

# ASSESSMENT OF RADIATION PROTECTION AWARENESS LEVELS IN MEDICAL RADIATION SCIENCE TECHNOLOGISTS -A PILOT SURVEY

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## ABSTRACT

**Objectives:** To assess the radiation protection awareness levels of medical radiation technologists working in three major hospitals of Peshawar metropolitan.

**Material and Methods:** The authors developed two questionnaires along with curriculum vitae form for the radiographers and radiation technologists. The questionnaires contained questions pertaining to radiation protection practices, procedures, dose limits and existing national and international standards. They were asked to complete the questionnaires and the same were collected back on the spot. Forty one technologists were included in this pilot survey.

**Results:** The educational qualification of the 41 technologists in all the three specialities ranged from secondary school certificate to Master of Arts. The experience duration (mean  $\pm$  SD) of the sample group professional practice in medical radiation science (MRS) technology was  $15 \pm 8$  years, with duration ranging from 1-32 years. It was observed that the radiation awareness knowledge levels in the sample group varied widely with a range of 35-95% and a median score of 75%. It was observed that educational background and duration of experience in the medical radiation science profession affects the awareness levels.

**Conclusion:** The survey results revealed that there is a strong need for technologists training programme in all the three MRS specialities both at regional and national level. Moreover there is also a need for relevant educational background in science and introduction of personal qualities (PQA) tests for MRS technologists at the time of selection and recruitments.

**Key words:** Medical Radiation Science, Radiation Protection Standards, Radiation Protection Awareness.

## INTRODUCTION

The use of ionizing radiations in medicine is expanding rapidly due to the introduction of new ionizing radiation oriented diagnostic and therapeutic practices. The man made annual ionizing radiation exposure contribution to human population is 13%, of which medical exposure alone constitutes 12%.<sup>1, 2</sup> The expanding use of ionizing radiation and its significant contribution to the annual radiation doses to the population demands trained human resource in all spheres of its use, calibrated radiation apparatuses and radiation protection measures both at personnel and facility levels. The other aspect is the careful justification and optimization at various stages of its use in medicine, in order to minimize radiation

doses to patients and workers. The three medical specialties contributing to the annual radiation doses are diagnostic radiology, radiotherapy and nuclear medicine which are collectively termed as *Medical Radiation Science* (MRS). Each speciality requires its respective professionals like radiologists, radiation oncologists, nuclear physicians, medical physicists, radiographers and radiation technologists to possess a high degree of understanding and competence in various domains of their respective specialities. The radiographers and radiation technologists are vital for providing quality diagnostic and therapeutic services to the patients as they are directly responsible for radiation exposure in diagnostic imaging or radiation dose delivery to the patients in radiation therapy.

### ACADEMIC QUALIFICATION VS MEAN SCORE

Academic Qualification	Frequency (n=41)	Mean Score (%)
SSC	12 (29.3%)	70
SSC with Certificate from Medical faculty	06 (14.6%)	74
HSSC	08 (19.5%)	76
HSSC with Certificate from Medical faculty	05 (12.2%)	78
BSc.	07 (17.1%)	80
MA	03 (7.3%)	67

SSC -Secondary School Certificate, HSSC Higher secondary school certificate, BA- Bachelor of Arts, BSc- Bachelor of Science, MA- Master of Arts.

Table 1

In developed countries a set of personal qualities assessment (PQA) tests have been developed for various professions. These tests measure cognitive ability, personal traits and moral/ ethical reasoning before joining a particular profession.<sup>3-7</sup> In Pakistan such personal quality assessment tests are seldom conducted for the radiation technologists at the time of recruitment. The most important aspect in medical radiation science is the understanding of safe use of ionizing radiation, associated radiation hazards and their consequences on the final outcome in diagnosis and treatment. The new professional, legal and regularity obligation of *Pakistan Nuclear Regularity Authority* (PNRA) demand stringent radiation protection measures and development of relevant expertise in radiation oriented applications in medicine from the licensee.<sup>8-12</sup> The present pilot survey was conducted to assess the level of radiation protection awareness of the radiographers and radiation technologists working in the three major hospitals of Peshawar metropolitan.

### MATERIAL AND METHODS

This questionnaire based awareness survey was conducted from May 2006 to September 2006. A total of forty one MRS technologists working in the three hospitals of the Peshawar metropolitan were included in this pilot survey. The hospital names were coded as the survey was intended to assess purely a technical aspect. The inclusion criteria being, all the radiation technologists and radiographers involved in radiation oriented practices in diagnostic radiology, radiation therapy and nuclear medicine. The exclusion criterion was the experience in the relevant field less than one year. The authors developed two questionnaires along with curriculum vitae form for the radiographers and radiation technologists. They were asked to complete the questionnaires and the same were collected back on the spot.

### OVER ALL SURVEY SCORE (PERCENT)

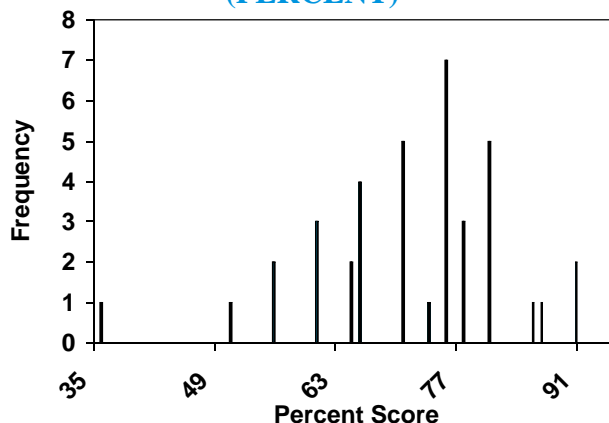


Fig.1

The questionnaires contained objective questions pertaining to the following categories.

- ! On job radiation protection training.
- ! Knowledge of ionizing radiation hazards.
- ! Awareness of radiation dose limits.
- ! Use of personal dosimeters.
- ! Sense of ethics.
- ! Knowledge of radiation machines.

The additional information regarding the radiation protection facilities were collected from the concerned senior radiologists by interviews.

### RESULTS

The educational qualification of the technologists in all the three specialities ranged from secondary school certificate to Master of Arts (table-1). On the whole only 30% technologists had certificates from provincial medical faculty. Out of 41 technologists, 12 (29.3%) had secondary school certificates (SSC) only, 06 (14.6%) had SSC with Certificate from Medical faculty, 08 (19.5%) had higher secondary school certificates (HSSC), 05 (12.2%) had HSSC with Certificate from Medical faculty, 07 (17.1%) had B Sc and 03 (7.3%) were having master degrees in regional language. The range and normal distribution of the overall scores is shown in Figure 1. It was observed there are widely different radiation awareness knowledge levels in the sample group with a range 35-95% and median score of 75%. The data analysis of academic qualifications versus percent mean percent score revealed that the sample group with SSC had score 70 %, SSC with certificate from medical faculty 74 %, HSSC 76 %, HSSC with certificate from medical faculty 78 %, BSc 80 % and MA 67% Table-1.

The experience duration (mean ± SD) of the sample group professional practice in MRS technology was found to be 15 ± 8 years, with duration ranging from 1-32 years.

## EXPERIENCE VS PERCENT SCORE

Experience Duration (Years)	Frequency (n=41)	% Score
1-5	03(7.3%)	65
6-10	06 (14.6%)	74
11-15	12 (29.3)	68
16-20	06 (14.6%)	88
21-25	07 (17.1%)	73
26-32	07 (17.1%)	70

Table 2

Moreover the survey results reveal that only one hospital is a licensee of national regularity body (PNRA) and except for that hospital there were no personnel monitoring programme for the radiation workers and quality control activities (Table-3).

## REGULARITY COMPLIANCE

Hospital	PNRA Licensee	Quality Control Activities	Personal Monitoring
A	Yes	Yes	Yes
B	No	No	No
C	No	No	No

Table 3

## DISCUSSION

The results of this survey indicate that the educational qualifications and training in the respective specialities of MRS technologists is essential for reliable diagnostic and therapeutic outcome from ionizing radiations usage in medicine. On job training of irrelevant educational background technologists is often cumbersome. In radiotherapy and nuclear medicine all the MRS technologists had on job training as presently there is no specialized national training course in the country for the technologists in these two specialities. The repetition or retakes of the procedures due to personnels in-competencies, lack of quality assurance activities or substandard equipment performance can result in unnecessary exposure not only to the patients but workers as well and at the same time loss of valuable resources. The PNRA regulations require awareness of the MRS personnel's about radiation protection practices, standards and guidance levels.<sup>9-11</sup> The continuing professional development (CPD) with regards to radiation protection practices is necessary to create awareness amongst the MRS technologists as the awareness is the first step before adoption, compliance and adherence to national regularity frame work.<sup>10-12</sup> The CPD of the MRS technologists here in Pakistan also needs mandatory changes following the introduction of new diagnostic and therapeutic modalities in medical use of ionizing radiations. In developed

countries CPD programme for the radiographers and radiation technologists also include clinical audit, risk management and research domains.<sup>13</sup> The data analysis of academic qualifications versus percent mean score revealed that the sample group with BSc degree and HSSC with certificate from provincial medical faculty had a higher score as compared to the other educational groups (Table-1). It was observed that sample group with science background had better radiation protection awareness levels than the others, indicating that relevant educational background has a definite role in the understanding of ionizing radiation oriented practices and associated awareness. It was further observed that the score of 16-20 years experience duration group was 88% which was higher than the all other groups. In the other five groups percent score ranged from 65 - 74% (Table-2). The probable causes for the decline in percent score in the higher experience groups appears to be due to the lack of interest with passing years, tardiness and other age related factors. In context of regularity requirements, the results of this survey indicate that all the public sector hospitals and clinics using ionizing radiation apparatuses and radioactive materials need to registered and licensed under the PNRA registration and licensing framework.

## CONCLUSION:

The survey results reveal that there is a strong need for technologists training programme in all the three MRS specialities both at regional and national level. The other aspect is the need for relevant educational background in science and introduction of PQA test for MRS technologists at the time of selection and recruitments.

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