



Educational intervention program regarding safe administration of chemotherapy: A quasiexperimental study among nursing personnel in a tertiary care hospital

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Abstract:

Chemotherapy is one of the major choices for treatment of cancer and closely controlling this fatal disease. A registered nurse is primarily responsible for administering chemotherapy with specific drug knowledge and expertise in preparation, administration, and toxicity management. One of the hazards in the healthcare settings is the occupational exposure to chemotherapeutic or cytotoxic drugs. Hence, the study was conducted aiming to evaluate the effectiveness of educational intervention programs in relation to safe administration of chemotherapy among nursing personnel. One group pretest post-test design with quasiexperimental design and the nonprobability purposive sampling technique was employed to select 38 nursing personnel in different chemotherapy units. The data were collected using a structured knowledge questionnaire consisting of 27 knowledge items from different areas like chemotherapy preparation, administration, management of side effects, management of extravasation, safe handling practices, and chemotherapy exposure. Descriptive and inferential statistics were utilized for analysis and interpretation of the obtained data. The overall mean of pretest knowledge score regarding safe administration of chemotherapy among nursing personnel was 16.21 ± 3.82 , and the post-test knowledge score was 20.49 ± 2.00 . The educational intervention was beneficial in enhancing the knowledge score ($P < 0.001$). Moreover, after the educational intervention, 68% of the respondents had very good knowledge, 11% had excellent knowledge, and 21% had good knowledge ($P < 0.001$). The educational intervention program was beneficial in meliorating the knowledge of nursing personnel on safe administration of chemotherapy.

Keywords:

Chemotherapy, educational intervention program, knowledge, nursing personnel, safe administration

Introduction

Cancer, with approximately 10 million fatalities in 2020 and with nearly one in six deaths, is the world's leading cause of mortality.^[1] Moreover, it is anticipated that in 2025, the number of cancer cases will escalate by 12.8% compared to 2020, from 1.46 million in 2022 to 1.57 million in 2025, as per the projections by Global Cancer Observatory (GLOBOCAN).^[2] The

major choice for treatment of cancer or control of this fatal disease is chemotherapy, which is categorized as high risk according to the National Institute of Occupational Safety and Health (NIOSH).^[3,4] Health care workers, especially the nursing personnel, may be occupationally exposed to low doses of chemotherapeutic drugs during preparation, administration, drug transport, unpacking, storage, waste disposal, and cleaning drug spillage and can enter by ingestion or inhalation of airborne particles

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and through exposed mucous membranes and skin or by needle stick injuries. As a result, registered nurses are susceptible to the adverse effects of chemotherapy on prolonged exposure.^[5,6]

Therefore, it is imperative that oncology nurses must adhere to appropriate safe handling protocols and procedures with great care to prevent such exposure. Chemotherapy administration is generally a vulnerable area of oncology nursing, where even a small amount of carelessness or neglect can have a negative influence on a patient's outcomes, personnel, and the surrounding environment.^[7,8] Inadequate knowledge and nonadherence to the protocols and guidelines are the main rationale for the noncompliance of safe handling practices of chemotherapeutic drugs, which jeopardizes both patient and personal safety. Therefore, awareness about the guidelines and knowledge regarding safe handling practices together guarantee safe behaviors and good performance in safe administration of chemotherapy. According to Specialized safety protocols by American Society of Clinical Oncology (ASCO) and the Oncology Nursing Society (ONS), every institution needs to implement an in-depth educational program and periodically evaluate the nursing personnel's skill.^[6,9,10]

Therefore, in order to assure the safe administration of chemotherapy to cancer patients, it is imperative to

evaluate the knowledge of the nursing staff working in the chemotherapy unit.^[11,12] Hence, this study was executed with the aim of evaluating the effectiveness of educational intervention programs on knowledge scores in relation to safe chemotherapy administration among nursing personnel working in chemotherapy units of selected hospitals of Delhi.

Materials and Methods

Study design and setting

One group pretest post-test quasiexperimental research design.

Study participants and sampling

The study was conducted among nursing personnel working in chemotherapy wards and chemotherapy day care units of VMMC and Safdarjung Hospital, New Delhi, who were selected using the purposive sampling (nonprobability) technique. The setting of the study was VMMC and Safdarjung Hospital, New Delhi. The schematic representation of conduct of study presented in Figure 1.

Sample size estimation

The online-based software Rao soft (2004) was used to estimate the sample size from a population of 100 subjects with a margin of error of 0.05 and a power level of 95%. The estimated sample size was 80. However, the

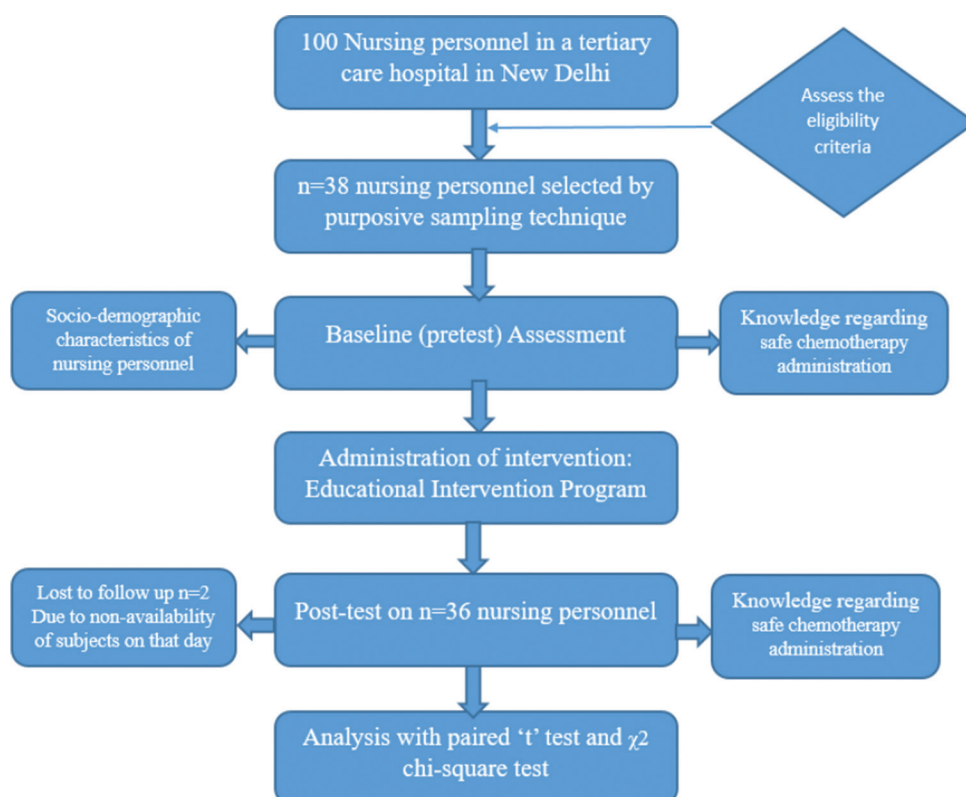


Figure 1: Schematic Representation of the study

eligibility criteria and availability of subjects on the day of pretest restricted the data collection from 38 subjects.

Inclusion and exclusion criteria

Both nursing officers and senior nursing officers who were posted in the chemotherapy unit, present during the collection of data, and who consented to participate were included in the study. The study excluded the nursing personnel who refused to give their consent.

Data collection tools and technique

The tool used for the assessment of knowledge was a structured knowledge questionnaire consisting of two parts.

Part - I: 8 items on sociodemographic variables

Part - II: 27 items on knowledge regarding various aspects of chemotherapy administration.

The reliability (internal consistency) of questionnaire was determined using the Spearman–Brown formula ($r = 0.88$).

Intervention

An educational intervention program regarding safe administration of chemotherapy was prepared by the expert's opinion, reviewing the related literature, deliberation with colleagues, and personal experience in the clinical setting and validated by ten experts, resulting in more than 95% agreement of the contents.

The intervention was administered as a part of continuing education program organized by the continuing education cell of a tertiary care hospital in New Delhi using the method of teaching, that is, lecture cum discussion. The total time taken to administer the intervention was 3.5 hours.

Data analysis

The period of data collection was August 2023. Sociodemographic variables and the baseline knowledge scores of the participants were assessed on the first day. On the same day, the educational intervention program was provided. Post-test was done on the 8th day using the same questionnaire for knowledge assessment. The collected data were tabulated and organized in Excel, and the data analysis was done according to the objectives of the study using descriptive and inferential statistics.

Ethical considerations

Ethical approval was taken from the Institutional Ethical Committee (IEC/VMMC/SJH/Project/2022-02/CC-243). Every participant gave written informed consent. The subjects' anonymity and confidentiality were maintained.

Results

Analysis of demographic parameters reveals key insights into the participants' background [Table 1].

With regard to the baseline knowledge level of nurses, most of the respondents (58%) had good knowledge and 21% had very good knowledge. But after the intervention, 68% of the respondents had very good knowledge, 11% had excellent knowledge, and 21% had good knowledge. It seems that the educational intervention

Table 1: Distribution of nursing personnel in terms of frequency and % (n=38)

Sample Characteristics	Frequency	Percentage (%)
Age		
25-35 yrs	18	47.36
36-45 yrs	12	31.57
Above 45 yrs	8	21.05
Gender		
Female	24	63.15
Male	14	36.84
Professional Qualification		
GNM	14	36.84
Post basic BScN	8	21.05
BSc Nursing	14	36.84
MSc Nursing	2	5.26
Total Experience		
Less than 10 yrs	13	34.21
10-20 yrs	16	42.10
More than 20 yrs	9	23.68
Experience in Chemotherapy Unit		
Less than 2 yrs	21	55.26
2-4 yrs	15	39.47
More than 4 yrs	2	5.26
Designation		
Nursing officer	22	57.89
Senior nursing officer	16	42.10
Assistant nursing superintendent	0	0
Area of Posting		
Med oncology	14	36.84
Surgical oncology	5	13.15
RT	4	10.52
Chemotherapy Day care	15	39.47
Chemotherapy Training attended		
Yes	0	0
No	38	100

Table 2: Distribution of baseline and follow-up level of knowledge

Knowledge Level	Pre test		Post test		Chi-square (χ^2)	P
	F	%	F	%		
Poor knowledge	8	21	0	0	28.06*	<0.001*
Good knowledge	22	58	8	21		
Very good knowledge	8	21	26	68		
Excellent knowledge	0	0	4	11		

*Significant at df(3)

Table 3: Topicwise baseline and post-test scores on knowledge of nursing personnel (n=38)

Areas	Max score	Pretest		Post-test		Diff Mean %	Paired t test value	P
		Mean±SD	Mean (%)	Mean±SD	Mean (%)			
Chemotherapy Preparation	5	3.44±0.92	68.8	4.2±0.47	84	15.2	4.13*	<0.001
Chemotherapy Administration	4	2.78±0.90	69.5	3.25±0.56	81.25	11.75	2.68*	0.009
Management of Side effects	4	2.63±0.71	65.75	3.11±0.47	78.5	12.75	3.41*	0.0011
Management of Extravasation	5	1.02±1.02	20.4	2.48±0.88	49.56	29.16	6.58*	<0.001
Safe Handling Practices	5	3.84±0.88	76.8	4.34±0.48	86.8	10	3.01*	0.003
Chemotherapy Exposure	4	2.21±0.93	55.25	3.05±0.59	76.25	21	4.61*	<0.001
Total score	27	16.21±3.82	60.03	20.49±2.00	75.88	15.85	6.08*	<0.001

*Significant at df(37)

Table 4: Association between baseline knowledge score and selected demographic variables

Demographic Variables		n	Mean±SD	Test Statistics	df	P
Gender	Male	14	16.86±2.79	t=1.42	36	0.16
	Female	24	15.42±3.12			
Professional qualification	GNM	14	13.93±2.40	F=4.54	3,34	0.009*
	Post Basic	8	17.88±2.64			
	BSc Nursing	14	16.86±2.95			
	Post graduate	2	16.00±2.82			
Designation	Nursing officer	22	16.77±2.91	t=2.04	36	0.049*
	Sr. Nursing officer	16	14.81±2.95			
Area of posting	Med oncology	14	15.14±3.23	F=0.94	3,34	0.43
	Surgical oncology	5	15.20±3.11			
	Radiation Oncology	4	16.00±1.83			
	Day care ward	15	16.93±3.08			

*Significant

Table 5: Post hoc test for association of qualification with pretest knowledge score

Variables	Mean difference	P
GNM – PBSc	-3.94	0.002*
GNM – BSc	-2.93	0.007*
GNM – MSc	-2.07	0.32
PBSc – BSc	1.018	0.39
PBSc – MSc	1.875	0.38
BSc – MSc	0.86	0.68

*Significant

program among nursing personnel was very effective, as evidenced by $\chi^2 = 26.08$ (df(3), $P < 0.001$) [Table 2].

With regard to comprehensive evaluation of the intervention program's effectiveness, a significant enhancement in the mean scores in terms of chemotherapy preparation ($P < 0.001$), administration ($P = 0.009$), management of side effects ($P = 0.0011$), management of extravasation ($P < 0.001$), safe handling practices ($P = 0.003$), and chemotherapy exposure ($P < 0.001$) after the training was found specifically. The mean scores of pretest (16.21 ± 3.82) and post-test (20.49 ± 2) knowledge scores on the safe administration of chemotherapy differed significantly ($t = 6.08$, $P < 0.001$). Consequently, the educational intervention program at Safdarjung Hospitals in New Delhi was successful in raising the knowledge scores of the nursing personnel [Table 3].

There was a significant association of the pretest knowledges scores of nurses with the sociodemographic variables such as professional qualification ($P = 0.009$) and designation of the nursing personnel ($P = 0.049$) [Table 4]. Moreover, *post hoc* test for association of qualification with pretest knowledge score was also depicted [Table 5].

The pretest knowledge scores of nursing personnel was negatively related with age ($r = -0.43$, $P = 0.007$) and years of experience ($r = -0.42$, $P = 0.009$) [Table 6].

Discussion

The study was implemented to assess the effectiveness of the educational intervention program on knowledge with regard to safe administration of chemotherapy among nursing personnel working in oncology settings at a selected tertiary care hospital, Delhi. The results of this study revealed that knowledge of safe chemotherapy administration had improved following the implementation of an educational intervention program. Similarly, Kumari *et al.*^[13] reported an enhancement in the scores of knowledge of oncology nurses after the implementation of training with a mean knowledge score of pretests of 16.75 ± 3.1 and a mean knowledge score of post-test of 23.03 ± 3.23 and a 't' value of 10.55.

Table 6: Correlation between baseline knowledge scores and selected sociodemographic variables (continuous variables)

Variables	Age	Total Experience	Experience in Chemotherapy
Pretest knowledge score	$r=-0.43$ ($P=0.007$)*	$r=-0.42$ ($P=0.009$)*	-0.22 ($P=0.89$)

*Significant at df(36)

Additionally, Mishra *et al.*^[14] and Sadiq *et al.*^[8] indicated that mean knowledge scores of oncology nurses before and following the training session differed significantly. Further, Shinde *et al.*,^[15] Kumar *et al.*,^[16] and others suggested that the structured teaching program positively affects the nurses' knowledge in relation to safe handling of chemotherapeutic medications.^[17,18]

The educational intervention program was also effective with regard to significant change in proportion of nursing personnel with respect to level of knowledge. These findings are in good congruence with the recent findings of Kumari *et al.*,^[13] which illustrated that following the implementation of a structured teaching program, 68.75% of participants in the post-test had adequate knowledge, and 32.25% had somewhat adequate knowledge. These findings also correspond with a research conducted in 2022 by Kumar *et al.*,^[16] in which all respondents (100%) felt they had received sufficient training. With regard to the different domains, these present findings are supported by the study results of Nouri *et al.*^[6] and Mahdy *et al.*,^[19] which indicate the different domain mean scores were increased significantly after the training.

The association of pretest knowledge scores with the nursing personnel's educational qualification and years of experience was in agreement with the findings of Kaur *et al.*,^[20] which also determined the significant association of pretest knowledge scores with level of education and total years of experience. Alehashem *et al.*^[21] and Salaheen *et al.*^[22] stated in their study that a significant association of knowledge scores with demographic variable years of chemotherapy work experience was identified, which was not in agreement with the present study findings. Nevertheless, findings of association of knowledge scores and years of experience in chemotherapy were in agreement with the findings of research study by Sargidy *et al.*,^[23] which also demonstrated no significant association between experience in chemotherapy and knowledge scores. The present study found significant relationship between age and experience in years, which was in corroboration with findings of a study by Kumari *et al.*,^[24] which identified the significant association with age and years of experience, but not in agreement with study findings of association with gender.

Limitations and recommendation

Knowledge regarding safe administration of chemotherapy was the need of the hour as none of the nursing personnel had undergone any training program

and evaluating the effectiveness of such educational intervention programs was beneficial in creating awareness about the safe chemotherapy administration. Thus, occupational exposure of chemotherapeutic agents can be minimized with such educational intervention programs and promotes safety among nursing personnel. The small sample size of 38 nursing personnel and the absence of a control group in the study were the limitations and restricted the generalization of findings of the current study.

Conclusion

The study findings indicated that educational intervention programs regarding safe administration of chemotherapy had a significant positive effect on enhancing the knowledge of nursing personnel regarding chemotherapy preparation, administration, monitoring and management of complications, safe handling techniques, and chemotherapy exposure.

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Conflicts of interest

There are no conflicts of interest.

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