Salud, Ciencia y Tecnología - Serie de Conferencias. 2025; 4:1585
doi: 10.56294/sctconf20251585

ORIGINAL

Efficacy of an Educational Program Based Intervention in Improving Nurses' knowledge Toward Radiation Protection Measures: A Randomized Controlled Trails

Eficacia de una intervención basada en un programa educativo para mejorar el conocimiento de las enfermeras sobre medidas de protección radiológica: un ensayo controlado aleatorio

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Cite as: Ali Wahab M, Muwfaq Younis N. Efficacy of an Educational Program Based Intervention in Improving Nurses' knowledge Toward Radiation Protection Measures: A Randomized Controlled Trails. Salud, Ciencia y Tecnología - Serie de Conferencias. 2025; 4:1585. https://doi.org/10.56294/sctconf20251585

Submitted: 07-09-2024 **Revised:** 06-12-2024 **Accepted:** 25-02-2025 **Published:** 26-02-2025

Editor: Prof. Dr. William Castillo-González

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ABSTRACT

Introduction: the emission or transfer of energy through space or a material medium as waves or particles is known as radiation. Depending on its capacity to ionize atoms and molecules, it can be divided into two primary types: ionizing radiation and non-ionizing radiation. The aim of the study to Improving Nurses' knowledge Toward Radiation Protection Measures.
Method: in a true experimental design, a randomized controlled trial is conducted from September 20, 2024, to January 25, 2025, to evaluate how well an educational program-based intervention improves nurses' knowledge of radiation safety measures. Data for this study was gathered using two sections of a questionnaire: Part 1 of the questionnaire covered demographic variables such as "Age, gender, marital status, educational attainment, number of years of employment in your unit, and participation in courses and workshops." Section Two: includes 12 questions pertaining to nurses' understanding of radiation. Data analysis is done using the "Statistical Package for Social Science (SPSS) software for Windows (Version 26)".
Results: the results appearance that nurses' knowledge of radiation before the program was poor (03,53) and after the intervention it became good (10,60) and continued to be good (10,10) in the secondary test.
Conclusions: this study concluded through the program that was applied to nurses towards radiation protection during exposure to it that the nurses had weak knowledge before the intervention and giving the program.

Keywords: Efficacy; Educational Program; Nurses' Knowledge; Radiation Protection Measures.

RESUMEN

Introducción: la emisión o transferencia de energía a través del espacio o de un medio material en forma de ondas o partículas se conoce como radiación. Dependiendo de su capacidad para ionizar átomos y moléculas, se puede dividir en dos tipos principales: radiación ionizante y radiación no ionizante. El objetivo del estudio es mejorar el conocimiento de las enfermeras sobre las medidas de protección radiológica.
Método: en un diseño experimental real, se lleva a cabo un ensayo controlado aleatorio del 20 de septiembre de 2024 al 25 de enero de 2025 para evaluar en qué medida una intervención basada en un programa educativo mejora el conocimiento de las enfermeras sobre las medidas de seguridad radiológica. Los datos para este estudio se recopilaron utilizando dos secciones de un cuestionario: la parte 1 del cuestionario cubría variables demográficas como "Edad, sexo, estado civil, nivel educativo, número de años de empleo en su unidad y participación en cursos y talleres". Sección dos: incluye 12 preguntas relacionadas con la

comprensión de las enfermeras sobre la radiación. El análisis de los datos se realizó con el programa estadístico "Statistical Package for Social Science (SPSS) para Windows (versión 26)".
Resultados: los resultados muestran que el conocimiento de las enfermeras sobre la radiación antes del programa era deficiente (3,53) y después de la intervención se volvió bueno (10,60) y continuó siendo bueno (10,10) en la prueba secundaria.
Conclusiones: este estudio concluyó que a través del programa que se aplicó a las enfermeras sobre la protección radiológica durante la exposición a la misma, las enfermeras tenían un conocimiento débil antes de la intervención y de la aplicación del programa.

Palabras clave: Eficacia; Programa Educativo; Conocimiento de las Enfermeras; Medidas de Protección Radiológica.

INTRODUCTION

Radiation is the emission or transmission of energy in the form of waves or particles through space or a material medium. It can be categorized into two main types: ionizing radiation and non-ionizing radiation, depending on its ability to ionize atoms and molecules.[1,2] We are exposed to radiation on a daily basis. Among the most well-known sources of radiation are the sun, microwaves in our kitchens, and radios in our automobiles. Most of this radiation is not harmful to our health. But some do. At lower doses, radiation usually presents less of a risk; however, at higher doses, it may be associated with increased risks. Depending on the type of radiation, different precautions must be taken to protect our bodies and the environment from its effects while still allowing us to benefit from its many uses.[3,4] Numerous human activities can result in occupational radiation exposure, such as work related to the various phases of the nuclear fuel cycle, the use of radiation in industry, scientific research, medicine, and agriculture, as well as jobs involving exposure from natural sources.[5,6] Patients and radioactive sources are the sources of radiation exposure in nuclear medicine. Workers and patient attendants are exposed to radiation from radioactive patients.[7,8] The environment contains natural sources of radiation, and radioactivity is a natural phenomenon. There are numerous advantageous uses for radiation and radioactive materials, including power generation, industry, agriculture, and medicine. It is necessary to evaluate and, if required, control the radiation risks that these applications may pose to the environment, the public, and employees.[9,10] Since the discovery of X-rays, the use of radiation has steadily increased in tandem with developments in radiation technology and medicine. Radiation is actively used in modern medicine to diagnose and treat human illnesses, as well as to further medical advancements. As a result, healthcare workers are exposed to more radiation every day, and there will probably be more opportunities for radiation exposure.[11,12,13,14] Among the medical specialists who help with medical imaging services are nurses. To schedule and provide nursing care to patients.[15,16,17,18] nurses collaborate with radiologists and radiographers in the radiology department. Outside of the radiology department, nurses assist radiographers in performing mobile radiography in clinical settings such as the intensive care unit (ICU), special care baby units (SCBU), accident and emergency departments, and operating rooms.[19,20,21,22] All of these clinical settings expose nurses to ionizing radiation, which has a biological impact on human tissue. As a result, the International Commission on Radiation Protection (ICRP) recommends that all medical staff members undergo basic radiation protection training, including nurses who conduct ionizing radiation-based medical imaging exams. Sherer and colleagues define radiation protection as the proactive measures taken by healthcare professionals to shield patients, employees, and the general public from unnecessary exposure to ionizing radiation.[23,24] The study's objective was to ascertain whether an educational program-based intervention was effective in raising nurses' awareness of radiation safety precautions.

METHOD

Study Design

From September 20, 2024, to January 25, 2025, a true experimental design using a randomized controlled trial was used to assess the effectiveness of an educational program-based intervention in increasing nurses' awareness of radiation protection measures. The study was conducted on two groups, intervention and control, using a pretest-posttest design among nurses from five hospitals that were exposed to radiation (three study and two control by random allocation).

Study Setting

The researcher selected that the nurses were exposed to radiation, participated in the study as an experimental and control group. All five hospitals are connected to the Iraqi Ministry of Health's Nineveh Health Department. Three of the five hospitals "the Mosul Center for Cardiology and Cardiac Surgery, Al Salam

Teaching Hospital, and Ibn Sina Teaching Hospital are situated on the left side of Mosul City, while the other two Mosul General Hospital and Al Jumhury Teaching Hospital"are situated on the right.

Study Sample

The nursing departments of the previously mentioned institutions were consulted during the sample selection process for both the intervention and control groups. Each nurse was assigned a unique number that omitted all identifying information, such as name, years of service, gender, and educational background, after lists of all nurses exposed to radiation in each hospital were compiled. Based on their degree of medical radiation exposure and the availability of nursing staff who satisfied the inclusion requirements, five hospitals were chosen for the study using a straightforward random sampling technique. Two groups of hospitals were created: the study group and the control group.

Data Collection Tools

Two sections of a questionnaire were used to collect the data for this study:"Age, gender, marital status, educational attainment, number of years of employment in your unit, and participation in courses and workshops" are the demographic variables covered in Part 1. Part Two: Contains 12 questions about nurses' radiation knowledge.

Data Collection Period

Initially, the study instrument will be used to gather data from employees starting in early October 2024 and ending in January 2025. It takes roughly 30 to 40 minutes for each person to finish the questionnaire.

Analysis of statistical data

For data analysis, the "Statistical Package for Social Science (SPSS) software for Windows (Version 26)" is utilized. For the data analysis, two distinct methods are used: the Fisher Exact Test for Equality of Variances and the Descriptive Statistical Data Analysis Approach.

Ethics consideration

In accordance with letter No. (456/661-ME), the Iraqi Ministry of Health authorized the Ethical Committee to collect information from official documents.

RESULTS

Table 1. Assessing the degree of demographic homogeneity between the study and control sample

		Test of Homogeneity				
Variables	**Categories**	**Group**	**No.**	**%**	**Test**	**P-value**
Gender	Male	Control	22	73	Fisher's exact test	0,779
		Study	20	67		
	Female	Control	8	27		0,779
		Study	10	33		
Age	20-29	Control	15	50	Fisher's exact test	0,796
		Study	17	57		
	30-39	Control	15	50		0,604
		Study	12	40		
	40-49	Control	0	0		1,000
		Study	1	3		
	50 or more	Control	0	0		1,000
		Study	0	0		
Marital status	Unmarried	Control	9	30	Fisher's exact test	1,000
		Study	8	27		
	Married	Control	20	67		0,779
		Study	22	73		
	Widowed	Control	1	3		1,000
		Study	0	0		
	Divorced	Control	0	0		1,000
		Study	0	0		
		Study				

https://doi.org/10.56294/sctconf20251585

Number of years working in your unit	1-4 Years	Control	23	67	Fisher's exact test	0,506
		Study	26	87		
	5-8 Years	Control	7	23		0,506
		Study	4	13		
	9-12 Years	Control	0	0		1,000
		Study	0	0		
Level education	Preparatory	Control	4	13	Fisher's exact test	1,000
		Study	4	13		
	Diploma	Control	10	33		1,000
		Study	9	30		
	Bachelor	Control	16	54		1,000
		Study	17	57		
	Higher Certificates	Control	0	0		1,000
		Study	0	0		
Participation in courses and workshops	Yes	Control	0	0	Fisher's exact test	1,000
		Study	0	0		
	No	Control	30	100		1,000
		Study	30	30		

Table 2. Assessment of nurses' knowledge of basic concepts related to radiation according three stage(Pre , Post 1 and Post 2 study)

Q	Scale	Pre -Study			Post1 -Study			Post2 -Study		
		N (%)		Ass.	N (%)	M	Ass.	N (%)	M	Ass.
Q1	Incorrect	30(100)	0,00	Poor	2(7)	11,20	Good	2(7)	11,20	Good
	Correct	0(0)			28(93)			28(93)		
Q2	Incorrect	28(93)	0,80	Poor	5(17)	10,00	Good	5(17)	10,00	Good
	Correct	2(7)			25(83)			25(83)		
Q3	Incorrect	19(63)	4,40	Fair	1(3)	11,60	Good	2(7)	11,20	Good
	Correct	11(37)			29(97)			28(93)		
Q4	Incorrect	20(67)	4,00	Poor	2(7)	11,20	Good	2(7)	11,20	Good
	Correct	10(33)			28(93)			28(93)		
Q5	Incorrect	25(83)	2,00	Poor	2(7)	11,20	Good	5(17)	10,00	Good
	Correct	5(17)			28(93)			25(83)		
Q6	Incorrect	18(60)	4,80	Fair	0(0)	12,00	Good	1(3)	11,60	Good
	Correct	12(40)			30(100)			29(97)		
Q7	Incorrect	13(43)	6,80	Fair	4(13)	10,40	Good	5(17)	10,00	Good
	Correct	17(57)			26(87)			25(83)		
Q8	Incorrect	22(73)	3,20	Poor	4(13)	10,40	Good	5(17)	10,00	Good
	Correct	8(27)			26(87)			25(83)		
Q9	Incorrect	25(83)	2,00	Poor	9(30)	8,40	Good	11(37)	7,60	Good
	Correct	5(17)			21(70)			19(63)		
Q10	Incorrect	17(57)	5,20	Fair	4(13)	10,40	Good	6(20)	9,60	Good
	Correct	13(43)			26(87)			24(80)		
Q11	Incorrect	16(53)	5,60	Fair	4(13)	10,40	Good	6(20)	9,60	Good
	Correct	14(47)			26(87)			24(80)		
Q12	Incorrect	21(70)	3,60	Poor	5(17)	10,00	Good	7(23)	9,20	Good
	Correct	9(30)			25(83)			23(77)		
Mean ass all		3,53		Poor	10,60		Good	10,10		Good

Note: N: Frequency, %: Percentage, M: Mean of total score, Poor= 0,0 – 4, Fair= 4,1 – 8, Good= 8,1 – 12

Results in table 1 show the homogeneity between the study and control groups. All probability values (P-values) in the table were more than 0,05, that indicating there is no statistically significant differences

https://doi.org/10.56294/sctconf20251585

between the two samples. Consequently, by using Fisher's Exact Test, the null hypothesis—which states that there is homogeneity between the study and control samples—is accepted.

Table 2 show that the pre-study results with the study group indicate a significant lack of knowledge among nurses related to radiation concepts. The total mean score of assessment across all questions was 3,53, which categorized as "Poor." After the intervention, there was a marked improvement in nurses' knowledge and the total mean score assessment increased to 10,60, which categorized as "Good." The total mean score in post2-study was 10,10, which still categorized as "Good." showed sustained improvement in knowledge, though slightly lower than Post1.

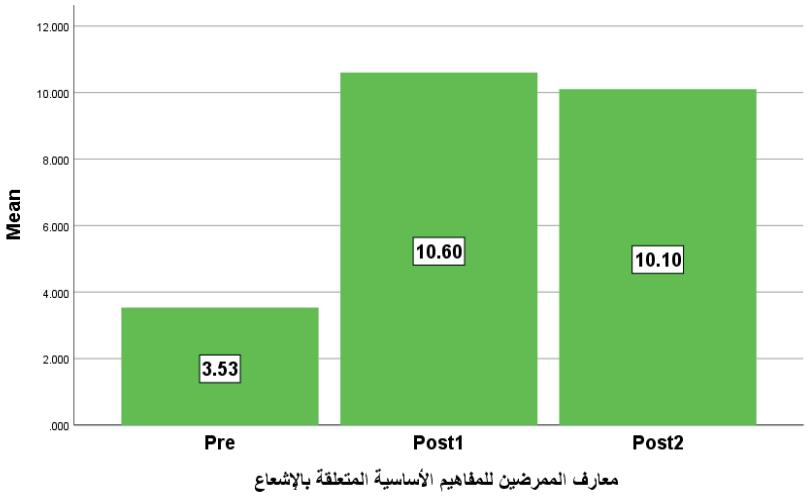

Figure 1. Assessment of nurses' knowledge of basic concepts related to radiation according three stage(Pre, Post 1 and Post 2 study)

DISCUSSION

Table 1 was testing the homogeneity process between the two study groups that were chosen by the researcher with respect to the experimental group and then the control group. The first test was with respect to gender. This test shows that there are no significant differences through the (Fisher's exact test) between males and females and with a percentage (0,779). This indicates that there are no significant differences between males and females. As for the homogeneity test between the four age groups, the homogeneity test was conducted to determine the strength of homogeneity between the experimental group and the control group, and it showed that there were no significant differences between the four groups, and the percentage ranged from 0,604-1,000). The third test showed the social status of the experimental and control groups. Fisher's test was conducted on the two groups or samples and it was found that there were no differences between the two groups in terms of social status, which included married and unmarried people, widows and divorcees, with a percentage ranging between (0,779-1,000). The most important test was the number of years the nurses had been working. They were tested according to Fisher's test to determine the differences between years of experience or years of work, which consisted of three basic categories. The first category was from 1 year to 4 years, the second category was from 10 years to 12 years, and the third category was from 10 years to 12 years for the purpose of testing the experimental group with the control group. It was found that there was no difference between the two mentioned groups. This indicates the strength of homogeneity between the selected samples, with a percentage ranging from (0,506-1,000). The educational level was tested among the selected samples for the study sample and the control sample through the same test that was used above and the homogeneity was at a very high rate reaching (1,000). For all four paragraphs that were related to the educational level such as graduates of middle school, institute and colleges as well as holders of bachelor's degrees. Finally, the samples participating in the study were tested in terms of the number of tools that were used and they were positive and homogeneous at a rate of (1,000). There are more than one study conducted in Iraq and other countries that were reinforced with the same homogeneity regarding the study samples that were tested among the selected categories.[25] Table 2 showed that nurses' knowledge of radiation before the program was poor (3,53) and after the intervention it became good (10,60) and continued to be good (10,10) in the secondary test. As for the table in which the study samples were tested for the study sample and the control sample, there were significant differences between the two groups. This indicates that the nurses who were exposed to the program had positive results and a noticeable increase in relation to the program through the three tests that were conducted on the study sample, unlike the control sample in which the nurses remained in the same information that they were tested with for the three periods in which they were tested, meaning that they were not exposed to a program or intervention correctly, so the nurses remained at the same level for the

https://doi.org/10.56294/sctconf20251585

pre-test periods, the first test, and the second test. Many studies in Iraq were consistent with the results and demographic characteristics of the study sample.[12,16] There are two studies that stated that whenever nurses are exposed to effective programs, the results will be noticeable and in a positive direction, unlike those who were not exposed to intervention or educational programs.[26]

CONCLUSIONS

This study concluded through the program that was applied to nurses towards radiation protection during exposure to it that the nurses had poor knowledge before the intervention and giving the program, but when the program was given and focused on lectures related to the process of dealing with radiation, their knowledge increased and became good. After a period of two months, the same sample was tested. It was noted that their knowledge continued well. This indicates the effectiveness of the program with regard to radiation towards nurses.

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FINANCING

None.

CONFLICT OF INTEREST

Authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

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Drafting - original draft: Mohammed Ali Wahab, Nasir Muwfaq Younis.
Writing - proofreading and editing: Mohammed Ali Wahab, Nasir Muwfaq Younis.