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Original Research Article

Assessment of awareness and attitude towards radiation hazards and safety in the general population

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ABSTRACT

Background: Dental radiologists, technicians, and other personnel understand the significance of radiation risks and, consequently, patient safety. It is equally important to know the understanding of patients visiting the hospital, which will assist in identifying gaps in patient education.
Methods: Patients (n=300) visiting the outpatient department were given a pre-validated questionnaire form, which consisted of 17 questions distributed separately in order to assess awareness and attitude. The responses collected were statistically analysed.
Results: Patients who are literate and have fairly good socioeconomic status are expected to be more aware and concerned about their attitude towards radiation safety and hazards, although fewer illiterate people are also expected to be equally aware and concerned.
Conclusions: Despite many efforts by authorities, there seems to be a need to spread more awareness about radiation safety and hazards among the general population, irrespective of their background characteristics and educational status, and thus improve their attitude towards the same.

Keywords: Radiation biology, Radiation protection, Radiation safety, Radiation knowledge, Radiation hazards

INTRODUCTION

Plans for diagnosis and treatment often include radiological studies. Radiographic tests are crucial for both straight forward operations like the identification of caries and cutting-edge therapies like the implantation of implants. Dentists employ a variety of radiographic techniques, from the traditional intraoral periapical radiograph to more recent innovations such as cone beam computed tomography. Ionizing radiation, although having favourable uses, has several side effects that could be dangerous. The time, dose, and frequency of radiation exposure affect these outcomes. Low radiation doses damage or modify the DNA of exposed cells, but high radiation doses cause cell death.[1] Depending on the radiation levels and how the organism reacts to the exposure, ionizing radiation exposure has both deterministic and stochastic effects. Several studies have found an association between dental X-ray exposure and increased risks of brain cancer, tumors of the parotid gland, breast cancer, and thyroid cancer.[2-7] Repeated exposure to dental X-rays may result in various health problems, including head and neck tumors and various systemic problems.[8] The dentist and the patients are more vulnerable to such effects since the stochastic effects do not adhere to a threshold dose. Dental radiologists, technicians, and other staff are aware of the importance of radiation hazards and, thus, safety. But it is equally important to know the awareness and attitude of the general public, especially those visiting dental hospitals

for radiological investigations. Literature reveals a very few such studies where the perceptions of patients are analyzed. Therefore, this study was planned with the objective to evaluate the awareness and attitude of the general public regarding radiation hazards and safety. Knowing the awareness and attitude of the general public towards radiation safety and hazards would be helpful in determining the shortfalls in patient education and measures to be implemented to fulfil those shortcomings in regards to spreading social awareness in the population.

METHODS

This cross-sectional questionnaire based study was conducted from the 7th of August, 2023 to 7th of December 2023 in department of oral medicine and radiology of Government dental college and hospital, Nagpur, Maharashtra.

Table 1: 17 questioned questionnaires for assessment.

Questions
Knowledge about radiations
There are different types of rays in the environment.
Ultraviolet rays, infrared rays, microwave rays, radio rays, and X-rays are different types of rays in the environment.
Some of these rays can be harmful.
We can encounter radiation in our daily lives at places other than the X-ray department of a hospital.
Knowledge about X-rays
X-rays are one of the essential requirements for diagnosis and treatment planning.
Getting images of bones and other structures has become easier with the use of X-rays.
The use of X-rays varies from patient to patient and area to be examined.
X-rays can be harmful to body parts.
Awareness
There is a need to create more awareness about the harmful effects of X-rays.
Knowing radiation risks will help you keep yourself away from unnecessary sources of radiation.
All should be made more aware of safety measures.
Using safety measures should always be a priority during an X-ray procedure.
All should restrict themselves from radiation sources when not essential.
There is a need to create more awareness about the harmful effects of X-rays.
Attitude and preventive measures
The patient in the waiting area should follow the necessary instructions given by the radiation handling personnel and maintain discipline.
Not following procedural instructions may lead to the formation of a bad X-ray image and the repentance of the procedure.
The most important instruction to follow is not to enter the X-ray when an X-ray procedure is already going on.
Pregnant women and growing children require special attention when coming into contact with X-rays.

After obtaining written informed consent, a questionnaire-based cross-sectional study was conducted among patients in the age range of 18-70 who visited the outpatient department of oral medicine and radiology. Using covariance sampling and substituting values of estimates of mean and standard deviation in the formula obtained from the previous study with estimates of 80% power and alpha error, i.e., a constant with a value of 1.96 and a beta error constant with a value of 0.84, a total sample size of 286 was calculated, which was rounded off to 300 to avoid dropouts.[9] Patients who required any emergency treatment, medically compromised or syndromic patients, people associated with ionizing radiation associated professions, and medical professionals were excluded from the study. A pre-validated 17-questionnaire (Table 1) using a 5-point Likert scale with multiple options (strongly agree, agree, don't know, disagree, strongly disagree) was made available to patients. After the complete dental examination was done, the patients were provided with the questionnaire and were asked to assess and respond. After approximately 15 minutes, a questionnaire was collected, and the responses were tabulated and statistically analyzed. The questions were arranged such that they reached an insightful reflection of the knowledge, attitude, and awareness of patients, since the gradual nature of the sequence provides a step-wise approach for achieving the desired response of what the respondent thinks.

RESULTS

There was an equal distribution among the categorized individual parameters of age, gender, educational status, and those who had already undergone an X-ray procedure. Demographic characteristics are presented in (Figures 1-4).

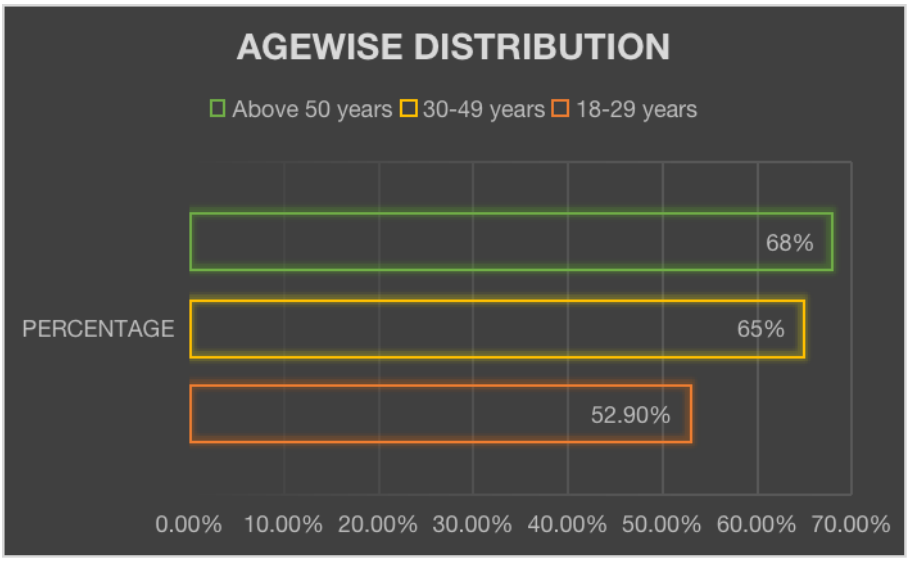

Figure 1: Age wise distribution of population.

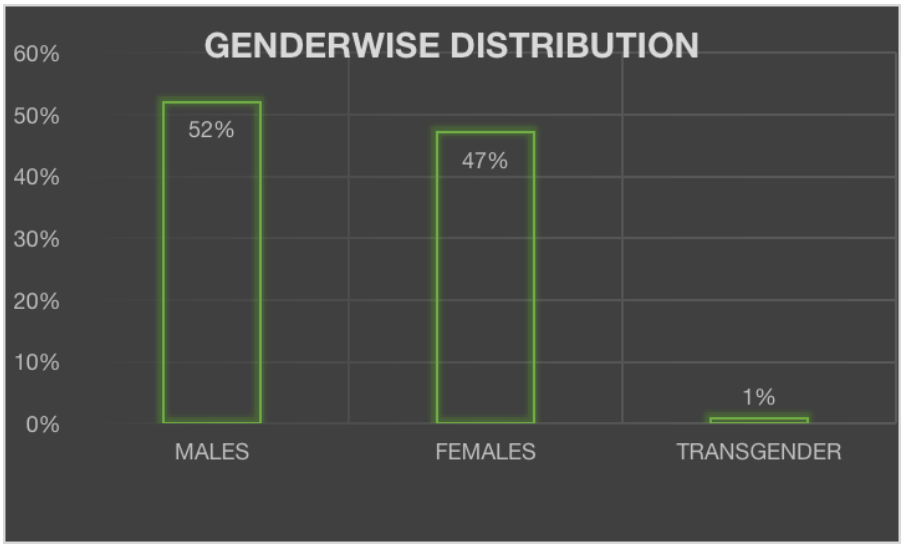

Figure 2: Gender wise distribution of population.

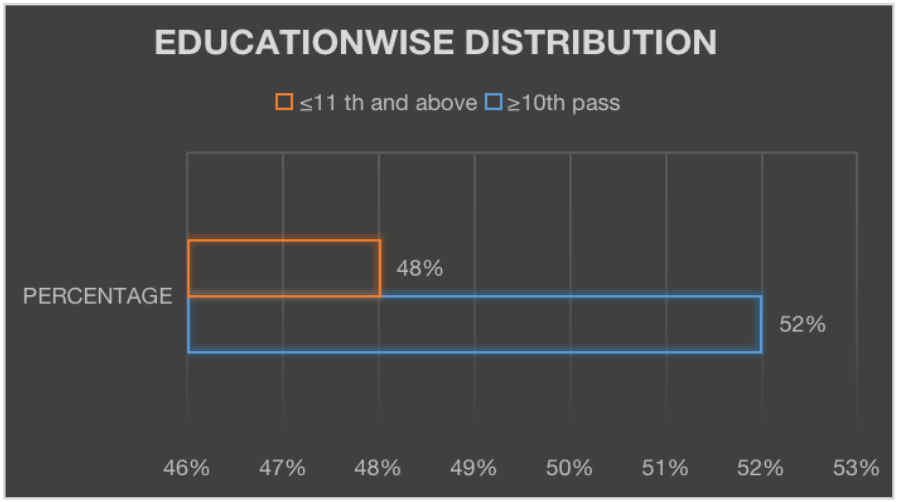

Figure 3: Education wise distribution of population.

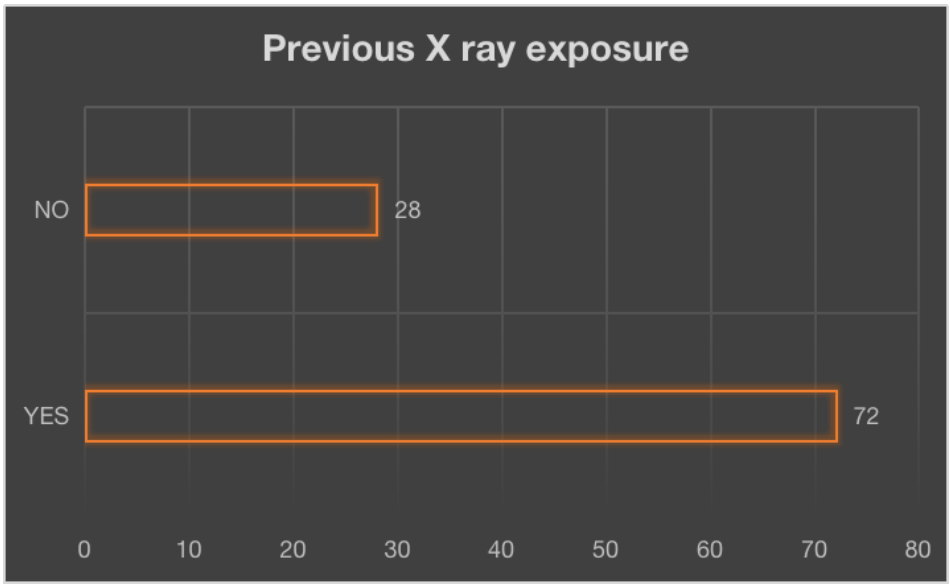

Figure 4: Distribution of population according to their previous experience of X-ray exposure.

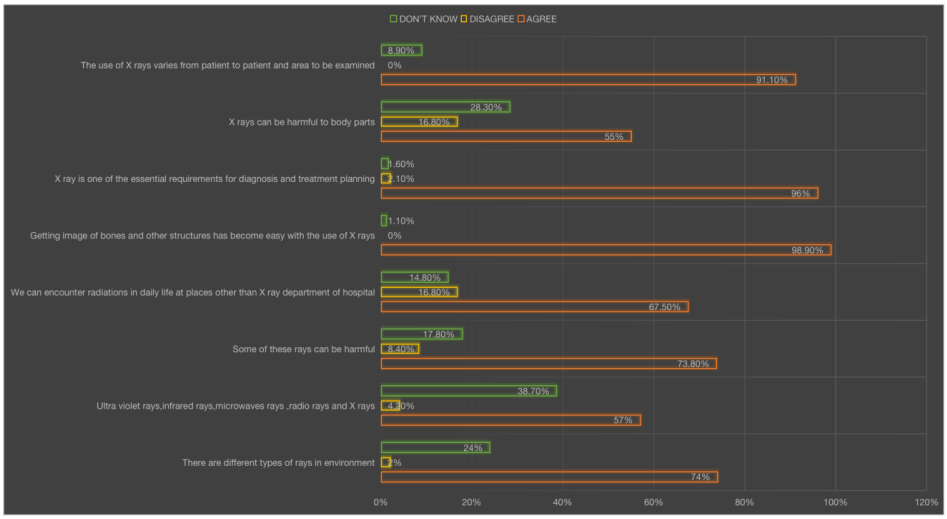

Figure 5: Responses to questions in percentage.

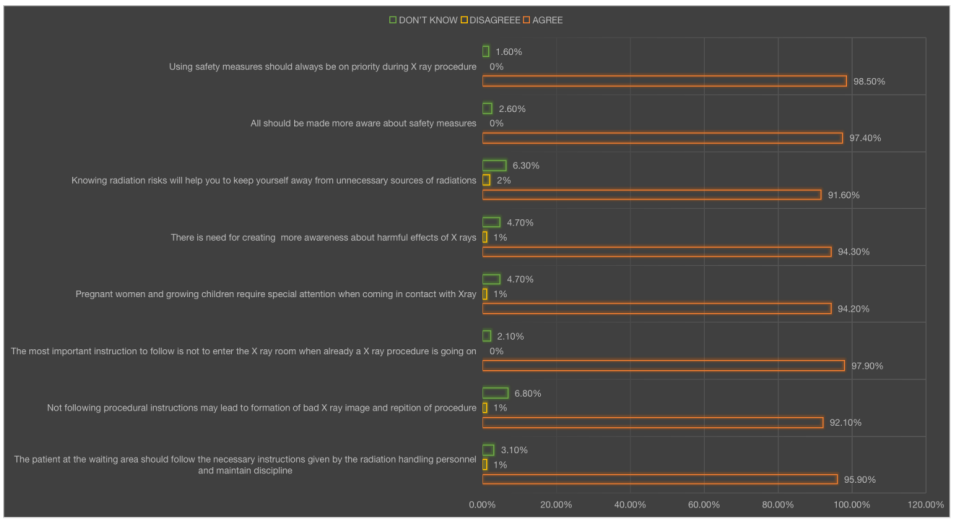

Figure 6: Responses to questions in percentage.

The responses were collected with multiple options: strongly agree, agree, don't know, disagree, and strongly disagree. For statistical assessment, strongly agree and agree were combined to a single response of agree and disagree, and strongly disagree were combined to a single response of disagree. All the responses collected are mentioned in (Figures 5-6) respectively.

All 300 participants completed the questionnaire. Each question was analyzed based on individual parameters of age, gender, education, and previous X-ray exposure. Overall responses were positive across most of the parameters, but few highlighted the importance of the study. 16.80% of the population disagreed with the fact that X-rays can be more harmful, whereas only 8.40% of respondents disagreed with the same in relation to general rays. 25% of the population is not at all aware that radiation does exist in the environment, justifying the need to create more awareness and spread knowledge. 4.70% of people do not know the need for creating awareness, while 1% disagree with creating awareness. These responses, even though they represent a small proportion, are indicative of a lack of knowledge and awareness and, therefore, an indifferent attitude towards radiation hazards and safety.

DISCUSSION

Radiographs can be thought of as the clinician's diagnostic tool because radiographic evaluation is a crucial component in dentistry for the diagnosis and treatment of the majority of patients. In comparison to other modalities like CT scans, dental X-rays, intraoral or extraoral, and 3D modalities like CBCT, CBCT exposes the patient to far less radiation.[10] Nevertheless, it is important to consider the long-term consequences of radiation exposure, like an alteration in immune response secondary to increased inflammatory mediators.[11] This may increase the risk of acquiring opportunistic infections like mucocutaneous ulcers, candidiasis, linear gingival erythema, necrotizing ulcerative gingivitis, mucositis, herpes zoster, etc.[12] It has been observed that despite being aware of radiation hazards and the harmful consequences induced by radiation exposure, only a small number of radiologists carefully follow safety protocols for themselves and for patients during radiological examination.[13] In the course, the patient also does not receive enough information about the negative effects of radiation exposure. Also, although not required, patients are exposed to frequent exposures, which increases the obvious chance of potential risks to their health. In this study, it was found that nearly 74% of patients had knowledge about the presence of radiation around them, and out of these, only 55% of people were aware of the ill effects of X-rays, which is relatively similar to the study given by Sharma et al.[9] The similarity can be attributed to the strata of the population visiting hospitals. Educational status affects the overall cognition of the patient. It is obvious that the majority of them would give optimistic responses, but this may or may not reflect a greater awareness of radiation knowledge, hazards, and safety, which is seen in both the studies. Socioeconomic status and age reflect the background characteristics as well as the ability to respond, which might be the reason for receiving negative responses for questions related to knowledge, but basic questions associated with X-ray use and attitude were positively answered. Almagharbi found that approximately 80% of the participants wanted their radiologists and doctors to inform them about radiation hazards and safety measures, which we found similar in our study, where 90% of patients wanted their radiologists to inform them of the same.[14] In our study, many female participants were well aware of exposure risks for pregnant women and growing children, a different finding from the study results of Sharma et al where female respondents were unaware of them. These contradictory findings could be due to the fact that the majority of the population in our study underwent earlier X-ray exposure than previous studies, which would have instilled this information from the instructions displayed in the X-ray section. Feng et al stated that the public's awareness of medical radiation was the topic that needed to be strengthened, and it will significantly increase the knowledge index of radiation if the public receives radiation education training.[15] Similarly, in our study, a mean of 95% of the population agreed to questions related to spreading awareness about harmful effects and knowing safety measures. This finding suggests that there should be the incorporation of public awareness programmes pertaining to teaching general radiation awareness and safety. Thus, continuous patient education and motivation are the keys to spreading social awareness and building a desirable attitude. This could probably be started by incorporating radiation associated topics into the school curriculum of school going children. This will nurture the upcoming generation with greater awareness and build up a positive attitude.

CONCLUSION

It is the responsibility of the policy implementers and the dental fraternity to spread awareness and build a positive attitude towards radiation safety, and it is also the equal responsibility of the public to accept the knowledge and follow instructions to save themselves and others from future radiation-induced damage.

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