

RADIATION AWARENESS AMONGST RADIATION WORKERS IN DIAGNOSTIC RADIOLOGY DEPARTMENT OF A PUBLIC SECTOR HOSPITAL IN KHYBERPAKHTUNKHWA

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ABSTRACT

OBJECTIVE: To determine the level of improvement amongst radiation workers of both sexes regarding knowledge of ionizing radiations and principles of radiation protection both for staff and patient's while performing routine diagnostic procedures after attending a dedicated refresher course of one (01) month on Radiation awareness and protection. **MATERIALS & METHOD:** Forty six (46) radiation workers (38 male and 08 female) out a total 60 radiation workers participated in this refresher course and have filled the pre and post Performa on basics of ionizing radiations, cellular interaction /radio-biology, biological effects of ionizing radiations, radiation protection principles and strategies to minimize patient dose which lasts for one month. The participants were asked to fill a questionnaire comprising twenty questions before starting the sessions to know their existing knowledge. Course materials prepared accordingly and the same Performa was filled from the participants after the sessions to find out the improvement after attending the course. **RESULTS:** Mean scores of all radiation workers in pre-sessions assessment was 39.35% which improved to 61.95% after attending the dedicated course designed with a mean difference of 22.6% ($p < 0.0000001$). The female radiation workers awareness level improvement was higher (pre: 36.25%, post: 59.38%) than male workers (pre: 40.0%, post: 62.5%). The workers having intermediate and higher qualification did better (pre: 38.42%, post: 61.45%) than the ones who have only metric (pre: 43.75%, post: 64.38%) and workers having relevant diploma in radiology scored (pre: 42.86%, post: 65.48%) than the workers who haven't got diploma (pre: 37.0%, post: 59.0%). **CONCLUSION:** The knowledge about basics of ionizing radiations and protection of both staff & patients before the sessions was not satisfactory as it should be. An improvement was found amongst the radiation workers about their knowledge and understanding after attending the dedicated course on radiation awareness designed according to their needs. The awareness amongst radiation workers can be improved by consistently conducting such sessions on radiation protection and updating them time to time about the new developments and researches in their field to boost their skills and it can be achieved with the coordination & cooperation of hospital & regulatory bodies and through concurrent efforts and planning.

Introduction

Ionizing radiation are playing a pivotal role both in the diagnosis and treatment of various diseases since its discovery by Wilhelm Roentgen on November

08th, 1895 and have revolutionalized the modern era of medicine with greater degree of precision and accuracy. At the same time we are aware of the detrimental effects of ionizing radiations if they are

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not used judiciously and without applying basic radiation safety principles.

Diagnostic radiology within a facility plays significant role in the diagnosis and in the treatment phase. Today highly sophisticated, state of the art diagnostic radiation emitting equipments well versed with modern technologies are being employed for accurate diagnosis and treatment of various diseases. Gamma camera, CT scanners and C-arms and Fluoroscopy, General radiology X-ray machines and Mammography machines uses ionizing radiations which are beneficial in the context of the patient if used judiciously and in-accordance with ALARA Principle but at the same time they pose threats specially cancer risk and genetic abnormalities to the staff working with ionizing radiations if appropriate radiation safety measurements are not taken accordingly.

As radiation workers are working in close proximity with ionizing radiations, so the risk of any effect is always there to occur. In order to ensure their safety, they should be well trained in their field through a dedicated course work with frequent awareness sessions to groom their skills regarding radiation safety.

The knowledge about radiation is the common shared problems faced in today's world and is the basic reason behind the possible effects of radiation incurred among radiation workers working in medical facilities. Staff working with ionizing radiations are not fully aware of the basics knowledge about radiations and protection rules & strategies which should be considered while working in radiation areas to ensure safety. The International Atomic Energy Agency (IAEA) and other professional societies while nationally PNRA also stresses on the need of justification-optimization policy and to keep ALARA principle in-front to limit the risk of ionizing radiation to staff working with these ionizing radiations in medical facilities. The awareness about radiation protection through awareness sessions & refresher courses plays an active role towards the improvements of the skills and knowledge of radiation workers and also helps to reduce the risks from ionizing radiations simultaneously.

The basic purpose of this study was to determine the level of improvement noticed amongst radiation workers of both sexes regarding knowledge of ionizing radiation and principles of radiation protection while

performing routine diagnostic procedures after attending a dedicated refresher course of one month on radiation awareness and protection which was designed in-accordance with the weak areas noticed in the pre-session evaluation. The evaluation was taken from the radiation workers by filling a questionnaire comprising basics questions about ionizing radiations and radiation protection before and after the course to find out the improvement noticed after conductance of the refresher course/awareness sessions.

Methodology

This cross-sectional prospective study was conducted in the department of Radiology, Lady Reading Hospital, Peshawar KPK after conducting one month dedicated radiation awareness session from 01st Aug 2017 to 01st Sept, 2017 for the radiation workers working within Radiology department to find out the level of improvement after conductance of the refresher course. Among a total of sixty (60) radiation workers, 46 workers out of which 38 (82.6%) were male technicians and 08 (22.4%) were female technicians who participated in the one month awareness session and filled the pre and post Performa.

To find out the level of improvement among the radiation workers who attended this course, a standardized Performa was designed comprising basic questions related to basics of ionizing radiations, interactions of ionizing radiation with human body, biological effects of radiations and protection against these ionizing radiations. The data collected after filling the pre session Performa and post session Performa was analyzed using latest SPSS version. Two-sample independent t test was applied in order to find out the statistical difference between pre and post session scores. The overall value for statistical significance was $p < 0.05$.

Results

Total 46 radiation workers (38 male technical staff while 08 female technical staff) participated and the correct answer in the pre sessions was $39.35\% \pm 2.65$. The overall correct answers after the post ses-

sions was 61.96% ± 2.92 with a mean difference between pre and post session of 22.61% with two sided confidence interval (CI) 95% (P<0.0000001)

Input Data						
Two Sided confidence interval 95 %						
	Sample Size	Mean	Std. Dev.			
Group-1	46	7.87	2.65			
Group-2	46	12.39	2.92			
Result	t-Statistics	df	p-value ¹	Mean Diff	Lower Limit	Upper Limit
Equal Variance	-7.77441	90	<0.0000001	-4.52	-5.67504	-3.36496
Un equal Variance	-7.77441	89	<0.0000001	-4.52	-5.67521	-3.36479

Table 1: Comparative analysis of pre and post session evaluation (Two sample independent t-test)

The gender cohort shows that male technical staff scored 40% ± 2.69 in the pre-session assessment while in the post session their score was 62.5% ± 2.66 with a mean difference in pre-post sessions of 22.5% as compared to female technical staff who scored 36.25% ± 2.38 in the pre-session while scored 59.38 ± 1.77 in the post session assessment with mean difference in post-pre sessions of 23.13% at 95% CI (p< 0.00001) respectively.

Subject	Pre-session Evaluation (%mean ± SD)	Post-session Evaluation (%mean ± SD)	Mean % difference Post - Pre Evaluation (95%CI)
Male Technical staff n=38	40 ± 2.69	62.5 ± 2.66	22.5 (62.5 - 40.0)
Female Technical staff n=08	36.25 ± 2.38	59.38 ± 1.77	23.13 (59.38 - 36.25)

Table 2: Comparative analysis of pre and post session evaluation of male and female technical staff

The educational cohort shows that technical staff having inter or higher qualifications scored 38.42% ± 2.65 in the pre- session assessment while in the post session their score was 61.45% ± 3.00 with a mean difference in pre-post sessions of 23.03% as compared to technical staff who have only metric qualification scored 43.75 ± 2.49 in the pre-session while scored 64.38 ± 1.11 in the post session assess-

Subject	Pre-session Evaluation (%mean ± SD)	Post-session Evaluation (%mean ± SD)	Mean % difference Post - Pre Evaluation (95%CI)
Technical staff having inter/ higher qualifications n=38	38.42 ± 2.65	61.45 ± 3.00	23.03 (61.45 - 38.42)
Technical staff having SSC n=08	43.75 ± 2.49	64.38 ± 1.11	20.63 (64.38 - 43.75)

Table 3: Comparative analysis of technical staff on the basis of educational qualifications in the pre and post session evaluation

ment with mean difference in post-pre sessions of 20.63% at 95% CI (p< 0.00001) respectively.

The diploma cohort shows that technical staff having diploma in radiography scored 42.86% ± 2.92 in the pre- session assessment while in the post session their score was 65.48% ± 3.28 with a mean difference in pre-post sessions of 22.62% as compared to technical staff who don't have diploma in radiography scored 37.0% ± 2.30 in the pre-session while scored 59.0% ± 2.42 in the post session assessment with mean difference in post-pre sessions of 22% at 95% CI (p< 0.00001)respectively.

Subject	Pre-session Evaluation (%mean ± SD)	Post-session Evaluation (%mean ± SD)	Mean % difference Post - Pre Evaluation (95%CI)
Technical staff having diploma in Radiography n=21	42.86 ± 2.92	65.48 ± 3.28	22.62 (65.48 - 42.86)
Technical staff not having diploma in Radiography n=25	37.00 ± 2.30	59.00 ± 2.42	22.00 (59.0 - 37.0)

Table 4: Comparative analysis of technical staff on the basis of relevant diploma in radiography in the pre and post session evaluation

Discussion

Our study reflects a poor score in terms of radiation awareness regarding basics of ionizing radiations, their interaction and biological effects on human body and protection of self and patients from the harmful effects of these ionizing radiations among the technical staffs working in radiology in the pre session evaluation while some improvement was noted among the technical workers after the post session evaluation. The pre session evaluation of technical staff shows that due to lack of continuous education and refresher courses the knowledge is weak regarding radiation protection while after one month dedicated course attendance, their knowledge increased somehow. Thus continuous medical and technical education is of utmost importance in the knowledge gaining of the technical staff irrespective of their gender as almost an equal improvement was noticed in the knowledge level of both sexes.

However, the pre-session score of staff having qualification of metric was somehow high than the technical staff having qualification of intermediate or higher. The basic reason of this is that the former technical staff have got an overall experience of radio-

graphy more than twenty years as compared to the ones who have higher academic qualification. While in the post session evaluation, the latter group scored high than the former, as they have got higher education and find it easy to understand terms and parameters regarding radiation protection and their practical implementations while the staff having only metric find it hard to understand things quite easily as their age is more as compared to the other group which is again a factor which contributed to a lower score in their post session evaluation.

One important aspect of our study was to find out the importance of relevant diploma in radiography on the knowledge of technical staff. This cohort shows that the technical staff having relevant diploma in radiography scored higher than the technical staff not having relevant diploma in radiography both in pre and post session evaluations. This reflects that technical staff should be trained according to their nature of their work to boost their knowledge both theoretically and practically, so that they can have good knowledge about their field as their syllabus is designed according to the present day needs and can use their knowledge in a better way to ensure safe radiation practice during routine working hours. However, the scores of diploma holders is not significantly high as compared to non diploma holders, this shows that the institutions which are offering diploma in relevant field have severe flaws in their syllabus and technical training, which needs immediate attention of those institutions to work on the preparation and implementation of updated and revised curriculum containing all aspects of technical training of technical staff.


Conclusion

The study shows that there is lack of knowledge among technical staffs whether they have higher qualification or less, relevant diploma or not according to the level of basic and relevant education. This problem can be improved by continuing technical training of the staff through awareness sessions and refresher courses. The institutions and regulatory bodies should ensure technical training and education of the technical staff and to enhance their knowledge

and modern trends and techniques in ensuring safe radiation practice within their working areas complying national and international radiation safety guidelines and principles. This is a shared responsibility of all stakeholders associated with ionizing radiations and together we can achieve the common goals of safe culture regarding radiation practice in our facility.

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