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Awareness of radiation safety among Health Care Professionals

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Abstract

Background: Radiological evaluation is an important diagnostic aid in various branches of medicine. But it exposes both the patients and the health professionals to the ionizing radiation which have adverse effects on the subjects. Optimum knowledge of the healthcare professionals regarding the radiation safety will ensure safety of both the health care professionals and the patients.

AIM: The aim of this study was to assess awareness of radiation protection measures among various health care professionals.

Material/Methods: The study consisted of a questionnaire survey which consisted of seven multiple choice questions regarding the knowledge of the health care professionals regarding the safety measures against radiation exposure and dose level of various protocols. The questionnaires were circulated among 200 healthcare professionals working in various medical colleges including doctors, radiology technician and medical interns.

Results: The result showed that only 87% of doctors, 64% of radiographers and 43% of students were aware about the protective measures during the radiation exposure. Regarding the dose of radiation of various procedure doctors with 5-10 years' experience gave maximum correct answers whereas medical interns had least knowledge regarding it.

Conclusions: Care should be taken to educate health care professionals in regular intervals to eliminate the risk of radiation exposure.

Keywords: Radiation Protection, Multidetector Computed Tomography, Ionizing Radiation, Surveys and Questionnaires

1. Introduction

The discovery of X-rays by Wilhelm C. Roentgen on 8 November 1895 raised many hopes for application of this discovery in various fields of medicine. In the early period of radiation diagnostics, no one suspected that ionizing radiation, despite its indisputable advantages, might have adverse effects on living organisms. The pioneers of radiology were exposed to high doses of radiation, leading to various dermatoses, hematological disorders, cataract or cancer diseases.^[1, 2]

Ionising radiation from medical applications represents the majority of radiation doses from artificial sources to which the general population is exposed. This is the consequence of a steadily increasing demand for radiological examinations with particular reference to multidetector computed tomography (MDCT), which alone accounts for about 50 % of the overall medical radiation exposure.^[3]

Though this has been paralleled by a dramatic evolution of imaging technology over the last decade, it is often worsened by a lack of appropriateness and optimisation criteria by both referring physicians and radiological staff. As shown by several authors, this increasing use of medical radiation can be partly explained by the inaccurate and often inadequate knowledge among professionals about radiation protection issues and radiation doses of commonly performed imaging procedures. This may result in a potentially significant biological lifetime risk for patients.^[3-5]

The aim of this study was to assess awareness of radiation protection measures among various health care professionals.

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Material & Methods

A questionnaire survey consisting of 7 questions was conducted between april 2015 and july 2016 among 200 medical professionals working in various medical colleges. Ethical committee review was not required as the survey population did not include any risk.

The survey consisted of multiple choice questions regarding the profession and the knowledge of the basic principles of radiation protection being used in diagnostics and treatment. The objective of the survey questions was to verify the knowledge of the medical professionals regarding the various protective measures during radiation exposure and the doses of ionizing radiation received by the patients during the use of various imaging technique. The participants were also asked about their designation and working department, clinical experience and the frequency of exposure to X-ray radiation examinations and the department. The obtained results were subjected to statistical analysis.

Statistical analysis was performed by using software (SPSS version 17.0). Categorical variables were expressed as percentages, while all continuous variables were expressed as mean values. The participants were classified by their profession, their level of clinical experience and (3) their different levels of knowledge about radiation protections and were compared using the Kruskal-Wallis test. Post-hoc analysis was performed using pairwise Mann–Whitney tests with Bonferroni correction. Questionnaire reliability was assessed as internal consistency using Cronbach's alpha coefficient.

Results

The study population consisted of students 53%, followed by doctors 19% responders and radiographers technicians 18%. In addition, 10% auxiliary staff members were also included in the study.

Maximum doctors (55%) were with 5-10 years of experience, whereas the students were in their internship which was considered as 1 year clinical experience.

All the radiographers were in contact with the ionizing radiation several times a day whereas almost 35% of doctors were in contact of everyday radiation exposure. The students were least exposed to radiation.

Though all the three groups i.e.100% were aware about negative effect of radiation exposure, only 87% of doctors, 64% of radiographers and 43% of students were aware about the protective measures during the radiation exposure. Distance from the source of radiation was the most commonly practiced protective measure followed by the lead apron. Shields were least commonly used whereas the collimation of the radiation beam was known only to 2% of study population.

The last question regarding ionizing radiation doses employed in individual diagnostic methods posed the biggest problem to the participants. The highest percentage of incorrect answers 83% of the study population pertaining to the estimated number of single chest X-ray equivalents of abdominal and pelvic CT scans. The highest percentage of correct answers 68% of the study group pertaining to the exposure in patients subjected to ultrasound scans.

The highest percentage of correct answers was provided by doctors with 5 to10 years of experience. The highest percentage of incorrect answers was provided by students with 1 year of clinical experience. Responders employed at

radiology departments and emergency departments had the best knowledge of radiation protection measures.

Discussion

Foundation for better treatment is laid by correct diagnosis and appropriate treatment planning. Presently most of the diagnostic procedures are based on various forms of ionizing radiation. However there exists the risks of radiation exposure among the medical staffs who are constantly been exposed to it throughout their life. Thus it has been recommended for the medical staff to proceed in accordance with As Low As Reasonable Achievable (ALARA) principles which includes performing the scans with possibly lowest doses of ionizing radiation to obtain the desired diagnostic effect.^[2-4]

Available scientific literature lacks studies regarding the awareness of radiological protection issues in medical staff regardless of position is low. Thus this present study was taken up to evaluate the knowledge about radiation safety among medical professionals during diagnostic procedures.^[5-6]

The study group purposefully included non-physicians (i.e. nurses, medical technicians and auxiliary staff members). This was included because of frequent contact of these medical professionals with patients before and during procedures involving ionizing radiation. According to the original premises, the study group should also be diverse in terms of the place and the length of service.^[7]

The obtained results showed diverse interesting information on the knowledge, expertise and convictions of medical professionals as regards radiation protection. Good knowledge of the full spectrum of ionizing radiation effects among the employees of radiology departments is not surprising owing to their speciality course background. However it was noteworthy that relatively good awareness of radiological protection within emergency departments, regardless of position (physician, nurse, auxilliary staff) was noted. This could be attributed to the frequent contacts of these professionals with imaging diagnostics labs, resulting in better understanding of radiological procedures.^[8]

However it was quite astonishing to observe the low level of overall knowledge of radiography procedures among the nursing staff. It is particularly curious in the context of care they provide to hospitalized patients and to their active participation in preparation for scheduled imaging examinations.^[7,9,10]

Of note is the high percentage of correct answers to most questions in were doctors with 5-10 years of experience. This could be attributed to their wide clinical experience over the years.^[11-12]

It was quite disturbing to report that highest numbers of incorrect answers were by the students with 1 year of experience. This could be due to the low availability of radiological protection trainings and the reluctance towards changing professional habits among younger generation.^[13-15]

Radiation protection trainings are compulsory only in case of staff professionally exposed to radiation. The analysis revealed a varying level of knowledge on ionizing radiation among the study population. At the same time, it is interesting that the knowledge of the responders regarding the potential cancer outcomes of large doses of ionizing radiation was quite good, with correct answers being provided by 60% of responders. Unfortunately, this

knowledge seems to be acquired from media rather than trainings and specialist journals. ^[15, 16]

Conclusion

According to this survey conducted in various medical colleges about the awareness of radiation protection doctors with more clinical experiences had maximum knowledge regarding the protective measures.

To increase the awareness of the safety protocol and biological effects of radiation it is imperative to include exclusive elaborate courses and training program for the health professionals both during and after their education to stay updated with the advances.

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