMENT

None.

REFERENCES

[1] Chaudhry M, Jayaprakash K, Shivalingesh KK, et al. Oral Radiology Safety Standards Adopted by the General Dentists Practicing in National Capital Region (NCR). J Clin Diagn Res. 2016;10(1):ZC42-ZC45. doi:10.7860/JCDR/2016/14591.7088.

[2] White SC, Mallya SM. Update on the biological effects of ionizing radiation, relative dose factors and radiation hygiene. Aust Dent J. 2012;57 Suppl 1:2-8. doi:10.1111/j.1834-7819.2011.01665.x

[3] Praveen BN, Shubhasini AR, Bhanushree R, Sumsum PS, Sushma CN. Radiation in dental practice: awareness, protection and recommendations. J Contemp Dent Pract. 2013 Jan 1;14(1):143-8.

[4] Hart G, Dugdale M. Radiation protection in dental X-ray surgeries--still rooms for improvement. Br Dent J. 2013;214(6):E16. doi:10.1038/sj.bdj.2013.274

[5] Singh G, Sood A, Kaur A, Gupta D. Pathogenesis, Clinical Features, Diagnosis, and Management of Radiation Hazards in Dentistry. Open Dent J. 2018;12:742-752

[6] White SC, Heslop EW, Hollender LG, Mosier KM, Ruprecht A, Shrout MK. Parameters of radiologic care: an official report of the American Academy of Oral and Maxillofacial Radiology. Oral Surg Oral Med Oral Pathol Oral RadiolEndod. 2001;91(5):498-511.

[7] Roman-Torres CVG. Biosafety in dental radiology: are we all protected? Int J Radiol Radiat Ther. 2017;4(1):318. DOI: 10.15406/ijrrt.2017.04.00084.

[8] Rout J, Brown J. Ionizing radiation regulations and the dental practitioner: 1. The nature of ionizing radiation and its use in dentistry. Dent Update. 2012;39(3):191-203. doi:10.12968/denu.2012.39.3.191

[9] Okano T, Sur J. Radiation dose and protection in dentistry, Jpn Dent Sci Ver. 2012;6:112-121.

[10] Ihle IR, Neibling E, Albrecht K, Treston H, Sholapurkar A. Investigation of radiation-protection knowledge, attitudes, and practices of North Queensland dentists. J Investig Clin Dent. 2019;10(1):e12374. doi:10.1111/jicd.12374.

[11] Tsapaki V. Radiation protection in dental radiology - recent advances and future directions. Phys Med. 2017;44:222-226.

[12] Coelho-Silva F, Fontenele RC, de-Azevedo-Vaz SL, Freitas DQ. A comparative study on image quality of two digital intraoral sensors-methodological, ethical and statistical issues. Dentomaxillofac Radiol. 2020;49(4):20200054. doi:10.1259/dmfr.20200054.

[13] Almohaimede AA, Bendahmash MW, Dhafr FM, Awwad AF, Al-Madi EM. Knowledge, Attitude, and Practice (KAP) of Radiographic Protection by Dental Undergraduate and Endodontic Postgraduate Students, General Practitioners, and Endodontists. Int J Dent. 2020;2020:2728949.

[14] Brazil. Ministry of Education. National Council of Education. Resolution CNE/CES. Board of Higher Education. National Curriculum Guidelines for Undergraduate Dentistry. Official Federal Gazette; 2002 Mar 4.

[15] Azevedo-Vaz SL de, Vasconcelos K de F, Rovaris K, Ferreira N de P, Haiter Neto F. A survey on dental undergraduates' knowledge of oral radiology. Braz. J. Oral Sci. [Internet]. 2015Oct.16 [cited 2020Jun.21];12(2):109-13.

[16] Tugnait A, Clerehugh V, Hirschmann PN. Radiographic equipment and techniques used in general dental practice: a survey of general dental practitioners in England and Wales. J Dent. 2003;31(3):197-203. doi:10.1016/s0300-5712(03)00013-7

[17] Snel R, Van De Maele E, Politis C, Jacobs R. Digital dental radiology in Belgium: a nationwide survey. Dentomaxillofac Radiol. 2018;47(8):20180045. doi:10.1259/dmfr.20180045.

[18] Svenson B, Ståhlnacke K, Karlsson R, Fält A. Dentists' use of digital radiographic techniques: Part I - intraoral X-ray: a questionnaire study of Swedish dentists. Acta Odontol Scand. 2018;76(2):111-118. doi:10.1080/00016357.2017.1387930

[19] Jacobs R, Vanderstappen M, Bogaerts R, Gijbels F. Attitude of the Belgian dentist population towards radiation protection. Dentomaxillofac Radiol. 2004;33(5):334-339. doi:10.1259/dmfr/22185511

[20] Kasat VO, Ladda R, Joshi S, Giri PA, Pandya M, Shaikh S. Knowledge and practice regarding safety standards of oral radiology among dental practitioners in western Maharashtra, India. Oral Radiol. 2016;33(1):1-7.

[21] Dölekoğlu S, Fişekçioğlu E, İlgüy M, İlgüy D. The usage of digital radiography and cone beam computed tomography among Turkish dentists. Dentomaxillofac Radiol. 2011;40(6):379-384. doi:10.1259/dmfr/27837552.

[22] Shahab S, Kavosi A, Nazarinia H, Mehralizadeh S, Mohammadpour M, Emami M. Compliance of Iranian dentists with safety standards of oral radiology. Dentomaxillofac Radiol. 2012;41(2):159-164. doi:10.1259/dmfr/29207955.
[23] Binnal A, Rajesh G, Denny C, Ahmed J, Nayak V. Insights into the state of radiation protection among a subpopulation of Indian dental practitioners. Imaging Sci Dent. 2013;43(4):253-259. doi:10.5624/isd.2013.43.4.253.
[24] Lee BD, Ludlow JB. Attitude of the Korean dentists towards radiation safety and selection criteria. Imaging Sci Dent. 2013;43(3):179-184. doi:10.5624/isd.2013.43.3.179.