

## Awareness of hazards of radiation in patients visiting radiology department of Social Security Hospital, Islamabad, Pakistan

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**Objective:** To assess the knowledge and awareness about radiation among patients visiting our institution.

**Methodology:** This cross-sectional study was carried out at Social Security Hospital, Islamabad, Pakistan from June 2008 to November 2009. A questionnaire was used to collect data from 192 patients who came for radiological procedures.

**Results:** Out of 192 patients, 99 (51.6%) were female while 93 (48.4%) were male. The age ranged from 10 years to 70 years. 58.3% had first radiological procedure while 41.7% had more than once. 53.12% had some knowledge about radiation and 0.75% correctly answered that x-ray

examination involved ionizing radiation. 69% thought cancer as the major side effect of radiation. Males are slightly more informed as compared to the females (67% versus 45%) about the radiation.

**Conclusion:** This study shows that there is lack of awareness among the general public about radiation exposure and its side effects. (Rawal Med J 2014;39:372-375).

**Key words:** Radiation exposure, Nuclear medicine, harmful Biological effects, Imaging procedure, DNA damage, Knowledge about radiation hazards.

### INTRODUCTION

Humans are constantly exposed to radiation, which may be natural or man-made. Most important natural radiation source is radon and man-made radiation includes radiation involved in medicine, consumer and industrial products. Medical exposure of radiation is mainly from radiological and nuclear medicine procedures. It has been estimated that everyday around the globe 11 million diagnostic radiology procedures and about 100,000 nuclear medicine scans are being done. However, the rampant use of this man-made ionizing radiation is associated with potentially harmful biological effects. Depending upon amount of radiation exposure there is a spectrum of radiation induced cell damage starting from DNA damage or alteration to cell death in high doses. There is a large body of evidence about harmful effects of medical radiation exposures.<sup>5</sup> In the United Kingdom an estimated 250 people die annually as a result of cancer secondary to medical radiation exposure.<sup>6</sup> Published data have shown that not only general public is unaware of the hazards associated with the use of radiation but even many physicians have poor knowledge about the possible risks to the health of populations.<sup>10</sup> The aim of this study was to assess the

knowledge and awareness of hazards of radiation in patients visiting Social Security Hospital, Islamabad, Pakistan.

### METHODOLOGY

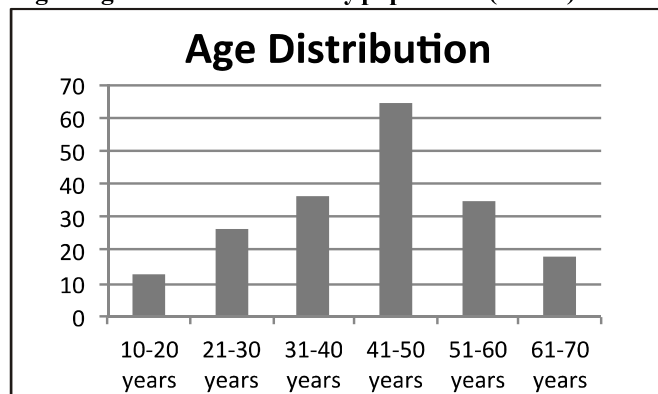
This cross-sectional study was carried out at Social Security Hospital, Islamabad, Pakistan from June 2008 to November 2009 and included 192 patients who came for radiological procedures as outpatient. Both male and female patients of ages 10-70 years were randomly selected. The patients were informed about the purpose of the study and a written consent obtained. A questionnaire, which was in Urdu, comprising of 2 sections was used for assessment of knowledge about radiation hazards. The section 1 contained the demographic information such as name, age, gender, occupation, education and socio economic status, while section 2 consisted of questions related to the patient's knowledge of radiation hazards. Questions were asked and the data collectors who were earlier trained in filling in the questionnaire entered data. The data were analyzed using SPSS version 15.

### RESULTS

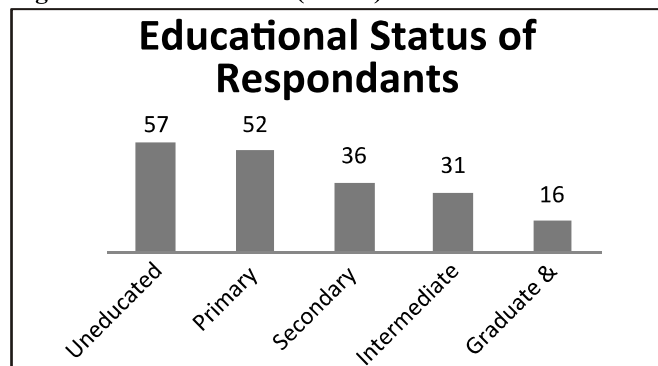
Out of 192 patients, 99 (51.6%) were female while

93 (48.4%) were male. The age ranged from 10 years to 70 years (Fig. 1). The response rate was 100%. 167 (87%) were married. 29.6% (N=57) were uneducated and 27.08% (N=52) had only primary education (Fig. 2).

**Fig. 1. Age distribution of study population (n=192).**

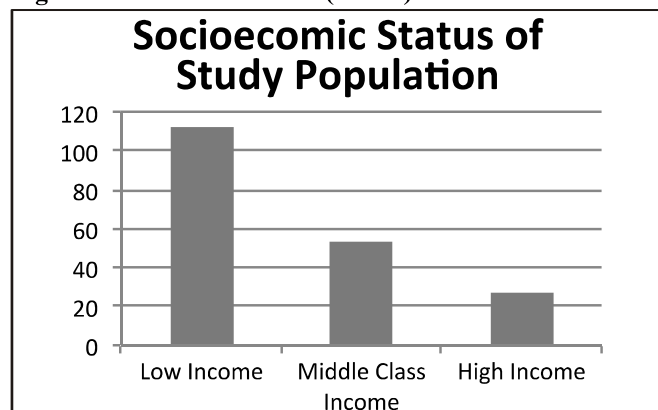


**Fig. 2. Educational status (n=192).**



58.3% (N=112) belonged to the poor or low-income class (Fig. 3). 58.3% (N=112) had first radiological procedure 41.7% (N=80) had more than once.

**Fig. 3. Socioeconomic status (n=192).**



53.12% (N=102) had some knowledge about radiation. 75% patients correctly answered that x-ray examination involved ionizing radiation. However, a similar percentage wrongly answered that ultrasonography uses ionizing radiation. 35.93% (N=69) knew that CT scan involved radiation however, 64.06% (N=123) were unaware of the basic fact that CT scanning involved radiation. Similarly, 60 (35%) patients knew that nuclear medicine procedures involved ionizing radiation. Only 23% knew that DEXA scanning and mammography also involved radiation. Surprisingly, 49% patients thought that MRI also involved ionizing radiation (Table 1).

**Table 1. Which of the following radiological examination uses ionizing radiation (can pick more than one).**

Modality	Number	Percentage
X-rays	145	75.52
Ultrasound	143	74.47
Nuclear Medicine	69	35.93
Mammography	45	23.43
DEXA Scan	42	21.87
CT Scanning	69	35.93
MRI	78	40.62

Regarding side effects of radiation, 69% chose cancer as the major side effect of ionizing radiation, followed by infertility, leukemia, skin lesions, cataract or gastric symptoms (Table 2).

75% considered ultrasound as having radiation still 62% chose this imaging modality safe in pregnancy, this was followed by CT, X-rays, mammography, DEXA, nuclear medicine and MRI (Table 3).

**Table 2. Which of the following can be side effect of ionizing radiation (can pick more than one).**

Side Effect	Number	Percentage
Cancer	132	68.75
Skin lesions	29	15.10
Cataract	14	07.29
Infertility	99	51.56
Leukemia	56	29.16
Fetal abnormalities (genetic mutations)	37	19.27
Vomiting and loose motions	12	06.25

**Table 3. Which of the following can be used safely in pregnant females (can pick more than one).**

Modality	Number	Percentage
Ultrasound	120	62.5
X-rays	59	30.72
CT	89	46.35
MRI	34	17.70
Nuclear Medicine	23	11.97
Mammography	56	29.16
DEXA	32	16.66

**Table 4. Knowledge about radiation.**

Male	Female
67.74 (N=63)	45.45 (N=45)
Higher education	Illiterate or low education status
53.19 (N=25)	38.62 (N=56)
First time having radiological procedure	Had multiple radiological procedures
41.25 (N=33)	50% (N=56)

Males were slightly well informed as compared to the females (67% versus 45%) about the radiation and its hazards (Table 4). It was noted that patients undergoing first radiological procedure are less informed as compared to those with more than one radiological procedure.

## DISCUSSION

When we compared knowledge about radiation hazards between both genders it was seen that males had more information about the radiation side effects as compared to the females. Our results are in contrast to a study, which showed no difference in knowledge of male, and female population.<sup>11</sup> One obvious reason for this difference is educational status. Male members of family usually communicate with clinicians keeping females unaware of useful information provided by the doctors. Difference of knowledge between genders was also noted by many other researchers.<sup>5,12-13</sup>

Education level was considered as the most important factor for preventing unnecessary radiological examinations not only among physicians but also among patients. In our study, also there was significant difference in knowledge about radiation in patient having higher education as compared to illiterate or patients having less than

secondary education (53 vs 31%). Level of education has been reported as a significant factor for determining knowledge about radiation hazards but it has been seen that even people with higher education without subject specific knowledge have inadequate information about radiation and its hazards.<sup>14</sup>

Patient having first radiological procedure in the department were 58.3 % (N=112) whereas 41.7% (N=80) patients were reporting to the department more than once. Comparing the status of knowledge of both groups, it was evident those patients having their first radiological examination were less aware of radiation hazards as compared to those who had more than one radiological procedure. Most likely cause of this difference was counseling by the radiology staff, which has increased the level of knowledge of patients repeatedly visiting radiology department. Studies have shown that even among medical professionals, the level of knowledge about radiation hazard is dismal.<sup>1,16</sup>

Our results are similar to the findings of previous studies and indicate a similar lack of knowledge among patients regarding the possible risks of radiological examinations, which was evident from the fact that about 75% patients thought that ultrasound involved ionizing radiation. Similarly, about 40% of patients had the false impression that MRI uses ionizing radiation. Knowledge about DEXA, mammography and CT scan was also very poor. Less than 30 % of study population knew about the radiation hazards involved in these procedures. These studies pointed out that even some medical doctors have misconception about ultrasound and MRI using ionizing radiation.<sup>17</sup>

Knowledge about the possible side effects of radiation was also very patchy. About 69% patients thought that exposure to radiation will cause cancer. The public misconception can be attributed to various factors like improper media coverage, misleading experiences and feedback. A recent survey conducted by the Office of Cancer Communications of the National Cancer Institute, 64% thought radiation was a significant cause of cancer.<sup>18</sup> Although some studies have quoted about 15-48% patients believing radiation as a cause of cancer, only about 1% of all cancer deaths may be

attributable to radiation exposure.<sup>9</sup> In addition, more than half of study population thought radiation as a cause of infertility. This is possibly because of misconception among non-radiology doctors who may pass or share this information with their patients.

## CONCLUSION

This study shows that there is lack of awareness among the general public about radiation exposure and its side effects. Public awareness programs are need of day to upgrade their existing knowledge about radiation.

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## REFERENCES

1. United Nations Scientific Committee on effects of Atomic Radiations (UNSCEAR) 2008 report to general assembly. Available at [http://www.unscear.org/unscear/en/publications/2008\\_1.html](http://www.unscear.org/unscear/en/publications/2008_1.html)
2. Scanff P, Donadieu J, Pirard P, Aubert B. Population exposure to ionizing radiation from medical examinations in France. *Brit J Radiol* 2008;81:204-13.
3. Goldberg Z, Schwietert CW, Lehnert B, Stern R, Nami I. Effects of low-dose ionizing radiation on gene expression in human skin biopsies. *Internat J Rad Oncol Biol Physics* 2004;58:567-74.
4. Arslanoğlu A, Bilgin S, Kubal Z, Ceyhan MN, İlhan MN, Maral I. Doctors' and intern doctors' knowledge about patients' ionizing radiation exposure doses during common radiological examinations. *Diagnostic and Interventional Radiology*, 2007, 13:5355.
5. Myles P, Evans S, Lophatananon A, Dimitropoulou P, Easton D, Key T, et al. Diagnostic radiation procedures and risk of prostate cancer. *Brit J Cancer* 2008; 98:1852-6.
6. Shiralkar S, Rennie A, Snow M, Galland RB, Lewis MH, Gower-Thomas K. Doctors' knowledge of radiation exposure: questionnaire study. *Brit Med J* 2003;327:371-372.
7. Rice HE. APSA Education Committee. Peer assessment of pediatric surgeons for potential risks of radiation exposure from computed tomography scans. *J Pediatr Surg* 2007;42:1157-64.
8. Lee CI, Haims AH, Monico EP, Brink JA, Forman HP. Diagnostic CT scans: assessment of patient, physician, and radiologist awareness of radiation dose and possible risks. *Radiology* 2004;231:393-8.
9. Thomas KE, Parnell-Parmley JE, Haidar S, Moineddin R, Charkot E, BenDavid G, et al. Assessment of radiation dose awareness among pediatricians. *Pediatr Radiol* 2006;36:823-32.
10. Soye JA, Paterson A. A survey of awareness of radiation dose among health professionals in Northern Ireland. *Brit J Radiol* 2008;81:725-9.
11. Yucel A, Karakas E, Bulbul E, Kocar I, Duman B, Onur A. Knowledge about Ionizing Radiation and Radiation Protection among patients awaiting radiological examinations: A cross-sectional survey, Kocatepe Tıp Dergisi, Cilt 10 No: 1-2-3, Ocak-Mayıs-Eylül 2009.
12. Tavakoli MR, Seilnian Toosi F, Saadatjou SA. Knowledge of medical students on hazards of ionizing radiation. *J Med Educ* 2003;3:3-6.
13. Hagi SK, Khafaji MA. Medical student's knowledge of ionizing radiation and radiation protection. *Saudi Med J* 2011;32:520-4.
14. Shah AS, Begum N, Nasreen S, Khan A. Assessment of radiation protection awareness Levels in medical radiation science Technologists-a pilot survey. *JPMI* 2007;21:169-72.
15. Margaret A, Briggs-Kamarl, Polycarp CO, Valentine B. Omubo-Pepple. Radiation Safety Awareness among patients and Radiographers in three Hospitals in Port Harcourt. *Am J Sci Ind Res* 2013;4:83-8.
16. Mubeen SM, Abbas Q, Nisar N. Knowledge about ionising and non-ionising radiation among medical students. *J Ayub Med Coll Abbottabad* 2008;20:118-21.
17. Zewdneh D, Dellie ST, Ayele T. A study of knowledge & awareness of medical doctors towards Radiation exposure risk at Tikur Anbessa specialized referral and teaching hospital, Addis Ababa, Ethiopia. *IOSR J Pharmacy Biol Sci* 2012;2:1-5.
18. Lee C. Diagnostic CT scans: assessment of patient, physician, and radiologist awareness of radiation dose and possible risks. *Radiology* 2004;231:393-8.