A questionnaire survey on radiation protection among medical staff working in cardiac catheterization laboratory

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1. Background and Goal of the present work

It is essential for cardiologist, technologists, and nurses working in cardiac catheterization laboratory to understand radiation protection. However, protective equipment usage is still low, wearing dosimeters also very low and there is little awareness of radiation protection in practice. The objective of this research work is to assess the awareness and knowledge of medical stuff working in cardiac catheterization laboratory of occupational radiation protection tools and detect areas of defects in their knowledge.

2. Materials and Method:

2.1. We conducted a questionnaire survey on radiation exposure protection: among workers in the cardiac catheterization laboratory and collected responses from September 2021 to December 2021.

- The questionnaire, which had been validated in advance to perform a prospective observational study, consisted of 10 questions in a multiple-choice format and was divided into three parts: background, equipment, and knowledge. The details of the questionnaire details are shown in Table1.
- Briefly, questions 1–4 regard the background of each person. Questions 5–8 asked about the proper equipment for radiation protection. Questions 9 and 10 focused on knowledge of radiation exposure and protection.

Question	Answer
1. What is your gender? 2. How old are you? 3. What is your job title?	a) Female, b) Male ……years. a) medical doctor, b) Nurse, c) Technologist
4. How many years of career experience do you have?	a) 1–5, b) 6–10, c) 11–15, d) 16–20, e) Over 21 years
5. Do you always wear a lead apron? 6. Do you always wear a thyroid collar?	a) Yes, b) No a) Yes, b) No.
7. Do you always wear lead glasses?	a) Yes, b) No
8. Do you always wear a radiation dosimeter? 9. Do you know how much radiation dose you are exposed to in each procedure under fluoroscopy?	a) Yes, b) No11. a) Yes, b) No
10. Have you ever attended a basic lecture on radiation exposure?	a) Yes, b) No

Table (1). Questionnaire questions and answers.

3. Results:

3.1. Statistical analysis:

- The categorical variables are expressed as the number in each category or the frequency and were compared using the chi-square test. A p-value of 0.05 was considered to indicate statistical significance. All statistical analyses were performed with SPSS software 20.

3.2. Responses to the questionnaire:

- As regard the part of the questioner about background of each person, there were 137 (76.1%) males. Mean + SD is 40.11 + 9.74. Cardiologist Doctors were the most common occupation 103 (57.2%), nurses 53 (29.4%) and technician were 24 (13.3%).
- Regarding years of experience, 23 (12.8%) had 1–5 years, 37 (20.6%) had 6-10 years, 40 (22.2%) had 11-15 years, 29 (16.1%) had 16 –20 years and 51 (28.3%) over 20 years of experience, respectively.
- Regarding proper equipment usage for radiation protection figure (1) shows all received answers.
- Thirty-three subjects (18.3%) were aware of the radiation dose of each procedure, 46 subjects (25.6%) had attended courses on radiation protection.

3.3. Differences according to job title:

- The rates of wearing a lead apron among cardiology doctors, nurses, and technologists, the rates of wearing a thyroid collar, the rates of wearing lead glasses and the rates of wearing radiation dosimeters were all presented in figures 2, 3, 4 and 5.
- Cardiologists were significantly more likely to wear dosimeters than the other medical workers (p<0.0001).

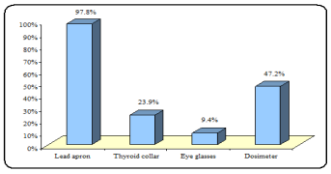

Figure (2): Study group characteristic regarding usage of radiation protection equipment.

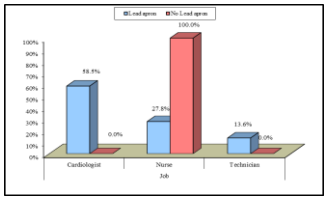

Figure (2). Relationship between job title and wearing lead apron.

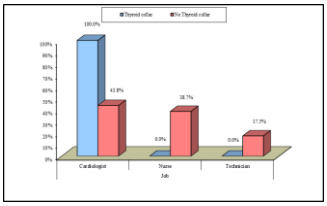

Figure (3). Relationship between job title and wearing thyroid collar.

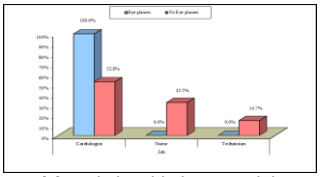

Figure (4). Relationship between job title and wearing lead glasses.

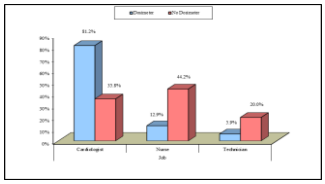

Figure (5): Relationship between job title and wearing dosimeter.

3.4. *Factors affecting questionnaire answers:*

- Use of equipment for radiation protection, including a lead apron, a thyroid collar, lead glasses, and a radiation dosimeter differ significantly based on job title.

- As regard attendance at basic lectures on radiation protection: we found that only 46 (25.6%) attending those courses, and attendance of basic courses didn't affect medical staff attitude toward wearing protective radiation equipment's (lead apron, lead glasses, thyroid collar and dosimeter), however awareness of the radiation exposure dose of the procedure made them wore dosimeters significantly more than those who were not (p=0.005) and wore lead apron significantly more than who were not (p=0.000).

- We found significant relation between experience and wearing dosimeters, highly significant relation between it and wearing lead apron, however experience didn't significantly relate to wearing lead glasses or thyroid collar. tables 2,3,4 and 5.

		Lead apron		Test value	P-value	Sig.
		Yes	No			
		No.= 170	No.= 4			
Gender	Male	137 (77.8%)	0 (0.0%)	13.034	0.000	HS
	Female	39 (22.2%)	4 (100.0%)			
Age	Mean±SD	40.35 ±9.71	29.50 ±1.73	2.228	0.027	S
	Range	23 –60	27 –31			
Job	Cardiologist	103 (58.5%)	0 (0.0%)	9.803	0.007	HS
	Nurse	49 (27.8%)	4 (100.0%)			
	Technician	24 (13.6%)	0 (0.0%)			
Experience	1-5	23 (13.1%)	0 (0.0%)	15.811	0.003	HS
	6-10	33 (18.8%)	4 (100.0%)			
	11-15	40 (22.7%)	0 (0.0%)			
	16 - 20	29 (16.5%)	0 (0.0%)			
	More than 20	51 (29.0%)	0 (0.0%)			
Procedure radiation dose	Yes	33 (18.8%)	0 (0.0%)	0.918	0.338	NS
	No	143 (81.2%)	4 (100.0%)			
Attend course	Yes	45 (25.6%)	1 (25.0%)	0.001	0.979	NS
	No	131 (74.4%)	3 (75.0%)			

Table (2). Wearing lead apron.

		Thyroid collar		Test value	P-value	Sig.
		Yes	No			
		No.= 45	No.= 137			
Gender	Male	35 (81.4%)	102 (76.5%)	0.668*	0.352	NS
	Female	8 (18.6%)	35 (25.5%)			
Age	Mean±SD	41.02 ±9.10	39.92 ±9.95	0.703*	0.483	NS
	Range	26 –59	23 –60			
Job	Cardiologist	43 (100.0%)	60 (43.8%)	42.215*	0.000	HS
	Nurse	0 (0.0%)	53 (38.7%)			
	Technician	0 (0.0%)	24 (17.5%)			
Experience	1-5	8 (18.6%)	15 (10.9%)	6.253*	0.181	NS
	6-10	8 (18.6%)	29 (21.2%)			
	11-15	5 (11.6%)	35 (25.5%)			
	16 - 20	10 (23.3%)	19 (13.9%)			
	More than 20	12 (27.9%)	39 (28.5%)			
Procedure radiation dose	Yes	12 (27.9%)	21 (15.3%)	3.458*	0.063	NS
	No	31 (72.1%)	116 (84.7%)			
Attend course	Yes	12 (27.9%)	34 (24.8%)	0.164*	0.685	NS
	No	31 (72.1%)	103 (75.2%)			

Table (3). Wearing thyroid collar.

		Lead glasses		Test value	P-value	Sig.
		Yes	No			
		No.= 17	No.= 163			
Gender	Male	13 (76.5%)	124 (76.1%)	0.001*	0.971	NS
	Female	4 (23.5%)	39 (23.9%)			
Age	Mean±SD	40.47 ±8.92	40.07 ±9.85	0.159*	0.874	NS
	Range	29 –54	23 –60			
Job	Cardiologist	17 (100.0%)	86 (52.8%)	14.014*	0.001	HS
	Nurse	0 (0.0%)	53 (32.5%)			
	Technician	0 (0.0%)	24 (14.7%)			
Experience	1-5	4 (23.5%)	19 (11.7%)	4.101*	0.393	NS
	6-10	4 (23.5%)	33 (20.2%)			
	11-15	2 (11.8%)	38 (23.3%)			
	16 - 20	4 (23.5%)	25 (15.3%)			
	More than 20	3 (17.6%)	48 (29.4%)			
Procedure radiation dose	Yes	11 (64.7%)	35 (21.5%)	15.125*	0.000	HS
	No	6 (35.3%)	128 (78.5%)			
Attend course	Yes	4 (23.5%)	29 (17.8%)	0.339*	0.561	NS
	No	13 (76.5%)	134 (82.2%)			

Table (4). Wearing lead glasses.

		Dosimeter		Test value	P-value	Sig.
		Yes	No			
		No.= 86	No.= 96			
Gender	Male	73 (85.9%)	64 (67.4%)	8.457*	0.004	HS
	Female	12 (14.1%)	31 (32.6%)			
Age	Mean±SD	41.67 ± 8.79	38.72 ± 10.37	2.050*	0.042	S
	Range	25 – 60	23 – 59			
Job	Cardiologist	60 (81.2%)	39 (35.4%)	37.753*	0.000	HS
	Nurse	11 (12.9%)	42 (44.2%)			
	Technician	5 (5.9%)	19 (20.0%)			
Experience	1-5	9 (10.6%)	14 (14.7%)	13.071*	0.011	S
	6-10	11 (12.9%)	26 (27.4%)			
	11-15	21 (24.7%)	19 (20.0%)			
	16 - 20	21 (24.7%)	8 (8.4%)			
	More than 20	23 (27.1%)	28 (29.5%)			
Knowing Procedure radiation dose	Yes	30 (35.3%)	36 (36.8%)	8.029*	0.004	HS
	No	55 (64.7%)	59 (63.2%)			
Attend course	Yes	20 (23.5%)	13 (13.7%)	2.904*	0.088	NS
	No	65 (76.5%)	82 (86.3%)			

Table (5). Wearing dosimeter.

4. Conclusions

- In conclusion, this nationwide multicentre questionnaire survey of 180 medical staff of the cardiac catheterization labs. showed the status of protective equipment usage, awareness, and education. At present, the low rate of dosimeter wearing among cath. Lab. Medical staff is a major problem, Continuing education can solve these problems, and cardiologists, nurses and technicians must be aware of the importance of radiation protection to protect both patients and staff.