

Impact of educational intervention on knowledge regarding safe handling of cytotoxic drugs among the nursing personnel working in BPKIHS

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Abstract

Introduction: Cytotoxic drugs are toxic compounds and are known to have carcinogenic, mutagenic and/or teratogenic potential. It is also considered as hazardous drugs. With direct contact they may cause irritation to the skin, eyes, and mucous membranes, and ulceration and necrosis of tissue. Safe handling refers to the process in which health care workers adhere to evidence-based practices (EBP) set forth by national organizations that have been designed to eliminate or significantly reduce occupational exposure. The key to safe handling is to protect the health care worker throughout the three phases of contact with the hazardous drugs. These phases are drug preparation, administration and disposal. **Objective:** To assess the effectiveness of education in enhancing the knowledge regarding safe handling of cytotoxic drugs among nursing personnel working at BPKIHS. **Methods:** Fifty nurses were taken as sample from selected ward of BPKIHS. One group pretest post test design was used by using population enumeration methods. **Results:** The overall mean score of knowledge on safe handling cytotoxic drugs of the respondents were 35.3 in the pre-test which increased to 83.7 in the post-test after an educational intervention. The difference was significant ($p < 0.001$). **Conclusion:** Thus, the study's findings highlighted that there was a significant improvement in knowledge of the staffs after educational intervention. The educational intervention was very effective to improve the knowledge of the staffs.

Key words: Cytotoxic drugs, educational intervention, knowledge, nursing personnel, safe handling

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Introduction

Cytotoxic drugs are toxic to cancer cells. They kill cancer cells, or stop them from multiplying. Different cytotoxic drugs do this in different ways. However, they all tend to work by interfering with some aspect of how the cells divide and multiply.¹ Cytotoxic drugs are not only harmful for human tissue but also present specific risks for health care personnel, as they are known to be mutagenic, carcinogenic and teratogenic, warranting safe handling.²⁻⁴ The primary routes of exposure during the preparation and administration phases are through the inhalation of aerosolized drug or by direct skin contact.⁵ Nurse is the key person to care for cancer patient, thus, nurses with specialized knowledge and skills therefore play a major role in ensuring safe and competent administration of cytotoxic drugs and care of people receiving these treatments. The toxicity of cytotoxic drugs dictates that the exposure of health-care personnel to these drugs should be minimized.⁶ Nurses who administer chemotherapy can be exposed to aerosols of drugs generated during administration. Body fluids of patients receiving hazardous drugs are a potential source of exposure. Gloves and gowns are recommended to protect nurses against splash contamination during drug administration and handling patient wastes. It is time for nurses to take their own

occupational safety as seriously as the safety of the patients under their care. This study was conducted to assess the effectiveness of education in enhancing the knowledge regarding safe handling of cytotoxic drugs among nursing personnel working at BPKIHS.

Methods

This is hospital based one group pre-test, post-test study conducted in 2010 in selected ward of B.P. Koirala Institute of Health Sciences (BPKIHS) where chemotherapy drugs were handled by using the universal sampling technique. Sample size was 50. A semi structure pretested closed and open ended questionnaire was developed.

Ethical clearance was obtained from IERB of BPKIHS included in acknowledgement. The ward incharges where cytotoxic drugs are used, i.e. medical, surgical, pediatric and gynaecological were informed about pretesting and intervention time and venue. The data was collected by investigator herself by administering questionnaire. The subjects were divided in to two groups (24 +26) according to feasibility of wards. Verbal consent was obtained from each participant. Educational package was developed according to the need identified from the pre-test and available literatures. Educational intervention was conducted after the pre-test. It was one hour educational intervention and

LCD media player was used as teaching learning resources. Post test data was collected after four week of the intervention from the participants who participated in pre test and the intervention program.

The collected data was analyzed using descriptive and inferential statistics. Descriptive statistics was used to report the

findings of pre-test and post-test knowledge. Knowledge score of the participants between the pre-test and post-test were compared by using Mc Nemar Chi-square test and Wilcoxon Sign Rank test and paired t test was used to find the overall significance of the educational intervention program. SPSS-13 program was used to analyze the data.

Results

Demographic characteristics of the respondents is given in table 1.

Table 1: Demographic variable of respondents (n=50)

Name of the colleges where the nurses were trained	No.	%
TU (Trivuban University)/Bir Hopital	18	36.0
PU (Purwanchal University)/CTEVT (Center of technical education and vocational training)	28	56.0
BPKIHS (B.P.Koirala Institute of Health science)	4	8.0
Department		
Medical	17	34.0
Surgical	22	44.0
Gynae	5	10.0
Pediatric	6	12.0
Total	50	100.0
Year of experiences		
<5 years	31	62.0
5-10 years	11	22.0
10-15 years	2	4.0
>15 years	6	12.0
Total	50	100.0
Age Group		
<25	24	48.0

25-30	17	34.0
30-35	2	4.0
35-40	1	2.0
>40	6	12.0
Total	50	100.0
Educational Level		
ANM (Auxillary nurse midwife)	10	20.0
CN (Ceritificate nursing)	37	74.0
BN(Bachelor nursing)	3	6.0
Total	50	100.0

Knowledge of the respondents regarding cytotoxic drugs is given in table 2.

Table 2: Knowledge of respondents regarding cytotoxic drugs (CD) (n=50)

Knowledge of CD	Pretest (n=50)		Post test (n=50)		Differences (%)	P=value
	Yes	%	Yes	%		
Heard about CD	44	88.0	49	98.0	10.0	0.139
Familiar with CD	26	52.0	46	92.0	40.0	0.001
CD are toxic	27	54.0	50	100.0	46.0	0.001
CD kill cancer cell	33	66.0	50	100.0	44.0	0.001
Different drug work differently	21	42.0	50	100.0	58.0	0.001
Some work by affect genetic materials	12	24.0	49	98.0	74.0	0.001
Most normal cell do not divide and multiply very often	8	16.0	46	92.0	76.0	0.001
Two or more CD are used together	21	42.0	46	92.0	50.0	0.001
More than 30 different CD are available	10	20.0	49	98.0	78.0	0.001
Chosen on type and stage of the most research trails	19	38.0	48	96.0	58.0	0.001
Doctor advice best treatment according to type	21	42.0	49	98.0	56.0	0.001

CD are best for rapid dividing and multiplying cell	25	50.0	50	100.0	50.0	0.001
Some normal cell divide and multiply quite rapidly	12	24.0	48	96.0	72.0	0.001

Knowledge of the respondents regarding administration of injectable cytotoxic drugs is given in table 3.

Table 3: Knowledge of administration of injectable cytotoxic drugs(CD) (n=50)

Injectable administration of CD	Pre-test (n=50)		Post-test (n=50)		Differences	P=value
	Yes	%	Yes	%		
Preparation of injectable CD	13	26.0	44	88.0	62.0	0.001
Use luer lock fittings on needles	9	18.0	47	94.0	78.0	0.001
Use appropriate receptacle container to carry syringes	10	20.0	46	92.0	72.0	0.001
Prime I/Vdrip start first without drugs	12	24.0	47	92.0	68.0	0.001
Connect iv bag at waist level	7	14.0	45	90.0	76.0	0.001
CD labeling to all container	16	32.0	48	96.0	64.0	0.001
Use disposable gauze squares	12	24.0	47	94.0	70.0	0.001
Use plastic backed absorbent	11	22.0	46	92.0	70.0	0.001
Return air containing syringe to Pharmacy/suppliers	4	8.0	45	90.0	82.0	0.001
Do not recap needles	12	24.0	49	98.0	74.0	0.001
Dispose of empty IV bags or flasks	7	14.0	45	90.0	76.0	0.001

Table 4 Knowledge of conditions that may recruit in inhalation of air born contaminants during parenteral administration (n=50)

Condition to inhale air born contaminants	Pretest (n=50)		Post test (n=50)		differences (%)	P=value
	Yes	%	Yes	%		
Drugs filled syringe	15	30.0	48	96.0	66.0	0.001
Withdrawal of needles from iv	17	34.0	50	100.0	66.0	0.001

Penetrating injury	26	52.0	49	98.0	46.0	0.001
Splashes and leakages of	28	56.0	50	100.0	44.0	0.001
Spills of CD	25	50.0	49	98.0	48.0	0.001

Table 5: Knowledge regarding uses of personal protective devices (n=50)

Personal protective devices	Pretest (n=50)		Post test (n=50)		Differences (%)	P=value
	Yes	%	Yes	%		
Gown	32	64.0	49	98.0	34.0	0.008
Gloves	43	86.0	49	98.0	12.0	0.151
Eye glass	34	68.0	49	98.0	30.0	0.001
Mask	36	72.0	49	98.0	26.0	0.001
Boots	21	42.0	49	98.0	56.0	0.001
Helmet	15	30.0	47	94.0	64.0	0.001

Table 5 shows the knowledge of the respondents regarding uses of personal protective devices.

Table 6: Knowledge regarding hazard of handling cytotoxic drugs (CD) (n=50)

Hazard of using CD	Pre-test (n=50)		Post-test (n=50)		Differences (%)	P=value
	Yes	%	Yes	%		
Knowledge of handling CD	18	36.0	50	100.0	64.0	0.001
Direct irritant mucous, eyes skin	24	48.0	50	100.0	52.0	0.001
Spills on to cut skin surfaces may affects	16	32.0	50	100.0	68.0	0.001
Dizzines, light headacheness, nausea	14	28.0	50	100.0	72.0	0.001
occupational effect	13	26.0	50	100.0	74.0	0.001
Small quantities of drug may affect extended period	7	14.0	50	100.0	86.0	0.001
Cytogenic abnormalities, mutagenic, teratonic effects	10	20.0	50	100.0	80.0	0.001
Alteration to normal blood cell count	13	26.0	50	100.0	74.0	0.001
Excretion of the drugs/metabolites	6	12.0	50	100.0	88.0	0.001
Abdominal pain, hair loss, nasal	12	24.0	50	100.0	76.0	0.001

Liver damage	11	22.0	49	98.0	76.0	0.001
Fertility changes	15	30.0	50	100.0	70.0	0.001
Fetal loss and malformations	18	36.0	50	100.0	64.0	0.001

Table 6 shows knowledges regarding Hazard of Handling CD.

Table 7: Knowledge regarding sources of risk transmission (n=50)

Sources of risk transmission through	Pretest (n=50)		Post test (n=50)		Differences (%)	P=value
	Yes	%	Yes	%		
Skin contact	12	24.0	48	96.0	72.0	0.001
Skin absorption	28	56.0	50	100.0	44.0	0.001
Inhalation of drug particles	28	56.0	50	100.0	44.0	0.001
Ingestion of drugs particles	21	42.0	44	88.0	46.0	0.001
Needle stick injury	24	48.0	28	56.0	8.0	0.151

Table 7 shows that, knowledge of respondents regarding sources of risk transmission through skin contact, skin absorption, Inhalation of drug particles, Ingestion of drugs particles. The difference were markedly significant in regarding needle stick injury, the difference was insignificant i.e. P=0.151.

Table 8: Knowledge of common risk condition (n=50)

Common risk condition	Pretest (n=50)		Post test (n=50)		Differences (%)	P=value
	Yes	%	Yes	%		
Drug preparation	35	70.0	50	100.0	30.0	0.001
Drug administration	31	62.0	50	100.0	38.0	0.001
Handling waste	23	46.0	50	100.0	54.0	0.001
Transport and waste disposal	29	58.0	50	100.0	42.0	0.001
Cytotoxic drug container	30	60.0	50	100.0	40.0	0.001
Handling bed linen	16	32.0	49	98.0	66.0	0.006

Table 8 shows knowledge regarding conditions that the risk is most likely to occur.

Table 9: Change in the percentage of responses after the educational intervention (n=50)

Intervention	Mean	St. Deviation	P value
Pretest	35.3	16.8	<0.001
Post test	83.7	3.8	

The overall mean score of knowledge on safe handling cytotoxic drugs of the respondents were 35.3 in the pre-test which incurred to 83.7 in the post-test after the educational intervention. The difference was found to be significant ($p < 0.001$).

Discussion

Knowledge of respondents regarding cytotoxic drugs significantly improved in post test. Knowledges about preparation and administration of injectable cytotoxic drugs also markedly increased in the post test.

Knowledges of conditions, that can lead to inhalation of contaminants during parenteral administration of cytotoxic drugs also increased in post test significantly.

Results showed that uses of personal protective devices, like gown, eye glass, mask, shoes, helmet, the differences significantly increased in post test. Our finding is comparable to another study which showed current patterns of use of personal protective equipment among oncology nurses while handling antineoplastic agents more than 94% reported usually wearing gloves during chemotherapy handling, which is

similar to this study (98%); 55% reported using laboratory coats. Use of face and respiratory protection was less than 6%. Chemotherapy was reported to be prepared in laminar air flow hoods in 99% of work settings.¹⁰

Knowledges regarding hazard of handling cytotoxic drugs, has markedly increased in post test and the difference was significant and p value < 0.5 . Study has shown that knowledge attitudes and beliefs of Cypriot nurses on their exposure to antineoplastic agents, majority of nurses were aware of the potential hazards with handling of chemotherapy, which is similar with this study in post test¹¹.

Knowledges regarding sources of risk transmission through skin contact, skin absorption, inhalation and ingestion of drugs partiles the difference were highly significant in post but knowledge of needle stick injury was not significantly different.

Knowledges regarding condition that the risk is most likely to occur during drug preparation, and administration, handling waste, transport and waste disposal, cytotoxic drug container, and bed linen, the difference were markedly increased.

The mean score of knowledge on safe handling cytotoxic drugs of the respondents were 35.3 in the pre-test and 83.7 in the post-test. The difference was significant ($p < 0.001$). Another study concluded the mean score of the nurse' knowledge safe handling of

chemotherapy was 79.43¹¹ a finding on post test with this study.

A study has shown that knowledge, attitude and safe behavior of nurses handling cytotoxic drugs, the knowledge of the nurses concerning antineoplastics was unsatisfactory.⁹ Thus finding of this study was similar with this study in pretest.

Study revealed that The Influence of nurses' knowledge, attitudes, and health beliefs on their safe behavior with cytotoxic drugs, a gap was found between the nurses' knowledge and their actual behavior cytotoxic drugs and their use of protective measures.⁷ the finding was similar with this study related to pretest and post test it was highly significant..

Conclusion

Educational intervention on knowledge regarding Safe handling cytotoxic drugs is effective measures to prevent from hazards. It could be helpful to promote primary prevention by providing a safe environment for the employee by means of education, refreshment training regarding safety measures, clear policy, written guidelines and their enforcement.

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