

# Knowledge, awareness, and practice survey on conventional radiographic methods and processing among dental students

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*J. Adv. Pharm. Technol. Res.*

## ABSTRACT

X-rays are electromagnetic waves produced by an X-ray machine and are used to observe the internal structures of patients. The X-rays pass through the body before being detected by the detector film or a digital detector behind the patient. To analyze the knowledge, awareness, and practice on conventional radiographic method and processing among the dental students. A well-framed questionnaire consisting of 10 questions were prepared and distributed among 100 dental professionals and students through the online Google forms link. The data were collected, tabulated in Excel sheets, and analyzed using the SPSS software. The Chi-square test was used to assess the *P* value. Sixty-five percentage of the participants are aware of conventional radiographic methods and 35% are not aware. The Chi-square test was done giving a  $P = 0.001$  ( $<0.05$ ), which is statistically significant. The dental students as compared to the other specialties have adequate and efficient knowledge and are aware of the conventional radiographic methods and its processing.

**Key words:** Awareness, conventional radiography, eco-friendly, knowledge, practice, processing

## INTRODUCTION

X-rays are electromagnetic waves produced by an X-ray machine and are used to observe the internal structures of patients.<sup>[1]</sup> The X-rays pass through the body before being detected by the detector film or a digital detector behind the patient.<sup>[2]</sup> The imaging technique of radiography

uses X-rays, gamma rays, and other forms of ionization radiation to display an object's internal form and accuracy. In certain X-rays radiation is absorbed by the object, depending on the density and structural composition of the object.<sup>[3]</sup> The first radiograms were recorded in the phosphorous-coated digital cassettes.<sup>[4]</sup> There are many advantages of digital radiography which includes its ability to differentiate the digital data at different stages.<sup>[5]</sup> In radiography, X-rays are used, a portion of which are absorbed by the body.<sup>[5,6]</sup> Ionizing radiation can either cause deterministic or stochastic effects on the body.<sup>[6]</sup> Because of the capacity change from ionizing radiation exposure from radiography methods should adhere to the ALARA principles, as little as moderately conceivable to acquire a diagnostic exam. Special consideration

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Submitted: 05-May-2022

Revised: 28-May-2022

Accepted: 04-Jun-2022

Published: 30-Nov-2022

### Access this article online

Quick Response Code:



Website:

www.japtr.org

DOI:

10.4103/japtr.japtr\_299\_22

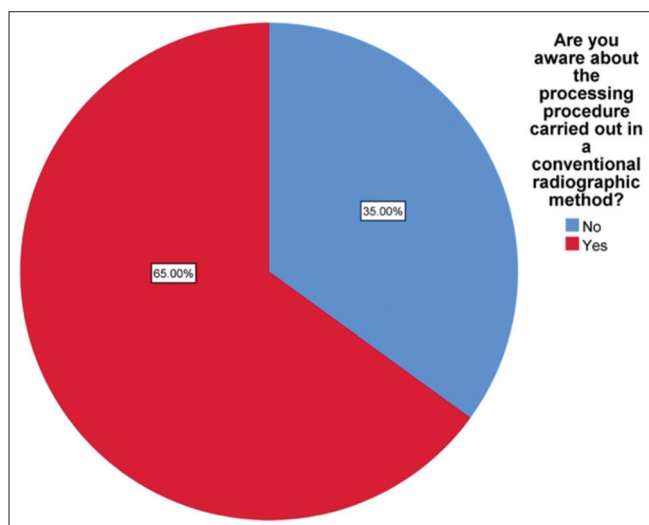
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**How to cite this article:** Begum A, Jayaraman M. Knowledge, awareness, and practice survey on conventional radiographic methods and processing among dental students. *J Adv Pharm Technol Res* 2022;13:S6-11.

needs to be given for pregnant women and children as they would be more sensitive to the radiation.<sup>[7]</sup> X-ray personnel ought to at all times ensure that the benefits of examination will outweigh the potential hazard from potential radiation.<sup>[8]</sup> And the person is less exposed to the radiation.<sup>[7,9]</sup> The absorption of X-rays occurs in a variety of variations in the body. Soft and tender tissues allow more radiation to pass through, while the dense bone absorbs more radiation.<sup>[10]</sup> The use of conventional radiography is mainly used for fractures, pneumonia, and intestinal obstruction. A three-dimensional object is projected onto a two-dimensional image in conventional radiography. The major limitation is that different overlying tissues are superimposed on the image.<sup>[11]</sup> Conventional radiography is a well-established imaging method that remains valuable as an outcome assessment of structural damage in specific parts. There are many commonly used scoring methods for determining structural damage. These methods have been validated and are sensitive to change over even very short periods of follow-up. Furthermore, the connection between structural damage and causal factors such as inflammation, as well as important outcome measures such as physical function, is well understood. This is an additional point supporting the fact that conventional radiographs are the useful measures of structural damage as well as long-term outcomes. Our team has an opulence of research expertise which has yielded high quality publications.<sup>[12-31]</sup>

The aim and purpose of the study is to assess and examine the knowledge, awareness, and practice of conventional radiographic methods and processing among dental students and other specialties.



**Figure 1:** The pie chart represents the percentage distribution regarding the awareness of the processing procedure carried out in conventional radiographic methods. Blue represents no and red color represents yes. Sixty five percentage of the participants were aware about the processing procedure carried out in conventional radiographic methods

## MATERIALS AND METHODS

### Study design

From February to April 2021, an online survey was used to perform a cross-sectional research among dental students and other dental specialties of Private Dental Institutions, Chennai.

### Study subjects

One hundred participants were chosen using a basic random sampling approach.

### Ethical consideration

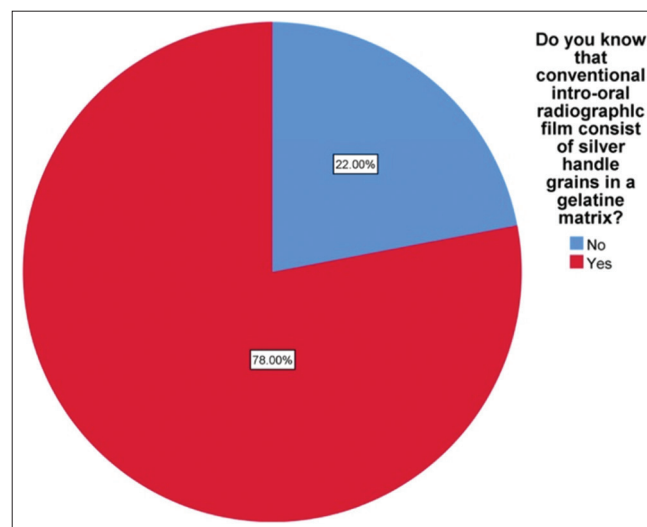
Prior to the initiation of the study, the Saveetha Dental College's Institutional Review Board issued Ethical Consent for the Research with the Clearance Number IHEC/SDC/ENDO/166.

### Study method

Fourteen self-administered questionnaires which consisted of 14 questions was prepared and was dispersed through an online Google form link among the participants. The present study allows us to circulate the questionnaire to more participants via an online platform which provides a convenient data gathering and gives a good statistical significance. The participants were asked to read the questions properly and respond.

### Statistical analysis

The collected data were inserted in Google sheets and transferred to SPSS software version 2.2. The statistics were substantiated by the guide. Descriptive statistics were carried out. Chi-square analysis was done.



**Figure 2:** The pie chart represents the percentage distribution regarding the knowledge and awareness that conventional intra oral radiographic film consists of silver handle grains in a gelatin matrix. Blue represents no and red represents yes. Seventy eight percentage of participants were aware that conventional intraoral radiographic film consists of silver handle grains in a gelatin matrix

## RESULTS

Sixty-seven percentage male participants and 33% female participants participated in the study. Sixty-four percentage of the participants were dental students, 20% of the participants were general practitioners, and 16% of the participants were from other specialties.

From the present study, 65% participants are aware about the processing procedure carried out in a conventional radiographic method [Figure 1]. Seventy-three percentage of the participants are aware about the dark room setup required in a conventional radiographic method. Seventy-eight percentage of the participants have knowledge that conventional intra oral radiographic film consists of silver handle grains in a Gelatine matrix [Figure 2]. Seventy-three percentage of the participants were aware

that the processing procedure transforms the latent image into a visible image followed by developing, fixing, rinsing, washing and drying. Seventy-seven percentage of the participants were aware about the fact that a thermometer and a clock are required to monitor the temperature of the developer or fixer solution in a conventional radiographic procedure. Seventy-three percentage of the participants had knowledge that the dark room is fitted with a safe light having higher wavelengths and which do not cause exposure of the X-ray films. Seventy-three percentage of the participants had knowledge that the X-ray cassettes which are loaded should be stored in an upright position in a cool dry place within the dark room. Seventy-nine percentage of the participants responded that sodium or ammonium thiosulfate, potassium alum, and acetic acid are the components of the fixer solution used in a conventional radiographic method [Figure 3]. Eighty percentage of the

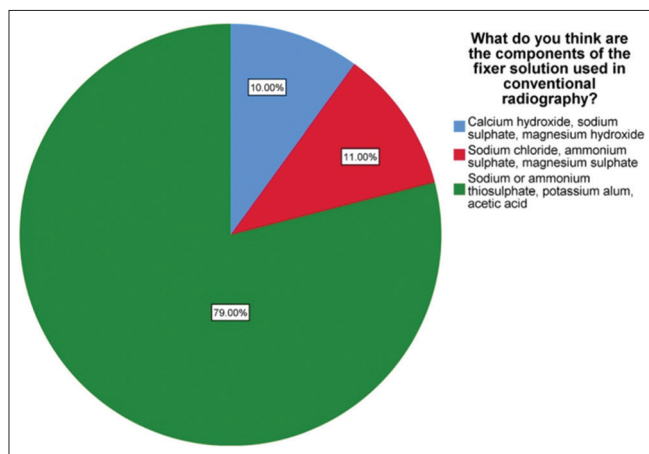
**Table 1: Depicts the frequency of responses on knowledge, awareness, and practice on conventional radiographic methods and processing**

Questions	Options	Responses (%)
Gender	Male	67
	Female	33
Specialties	Dental students	64
	General practitioners	20
	Other specialties	16
Are you aware about the processing procedure carried out in a conventional radiographic method?	Yes	65
	No	35
Are you aware about the dark room setup required in a conventional radiography method?	Yes	73
	No	27
Do you know that conventional intro-oral radiographic film consists of silver handle grains in a gelatine matrix?	Yes	78
	No	22
Are you aware that the procedure processing transforms the latent image into a visible image followed by developing, rinsing, fixing, washing and drying procedures?	Yes	73
	No	27
Are you aware of the fact that a thermometer and a clock are required to monitor the temperature of the developer/fixer solutions in a conventional radiographic procedures?	Yes	77
	No	23
Do you know that the dark room is fitted with a safe light having higher wavelengths and which do not cause exposure of the x-ray films?	Yes	73
	No	27
Do you know that the x-ray cassettes which are loaded should be stored in an upright position in a cool dry place within the dark room?	Yes	73
	No	27
What do you think are the components of the fixer solution used in conventional radiography?	Sodium or ammonium thiosulphate, potassium alum, acetic acid	79
	Sodium chloride, ammonium sulfate, magnesium sulfate	11
	Calcium hydroxide, sodium sulfate, magnesium hydroxide	10
	Hydroquinone, alkali, sodium sulfite, potassium bromide	80
What do you think are the components of a developer solution used in a conventional radiograph?	Alkane, calcium chloride, sodium thiosulfate potassium	9
	Chloride, sodium hydroxide, calcium oxide	11
What do you think is the total thickness of a radiographic film? (mm)	1.2	72
	3	11
	0.25	17

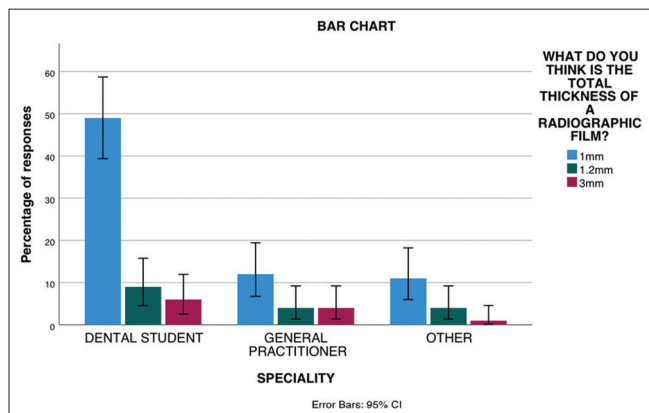
participants responded that hydroquinone, alkali, sodium sulfite, and potassium bromide are the components of the developer solution used in conventional radiographic methods [Figure 4]. Seventy-two percentage of the participants responded that 0.25 mm is the total thickness of a radiographic film [Table 1].

## DISCUSSION

It is evident that 0.25 mm is the total thickness of the radiographic film [Figure 5], which was responded to by 49% by the dental students with  $P = 0.463$  which is

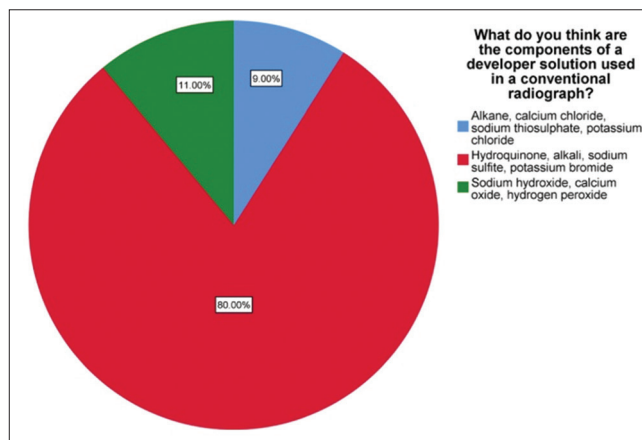


**Figure 3:** The pie chart represents the percentage distribution regarding the knowledge and awareness about the components of the fixer solution used in conventional radiography. Blue color represents calcium hydroxide, sodium sulfate, magnesium hydroxide, red color represents sodium chloride, ammonium sulfate, magnesium sulfate and green color represents sodium or ammonium thiosulphate, potassium alum, acetic acid. Seventy nine percentage of the participants had knowledge and were aware about the components of the fixer solution used in conventional radiography

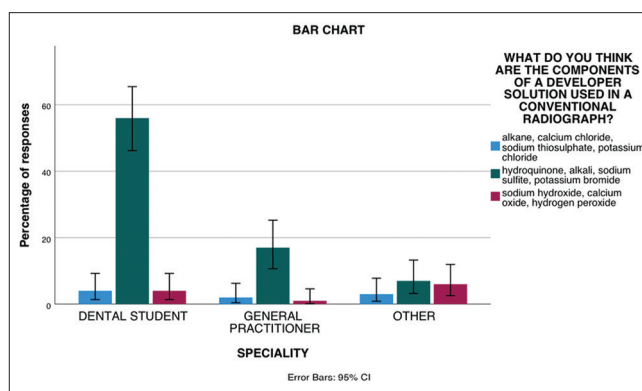


**Figure 5:** The histogram illustrates the interrelation between the specialities and knowledge on the total thickness of a radiographic film. X-axis constitutes the different specialities and Y-axis constitutes the percentage of responses. Blue denotes 1mm, green denotes 1.2mm and pink denotes 3mm. Chi-square test was done,  $P = 0.463$  ( $>0.05$ ) thus, it is statistically not significant

statistically not significant. Similar study was done by Unett *et al.*,<sup>[32]</sup> where the author concludes that the radiographic films are used in a fast manner with intensifying screens. From the present study, it is evident that hydroquinone, alkali, sodium sulfite, and potassium bromide are the components of the developer solution used in a conventional radiograph [Figure 6], which was responded by 56% by the dental students with  $P = 0.001$  which is statistically significant. Similar study was done by Anburajan<sup>[33]</sup> where the author concludes that the hydroquinone is used for the low contrast, alkali is to maintain the ph, sodium sulfite



**Figure 4:** The pie chart represents the percentage distribution regarding the knowledge and awareness about the components of the developer solution used in conventional radiography. Blue color represents alkane, calcium chloride, sodium thiosulphate, potassium chloride, red color represents hydroquinone, alkali, sodium sulphite, potassium bromide and green color represents sodium hydroxide, calcium oxide, hydrogen peroxide. Eighty percentage of the participants had knowledge and were aware about the components of the developer solution used in conventional radiography



**Figure 6:** The histogram illustrates the interrelation between the specialities and the knowledge on components of a developer solution in a conventional radiograph. X-axis constitutes the different specialities and Y-axis constitutes the percentage of responses. Blue denotes Alkans, calcium chloride, sodium thiosulphate, potassium chloride, green denotes hydroquinone, alkali, sodium sulfite, potassium bromide and pink denotes sodium hydroxide, calcium oxide, hydrogen peroxide. Chi-square test was done,  $P = 0.001$  ( $<0.05$ ) thus, it is statistically significant

is to reduce the oxidation rate and potassium bromide prevents the developer from acting on unexposed silver. From the present study, it is evident that sodium or ammonium thiosulfate, potassium alum, and acetic acid are the components of the fixer solution used in a conventional radiography [Figure 7], which was responded by 56% by the dental students with  $P = 0.024$  which is statistically significant. Similar study was done by Sahni *et al.*<sup>[34]</sup> where the author concludes that sodium or ammonium thiosulfate dissolves the exposed silver, potassium alum is used as a hardener and acetic acid is used to remove any residual alkalinity from the previous development. The drawback of this study consists of a small population and a number of questions which might be addressed in future research.

## CONCLUSION

The present survey shows that the knowledge and awareness on the conventional radiographic methods and practices among the dental students were good. Within the limitation of the study, it concludes that the dental students were more aware about the usage of conventional radiographic methods.

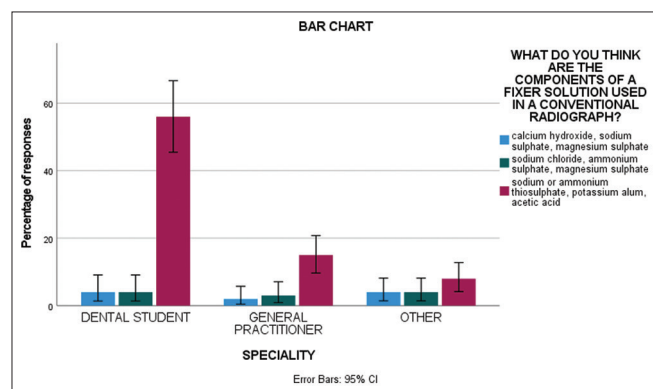
## Acknowledgment

The authors would like to thank the study participants for their participation and kind cooperation throughout the study.

## Financial support and sponsorship

The present project is supported by

- Saveetha Institute of Medical and Technical Sciences
- SaveethaDental College and Hospitals, Saveetha University
- Fresco Hospitality and Hotels LLP.



**Figure 7:** The histogram illustrates the interrelation between the specialities and the knowledge on components of a fixer solution in conventional radiography. X-axis constitutes the different specialities and Y-axis constitutes the percentage of responses. Blue denotes calcium hydroxide, sodium sulfate, magnesium hydroxide, green denotes sodium chloride, ammonium sulfate, magnesium sulfate and pink denotes sodium or ammonium thiosulfate, potassium alum, acetic acid. Chi-square test was done,  $P = 0.024$  ( $<0.05$ ) thus it is statistically significant

## Conflicts of interest

There are no conflicts of interest.

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