Medical Science Journal for Advance Research

Copyright © The Author(s)
Vol. 4 , No. 3 , August 2023
e-ISSN: 2774-4892

Awareness Of Ionizing And Nonionizing Radiation And Their Effects In Medical Students

Ameena Ramzan[1],Taiba Zulfiqar[2], and Dr Abid Ali [3]

[1]*Student, The University Of Lahore, Gujrat Campus, Pakistan.*

[2]*Lecturer, The University Of Chenab Gujrat, Pakistan.*

[3]*Associate Professor, The University Of Chenab Gujrat, Pakistan.*

Email :- taiba.zulfiqar@rsmi.uol.edu.pk, taibazulfiqar1@gmail.com, 70058846@student.uol.edu.pk

ABSTRACT

Background: *The majority of patients are still anxious about exposure to radiation and the risks it poses to their health. A doctor is someone who can answer all of their patients' queries about radiation and make them happy. This competence may be acquired by medical students during their clinical rotation in the radiology department. The objective of this study is to test medical students' knowledge, risks, ambiguities, and assumptions about equipment that uses ionizing and non-ionizing radiation.* ***Methods:*** *A questionnaire was self-administered to medical students of a private university of Gujrat. One hundred students included in the study. Final year students who had completed their clinical rotation in the radiology department were included in the study. Also students of third year were also included. The obtained data was analyzed using statistical software.* ***Conclusion:*** *The majority of medical students in both years have little awareness of different features of radiation sources, the risks associated with them, and how to protect themselves from them specially student do not know about the early and late effects associated with radiations. For medical students studying radiography, better teaching techniques and programmes are essential.*

Key words: Radiology, Ionizing radiations, Non-ionizing radiation, medical students

Article Information

Received: June 28, 2023; Revised: July 31, 2023; Online: August , 2023

INTRODUCTION

The term 'radiation' refers to a wide range of different types of energy, the largest of which have been linked to human health issues[1]. A substantial number of individuals are concerned about the effects of low-level ionising radiation exposure[2]. They are also worried about the health risks linked with it, as well as their information about radiation, which influences their decision to have a medical operation and their contentment with the medical care professional[3].

Cassels gave a brief summary of some of the public's misconceptions about radiation and offered suggestions for improving public knowledge of radiation concerns. The media is active in raising public awareness of radiation concerns, although it is frequently overblown[4]. This leads to a number of misunderstandings, misunderstandings, and erroneous assumptions about the radiation dangers. According to studies, most individuals overestimate the hazard of occupational radiation while underestimating the risk of medical radiation[5, 6]. Furthermore, when it comes to treatments requiring contrast materials, the majority of the people prefer to know more before injecting the contrast

https://doi.org/10.46966/msjar.v4i3.144
This work is licensed under a Creative Commons Attribution 4.0 International License

medium[7]. One of a public healthcare professional's obligations is to convey firsthand knowledge to patients experiencing all radiological treatments and processes. The physician can respond to questions from the general public about radiation dangers.If their information is adequate and current, they may be trusted. Radiation-related information is taught in medical schools throughout undergraduate training. Physicians, on the other hand, severely overestimated the true risk of using medical imaging instruments and the radiation concerns that come with them[8, 9]. A study of medical students revealed an appropriate degree of radiation protection awareness[10]. Literature review has revealed that there is a lack of studies on aspects of radiation among medical students in Pakistan[11]. During their rotation at the radiology department, medical students learn the principles of radiology and how to interpret clinical radiodiagnostics. It would be impossible to give accurate information to a potential radiation receiver if medical students did not have sufficient and exact understanding of many elements of radiation[12]. According to studies, doctors have a poor understanding of the radiation doses associated with radiological scans requested and conducted in clinical practise. Clinicians' proper dose calculations in plain radiography, computed tomography (CT) scans, contrast media radiography, and mammography examinations are not suitable. The dosage supplied in above radiological exams is frequently underestimated by clinicians. Radiation protection courses and practical user education, including radiation safety during medical education programmes, might be an effective way to limit patient dosage in medical exposures. A high degree of radiation hazard awareness among doctors aids in the proper use of referral guidelines and dosage reduction for patients. Radiation can help patients by giving doctors with medical diagnoses, but the dose must be kept low enough to minimize the statistical chance of malignancies or sarcomas (stochastic effects) below an acceptable standard and the deterministic effect to a minimum (i.e., skin cataracts)[13]. The purpose of this study is to determine the degree of awareness among senior medical students on the danger of potential health risks linked with radiological equipment and procedures.

The study's goals were to:

- Examine medical students' understanding of ionizing and non-ionizing radiations, as well as their dangers.
- Determine the degree of awareness among medical students on the usage of ionizing and non-ionizing equipment.

MATERIAL AND METHODS

A cross-sectional study was conducted in one of the private university of Gujrat, Pakistan. A semi-structured questionnaire based on a previously conducted study was developed regarding different aspects of ionizing and non-ionizing radiation. Only those students who had completed their twenty-five days posting in the radiology department among the third and final years were included in the study. The questionnaire was self- administered to 53 and 47 students of the third and the final year medical students respectively. Three questionnaires with incomplete responses were rejected. Participants were given 32 questions to answer. The data obtained by the questionnaire was entered and were analyzed using statistical software SPSS version.

Copyright © The Author(s)

RESULTS

Table-1 shows responses given against eight questions by the respondents about various common aspects of ionizing and non-ionization radiation. There were 53(53%) students from third year and 47(47%) students from final year. Table 1 displays the descriptive statistical data as well as the 32 questions about general radiation knowledge and awareness of biological impacts that were asked of the participants. The mean of the correct answers to the questions is also shown in table.The percentage of correct answer is shown in Table-1:53 student of third year and 45 of final year identify the radiation-protection measures.14% of third year and 16 of final year students knows maximum annual dose limits for adult persons working with ionizing radiation.25 of third year and 16 of final year studetnts know about amount of radiation dose induced cataract.42 of third year and 32 of final year studetns knows MRI classified as non-ionizing radiation.51 of third year and 45 of final year studetns have an idea about ALARA(As low as reasonably achievable).only 20 of third year and 27 of final year students have knowledge about the biggest source of ionization.9 of third year and 4 of final year knows about most health risk caused by radiation exposure.4 of third year and 2 of final year studetns received any training in radiation protection when they get any of the diagnostic tests done.23 of third year and 27 of final year knows which beam of X-rays is more hazardous.45 of third year and 37 of final year know that X-rays cannot be performed without previous history.43 of third year and 42 of final year know human life time decreases by exposure in ionizing radiation.12 of third year and 15 of final year have knowledge that In case of pregnancy can X-ray /CT scan be performed in 3rd trimester. None of the student in third year and only 1 students in final year knows about after how many days dosimeter should be scanned.20 of the third year and 20 of the final year students knows about effects which can be seen in very short time after exposure.23 of third year and 20 of final year studetns knows about those effects which happen after a while. All the participant have an idea that there must be a law for radiation protection.8 of the third year and 9 of the final year knows about field of radiology shows maximum radiation exposure value on dosimeter. All the participants consider that there must be proper protection from radiations.50 of the third year and 47 of the final year students know about most susceptible tissue in ionizing radiation.26 of the third year and 30 of the final year students know about the part of body required more concerned about radiation hazards. All the participants know about lead material is used for radiation protection.22 of the third year and 21 of the students believe there are radiation hazard warning signs in their work area. None of the student from third year and only 1 students from final year about the radiation dose which causes fetal abnormality.4 of third and 3 of final year students know about stochastic effect of ionizing radiation.12 of the third year and 7 of the final year knows about deterministic effect of ionizing radiation. 32 of the third year and 23 of the final year knows about professionals is more likely to high radiation because of their jobs. All the participants have an idea that ultrasound have no any harmful effects. About 39 students from both years know that weight is an important factor for radiation exposure.34 of third year and 35 students from final year know how can scatter radiation be reduced.45 of third year and 42 of final year students know how to protect them from radiations.15 of the third year and only 12 of the final year studetns concerned about radiation dose emitted from medical imaging-test.

 Copyright © The Author(s)

Medical Science Journal for Advance Research

Copyright © The Author(s)
Vol. 4 , No. 3 , August 2023
e-ISSN: 2774-4892

Sr.no	Questions	Correct responses		Total=100
		Third year (n=53)	Final year (n=47)	
1.	Identify patient's radiation - protection measures you are aware of:	53	45	98
2.	The maximum annual dose limits for adult persons working with ionizing radiation is:	14	16	30
3.	Which amount of radiation dose induced cataract?	25	16	41
4.	Is MRI classified as non-ionizing radiation?	42	32	74
5.	Have you any idea about ALARA?	51	45	96
6.	What is biggest source of ionization in daily life?	20	27	47
7.	What is most health risk caused by radiation exposure?	9	4	13
8.	Have you received any training in radiation protection?	4	2	6
9.	Which beam of X-rays is more hazardous?	23	27	50
10.	Which one is more informative for diagnostic purpose?	0	3	3
11.	Can X-rays be performed without previous history?	45	37	82
12.	Is human life time decreases by exposure in ionizing radiation?	43	42	85
13.	In case of pregnancy can X-ray /CT scan be performed?	12	15	27

https://doi.org/10.46966/msjar.v4i3.144
This work is licensed under a Creative Commons Attribution 4.0 International License
Published by: READ INSTITUTE

14.	After how many days dosimeter should be scanned?	0	1	1
15.	Those effects which can be seen in very short time after exposure?	20	20	40
16.	Those effects which happen after a while?	23	22	43
17.	Is there any law applied for radiation protection?	53	47	100
18.	Which field of radiology shows maximum radiation exposure value on dosimeter?	8	9	17
19.	You believe to have any adequate preparation on radiation protection field?	53	47	100
20.	What is most susceptible tissue in ionizing radiation?	50	47	97
21.	Which part of body required more concerned about radiation hazards?	26	30	56
22.	Which material is used for radiation safety in department of radiology?	53	47	100
23.	Do you have radiation hazard warning signs in your work area?	22	21	43
24.	Fetal abnormality is seen when dose value exceeds?	0	1	1
25.	Which of the following is considered as stochastic effect of ionizing radiation?	4	3	7
26.	Which of following is considered as deterministic effect of ionizing radiation?	12	7	19
27.	Which of following professionals is more likely to high radiation because of their jobs?	32	23	55
28.	Does ultrasound have side effects?	53	47	100
29.	Is weight an important parameter that affect radiation dose?	39	39	78

Copyright © The Author(s)

30.	**How can scatter radiation be reduced?**	**34**	**35**	**69**
31.	**How can you protect yourself from radiation?**	**45**	**42**	**87**
32.	**How concerned are you about radiation dose emitted from medical imaging test?**	**15**	**12**	**27**

DISCUSSION

Everyone on the planet is exposed to ionizing radiation, with man-made sources accounting for around 18% of total exposure[14]. Medical X-rays and nuclear medicine account for just 15% of all radiation exposures, according to the US National Council on Radiation Protection and Measurements, therefore there is likely to be a danger to patients' health in investigations that include ionizing radiation[15]. Similarly, in the United Kingdom, an estimated 100-250 people die each year from malignancies caused by medical radiation exposure[16]. Although the use of radiation technology has resulted in great gains in patient diagnosis and treatment, there are side effects that vary depending on the kind and amount of radiation used, although some risk is considered to be acceptable[17]. A huge number of people, especially employees who are exposed to ionizing radiation on the job, are concerned about the effects of low-level ionizing radiation exposure[18-20]. Various investigations have shown that medical students, doctors, paramedics, and dentists have inadequate awareness about ionizing radiation[21]. The findings of this study were found to be similar to those of a Dutch study involving medical students, which revealed a lack of understanding of the radiation risks of in-hospital treatments; the majority of the students believed that items produce radiation following a radiological operation[13]. The current study clearly shows a difference in fourth and final year mean scores for ionizing and non-ionizing radiation, as well as the equipment used, which may influence their decision to use the equipment, as well as informing patients about the exposure, dose, and health risk associated with any imaging procedure. Although magnetic resonance imaging (MRI) and ultrasound do not constitute a radiation threat and may be used safely with proper safeguards, there is less debate about the radiation risk connected with medical imaging procedures such as bone scans[8]. Furthermore, medical or emergency professionals treating patients exposed to high amounts of radiation who follow adequate universal measures offer minimal health risk[22]. A health professional's lack of information might change the expected benefits relative to the risk involved, and thus influence medical judgments. As a result, this study underscores the need of all health care practitioners having current and relevant understanding of ionising and non-ionizing radiation. They must also address the emotional needs of patients in addition to presenting objective data[5]. Appropriate educational efforts, paired with excellent communication skills, correct judgement mistakes caused by insufficient or wrong information, resulting in better healthcare results[23]. Every professional should consider the importance of explaining the effects of radiation, as well as attempts to enhance fundamental radiation protection[24]. In order to successfully explain about radiation, health care practitioners need also comprehend its physics, chemistry, and biology[14]. They

Copyright © The Author(s)

should also be well-versed on the effects of radiation and the radiological modalities that semploy radiation. And a sufficient response should be given to each inquiry posed by patients. Furthermore, an effective medical education model would be beneficial in disseminating information to people who have little understanding of radiology and radio-diagnostics in order to build knowledge among students about radiation dangers and prevention[8].

CONCLUSION

Patient education regarding radiation and its consequences should be a part of health care providers' responsibilities. The majority of medical students, according to this survey, have little awareness of radiation sources, hazards, and protection. Most of them do not about about the effects like deterministic and stochastic effects of radiation. Medical students have misconceptions regarding exposure risk, which might have an impact on health-care decisions. It is necessary to include particular radiation objectives in the curriculum as well as during radiology ward rotations for medical students, in order to change community-wide attitudes and ideas about health. Also knowledge of radiation protection training should be so common so that patient should not get dose more than normal. More research is needed to emphasize the significance of radiation injury and its prevention.

REFERENCES

1. Bobrow, M., Radiation-induced disease. Ciba Found Symp, 1993. 175: p. 182-92; discussion 192-6.
2. Richardson, D.B. and S. Wing, Greater sensitivity to ionizing radiation at older age: follow-up of workers at Oak Ridge National Laboratory through 1990. Int J Epidemiol, 1999. 28(3): p. 428-36.
3. Cassels, B., Public perception of radiation issues. Radiation Protection in Australia, 1990. 8(1): p. 13-17.
4. Conway, J. Radiation Risk and the public perception. in Annual Scientific Meeting: Australian and New Zealand Society of Nuclear Medicine. 2003.
5. Dowd, S.B. and S.F. Hulse, A Selection of “Teaching Techniques” Columns Published in Radiologic Technology, 1988-1996.
6. Hammick, M., A. Tutt, and D. Tait, Knowledge and perception regarding radiotherapy and radiation in patients receiving radiotherapy: a qualitative study. European journal of cancer care, 1998. 7(2): p. 103-112.
7. Hopper, K.D., et al., Patients' attitudes toward informed consent for intravenous contrast media. Investigative radiology, 1992. 27(5): p. 362-366.
8. Finestone, A., et al., Do physicians correctly estimate radiation risks from medical imaging? Archives of Environmental Health: An International Journal, 2003. 58(1): p. 59-62.
9. Shiralkar, S., et al., Doctors' knowledge of radiation exposure: questionnaire study. Bmj, 2003. 327(7411): p. 371-372.
10. Adeyekun, A., A post rotation survey of medical students attitude to radiology. African journal of medicine and medical sciences, 2003. 32(4): p. 405-407.
11. Humayun, A. and M. Herbert, Special Communication.
12. Watanabe, M.E., Public perception of radiation: Using the press to your advantage. Teratology, 1999. 59(4): p. 316-317.
13. Almohiy, H., Knowledge and awareness of ionizing radiation risks

 Copyright © The Author(s)

among Saudi Obstetricians. Journal of Radiation Research and Applied Sciences, 2020. 13(1): p. 542-545.
14. Substances, A.f.T. and D. Registry, Ionizing radiation: An overview for the occupational health nurse. AAOHN Journal, 1997. 45(4): p. 170-183.
15. Schauer, D.A. and O.W. Linton, NCRP Report No. 160, Ionizing Radiation Exposure of the Population of the United States, medical exposure--are we doing less with more, and is there a role for health physicists? Health Phys, 2009. 97(1): p. 1-5.
16. Shiralkar, S., et al., Doctors' knowledge of radiation exposure: questionnaire study. Bmj, 2003. 327(7411): p. 371-2.
17. Berrington de González, A. and S. Darby, Risk of cancer from diagnostic X-rays: estimates for the UK and 14 other countries. Lancet, 2004. 363(9406): p. 345-51.
18. Beir, V., Health effects of exposure to low levels of ionizing radiation. Biological effects of ionizing radiations., 1990: p. 22-45.
19. Assessment, U.S.C.O.o.T., Complex cleanup: the environmental legacy of nuclear weapons production. Vol. 22. 1991: US Government Printing Office.
20. Runciman, W.A., Multiple Exposures: Chronicles of the Radiation Age by Catherine Caufield (University of Chicago Press, Chicago, 1990), pp. vi + 304, $USI5.95, ISBN 0-226-09785-4 (pbk). Prometheus, 1991. 9(2): p. 385-388.
21. Smith, N., Continuing education in radiation protection: assessment of a one-day course. British dental journal, 1991. 170(5): p. 186-188.
22. Veenema, T.G. and P.A. Karam, Radiation: Clinical responses to radiologic incidents and emergencies. AJN The American Journal of Nursing, 2003. 103(5): p. 32-40.
23. Maynard, D., On clinicians co-implicating recipients perspective in the delivery of bad news, in Talk at Work: Social Interaction in Institutional Settings. 1990, Cambridge University Press, Cambridge.
24. Sherer, M.A.S., et al., Radiation protection in medical radiography. 2013: Elsevier Health Sciences.

Copyright © The Author(s)