

Knowledge Regarding Health Hazards of Cytotoxic Agent among Nurses Working in a Tertiary Care Hospital of Central Nepal

Laxmi Neupane¹,² Kristeena Bogati², Hari Prasad Upadhyay³

¹Department of Nursing, B. P. Koirala Memorial Cancer Hospital Nursing College, Bharatpur, Chitwan, Nepal, ²Department of Nursing Chitwan Medical College, Bharatpur, Chitwan, ³Department of Statistics, Birendra Multiple Campus, Bharatpur, Chitwan, Nepal.

ABSTRACT

Background: Cytotoxic agent is a substance that kills cells, including cancer cells, which may stop cancer cells from dividing and growing and may cause tumors to shrink in size. These may have carcinogenic, mutagenic or teratogenic effects. Nurses are directly exposed to it while handling cytotoxic agents. Objective of the study was to find out the level of knowledge regarding health hazards of cytotoxic agent among nurses working in B.P. Koirala Memorial Cancer Hospital, Bharatpur Chitwan.

Method: A descriptive cross sectional study was conducted using non probability purposive sampling technique to collect the information among 106 nurses. Self-administered structured questionnaire was used to collect data. Data were analyzed by using SPSS version 22 and descriptive and inferential statistics were used.

Result: The finding of the study showed that the majority of respondents (48.10%) had <2 years of work experience and educational level was Bachelor's degree in nursing (74.50%). Only 12.30% had special course or training on health hazards of cytotoxic agent. The majority of the respondents (98.10%) had good level of knowledge regarding exposure of cytotoxic agents and 75.50% had good level of knowledge regarding hazardous effects of cytotoxic agents. The overall level of knowledge regarding health hazards of cytotoxic agents was good (88.70%).

Conclusion: This study finding concluded that, nurses working at B.P. Koirala Memorial Cancer Hospital had good level of knowledge regarding health hazards of cytotoxic agents. However, in-service education and training is required.

Key words: knowledge; health hazards; cytotoxic agent.

Received: 3rd January, 2024

Accepted: 2th March, 2024

Published: 4th August, 2024

INTRODUCTION

The cytotoxic agent is frequently used in cancer treatment. It not only prevents the rapid growth and division of cancer cells, but it can also affect the normal and quick dividing cells in the body. Nurses are at risk of exposure to cytotoxic agents while preparing, transporting, administering, and disposal of cytotoxic waste.¹ Nurses who exposed to cytotoxic agents have reported allergic reactions, headache, eye irritation, hair loss, nausea and vomiting, fertility changes, abortion, fetal loss and possible chromosomal aberration in offspring, alterations in complete blood picture and are increased risk of leukemia and other cancers.² The most frequent adverse effect experienced by nurses was headache 65% and skin reaction 64%.³ Health hazards among nurses due to exposure to cytotoxic drugs were present in 67.7%.⁴ Majority of nurses reported hair loss, more than three quarters of them had a headache and approximately two third of them had eye irritation.⁴ Nurses' knowledge

about mutagenic effect was present in 20%, teratogenic effect 30%, carcinogenic effect 70%, infertility 70% and others including nausea, vomiting, alopecia 90%.⁵ Knowledge on safe handling of cytotoxic drugs was inadequate. The mean score of knowledge was 7.8%±2.22%.⁶ It was found that 89.6% of the nurses reported cytotoxic agents are hazardous to health.⁶ Nurses must be aware of the hazards and safe handling practices of cytotoxic drugs.⁴

METHODS

A descriptive cross sectional study design was used to find out the level of knowledge regarding health hazards of cytotoxic agents among nurses working at B.P. Koirala Memorial Cancer Hospital. The research was conducted at B.P. Koirala Memorial Cancer Hospital Bharatpur-7, Chitwan. It is the first national, referral cancer hospital and tertiary cancer center. Chemotherapy is the most common treatment modality for cancer. So, the nurses are directly

Correspondence: Mrs. Laxmi Neupane, Department of Nursing, B. P. Koirala Memorial Cancer Hospital Nursing College, Bharatpur, Chitwan, Nepal. E-mail: laxmibpkmch2017@gmail.com, Phone: +977-9845050145.

exposed to the cytotoxic agents and it may lead to various health hazards. The population of the study was the nurses working at BPKMCH Bharatpur, Hospital. Non probability purposive sampling technique was used. Nurses who have been working with the cancer patients for at least 6 months in chemotherapy ward were included in this study. By taking 50% prevalence with 95% CI with 10% margin of error. Sample size was calculated as, Sample size $(n) = Z^2pq/e^2 = (1.96)^2 * 0.5 * 0.5 / (0.10)^2$

$$= 3.84 * 0.25 / 0.01 = 0.96 / 0.01 = 96$$

With adding 10% non response, this research was conducted among 106 nurses.

Self-administered questionnaire was used to collect data. The validity and reliability of instrument was established. Pre-testing was done in 10% population of the study in same setting and those samples were excluded from the main study. Necessary modification was done. Ethical approval was obtained from IRC, BPKMCH. Before the collection of data, administrative approval was obtained from the concerned authority. Objective of the study was explained and written informed consent was obtained from each participant and the subject's anonymity and confidentiality were maintained during as well as after data collection. Data was collected within two weeks and collected data was checked, reviewed, organized for completeness. Data was analyzed by statistical package for social science (SPSS) version 20 and analyzed by using descriptive and inferential statistics.

RESULTS

Table 1 shows that, more than half of respondents 66(62.30%) were 21-31 years of age. The mean±SD of the respondents was 31.02±6.249 with the maximum age of 52 and minimum age of 21 years. Majority of the respondents 79(74.50%) had bachelor's nursing and were married 90(84.90%). Regarding religion, majority of respondents 99(93.40%) followed Hindu religion. Similarly, more than half 68(64.20%) of the respondents belong to Brahmin/Chhetri.

Table 2 shows that, more than half of respondents 57(53.80%) were recently working in chemotherapy ward, 51(48.10%) had <2 years of work experience

Table 1. Socio-demographic characteristics of respondents. (n=106)

Variables	Frequency (%)
Age in Years	
21-31	66(62.30)
32-42	33(31.10)
43-53	7(6.60)
Mean±SD, Min.(max.)	31.02±6.249, 21(52)
Education level	
PCL Nursing	25(23.60)
Bachelor's Nursing	79(74.50)
Master's Nursing	2(1.90)
Marital Status	
Married	90(84.90)
Unmarried	16(15.10)
Religion	
Hindu	99(93.40)
Buddhist	6(5.70)
Christian	1(0.90)
Ethnicity	
Brahmin/chhetri	68(64.20)
Madhesi	10(9.40)
Dalit	4(3.80)
Janjati/Newar	24(22.60)

and least 7(6.60%) had >6 years of work experience. Likewise, 13 (12.30%) respondents had participated in training on health hazards of cytotoxic agents and less than half of respondents 42(39.60%) answered that policy and protocol were present in hospital.

Table 2. Work related information of the respondents. (n=106)

Variables	Frequency (%)
Recently Working Area	
Chemotherapy ward	57(53.80)
Surgery ward	40(37.70)
Critical care unit	9(8.50)
Work Experience	
<2year	51(48.10)
2-4year	32(30.20)
4-6year	16(15.10)
>6year	7(6.60)
Participation in training on health hazards of cytotoxic agents	13(12.30)
Presence of policy and protocol of hospital	42(39.60)

Table 3 reveals that, cent percent of respondents answered PPE and biosafety cabinet should be

used. Equal number and percent 105(99.1%) of the respondents answered that, needs precaution while handling, hazardous to health and nurses can minimize these hazards. Majority of respondents knew safe disposal of cytotoxic agents 104(98.1%), followed by preventing leakage 103(97.2%) and careful transportation 102(96.2%). Regarding spill management, majority of respondents 105(99.1%) knew minimizing cytotoxic agent exposure by restricting the area of spills and using of drug spill kit followed by spills cleaned with absorbent towel and detergent solution 102(96.2%), discarding waste bag and content in approved container 99(93.4%) and wash hand thoroughly with soap and water 95(89.6%).

Table 3. Knowledge regarding exposure of cytotoxic agent. (n=106)	
Statements	Frequency (%)
General concept & Preventing Exposure	
Cytotoxic agent kills cells, including cancer cells.	97(91.5)
PPE should be used while handling cytotoxic agent	106(100)
Use Bio-safety cabinet	106(100)
Precaution needs while handling cytotoxic agent	105(99.1)
Cytotoxic agents exposure is hazardous to health	105(99.1)
Nurses can minimize hazardous effect	105(99.1)
Transport carefully	102(96.2)
Administration by preventing from leakage	103(97.2)
Safe disposal of cytotoxic agents	104(98.1)
Spill Management	
Restrict the area of spill	105(99.1)
Use of drug spill kit	105(99.1)
Use of absorbent towel and detergent solution	102(96.2)
Discard waste in approved container	99(93.4)
Wash hand with soap and water	95(89.6)

Table 4 reveals the knowledge regarding hazardous effects of cytotoxic agent. Majority of respondents 101(95.3%) answered hair loss followed by, 100(94.3%) skin rashes/allergic reaction, 98(92.5%) eye irritation, 95(89.6%) headache and 91(85.8%) nausea & vomiting. Likewise, stress 96(90.6%) followed by 86(81.1%) anxiety, 78(73.6%) fear and 63(59.4%) anger. Similarly, majority of respondents

answered that, long term hazard of cytotoxic agents exposure may cause problem to conceive 98(92.5%) followed by secondary malignancy 94 (88.7%) and abortion 92 (86.8%).

Table 4. Knowledge regarding hazardous effects of cytotoxic agent. (n=106)	
Statements	Frequency (%)
Physical Problems	
Skin rashes/allergic reaction	100(94.3)
Eye irritation	98(92.5)
Nausea and vomiting	91(85.8)
Headache	95(89.6)
Hair loss	101(95.3)
Psychological Problems	
Stress	96(90.6)
Anger	63(59.4)
Fear	78(73.6)
Anxiety	86(81.1)
Long-term Health Problems	
Secondary malignancy	94(88.7)
Abortion	92(86.8)
Problem to conceive	98(92.5)

Table 5 represents the level of knowledge regarding cytotoxic agents. Majority of the respondent 104(98.10%) had good level of knowledge regarding exposure to cytotoxic agents and 80(75.50%) had good level of knowledge regarding hazardous effects of cytotoxic agents. Overall level of knowledge regarding health hazards of cytotoxic agents was good on 94 (88.70%).

Table 5. Level of knowledge regarding cytotoxic agent. (n=106)	
Level of Knowledge	Frequency
Exposure to Cytotoxic Agent	
Poor	0(0.00)
Moderate	2(1.90)
Good	104(98.10)
Hazardous Effect of Cytotoxic Agent	
Poor	7(6.60)
Moderate	19(17.90)
Good	80(75.50)
Overall Level of Knowledge	
Poor	0(0.00)
Moderate	12(11.30)
Good	94(88.70)

Table 6 shows that, there is no association between the level of knowledge with age, educational level, marital status, and religion of the respondents.

Table 6. Association between overall level of knowledge with socio-demographic characteristics (age, educational level and marital status and religion).

Variables	Level of Knowledge			Chi-square	p-value
	Poor	Moderate	Good		
Age in Years					
21-31	0	5(7.6%)	61(92.4%)	3.011	0.222
32-42	0	5(15.2%)	28(84.8%)		
43-53	0	2(28.6%)	5(71.4%)		
Education					
Pcl Nursing	0	3(12.0%)	22(88.0%)	4.92	0.782
Bachelor's Nursing	0	9(11.4%)	70(88.6%)		
Master's Nursing	0	0	2(100.0%)		
Marital Status					
Married	0	11(12.2%)	79(87.8%)	0.551	0.458
Unmarried	0	1(6.3%)	15(93.8%)		
Religion					
Hindu	0	10(10.1%)	3(89.9%)	4.66	0.097
Buddhist	0	1(16.7%)	5(83.3%)		

The table 7 shows that, there is no association between the level of knowledge with ethnicity, recently working ward and experience of the respondents.

Table 7. Association between overall level of knowledge with socio-demographic characteristics (ethnicity, recently working ward and experience).

Variables	Level of Knowledge			Chi-square	p-value
	Poor	Moderate	Good		
Ethnicity					
Brahmin/Chhetri	0	2(11.8%)	60(88.2%)	1.835	0.607
Madhesi	0	2(20.0%)	8(80.0%)		
Janajati/Newar	0	2(8.3%)	22(91.7%)		
Dalit	0	0	4(100.0%)		
Recently Working Ward					
Chemo ward	0	8(14.0%)	49(86.0%)	2.627	0.269
Surgery ward	0	4(10.0%)	36(90.0%)		
Critical Care Unit	0	0	9(100.0%)		
Experience					
<2 years	0	4(7.8%)	47(92.2%)	3.181	0.365
2-4 years	0	3(9.4%)	29(90.6%)		
4-6 years	0	4(25.0%)	12(75.0%)		
>6 years	0	1(14.3%)	6(85.7%)		

DISCUSSION

This study revealed that, majority of respondents (62.30%) were 21-31 years of age with mean±SD 31.02±6.249. Maximum age was 52 years and minimum was 21 years. This study showed that, majority of respondents (74.50%) had completed Bachelor's nursing. Likewise, most of the respondents (48.10%) had <2 years of work

experience and at least 6.60% had >6 years of work experience. While, the study conducted at Enam Medical College Hospital, Dhaka, Bangladesh showed that most of the respondents (91.7%) had minimum qualification i.e. diploma and remaining 8.3% had bachelor degree in nursing. Likewise, majority (65.6%) of the respondents had 0.6-4 years and only 11.5% had more than 8 years of working experience.⁷ In this study, majority of respondents (84.90%) were married, and 93.40% followed Hindu religion. While the previous study conducted in the same setting showed 56% were married.⁴ This study showed that only 12.30% of respondents had participated in-service education on health hazards of cytotoxic agent. While, the study conducted at Enam Medical College Hospital, Dhaka, Bangladesh showed that 27.1% respondents had training regarding chemotherapy agent handling.⁷ Another study conducted at Tanta University and Ethiopia showed that 54.5% of respondents had training on safe handling of cytotoxic drugs.⁸ Likewise, 31.2% respondents had training on chemotherapy handling at Tertiary Teaching Hospital.⁶ Another study conducted at Khartoum Oncology Hospital, 55.1% reported never having undergone any training in chemotherapy.⁹ This study showed that, majority (91.5%) of the respondents had knowledge about meaning of cytotoxic agent. And, cent percent of respondents answered they had knowledge about PPE and cytotoxic drug should be prepared in bio-safety cabinet. Likewise this study further reveals that 99.1% respondents answered it needs precaution while handling. While, nearly similar findings was found in another study conducted at Tertiary Teaching Hospital, which showed that 76.6% nurses heard about Cytotoxic drugs and 90.9% respondents answered that they must wear PPE and almost all (97.4%) respondents reported they could minimize by taking safety precaution. And 57.1% of the respondents correctly reported that cytotoxic drugs should be prepared in biological safety cabinets which finding is contrast with this study (100%).⁶ This study represents that,

majority of respondents (99.1%) had answered cytotoxic drugs exposure is hazardous to health and nurses can minimize these hazards. While, nearly similar finding was found on the study conducted at Tertiary teaching Hospital which showed that, majority of the respondents (89.6%) reported cytotoxic drugs are hazardous to health.⁶ This study revealed that cent percentage respondents had knowledge about preparing the cytotoxic agents in bio-safety cabinet and PPE should be used to minimize the hazardous effects. Similarly, 98.1% of respondents seem to have knowledge on safe disposal of cytotoxic agents, 97.2% properly administration by preventing from leakage and 96.2% had knowledge on carefully transportation of cytotoxic agents. While, the study conducted at Oncology center in Egypt had surprising finding is that regarding the drug preparation areas, there is no biological safety cabinet for the preparation of chemotherapy. This is usually done in the pharmacy room (usually used) and sometimes in the nurses' station or treatment room.¹⁰ Likewise another research held at Kenyatta National Hospital, Kenya found that, majority (80.65%) of respondents used PPE while preparing cytotoxic drugs and only (32.26%) prepared the drugs in biological safety cabinet.⁷ This study represents that, majority (99.1%) of respondents answered cytotoxic agents exposure can be minimized by restricting area of spills and use of drug spill kit and 96.2% reported spills should be cleaned with absorbent towel and detergent solution. While, research conducted at Kenyatta National Hospital, Kenya found the contrast finding that only 21.86% demarcated the spill area, and 28.33% had knowledge on use of drug spill kit and 72% respondents had known the use of cleaning reagents.⁷ This study showed that, 93.4% of respondent replied discard waste bag and content in approved container and 89.6% wash hand thoroughly with soap and water to minimize cytotoxic agent's exposure for spill management. While, research conducted at Kenyatta National Hospital, Kenya found the similar finding that showed, 88% had knew hand washing after cleaning

of spills.¹¹ This study showed that, in regarding the knowledge on hazards of cytotoxic agents, majority (95.3%) of respondents answered hair loss followed by, 94.3% skin rashes/allergic reaction, 92.5% eye irritation, 89.6% headache, 85.8% nausea and vomiting. While, study conducted at Tanta University Hospital Egypt found that, 9.1% respondents had suffered from nausea, 18.2% had headache.¹² Another study held at Oncology Centre in Minia city also found construct finding that, nearly half of respondents (48%) had some general health hazards, including skin irritation 45.8%, inflammation of the eye 37.5%.¹³ This study showed that, majority of respondents (92.5%) answered excessive exposure to cytotoxic agents may cause problem to conceive, 88.7% knew may cause secondary malignancy, 86.8% replied this may cause abortion. While, another study conducted in BPKMC found that, 20% of respondents answered mutagenic effects, 30% teratogenic effects, 70% carcinogenic effects, 70% infertility.⁵ Further study conducted at Oncology Centre in Minia city also found that 33.3% of respondents had complains of abortion.¹³ This study also revealed that, majority of respondents had answered stress 90.6%, anxiety 81.1%, fear 73.6% and anger 59.4% as a psychological problems. This study showed that, majority (88.70%) of the respondents had a good level of knowledge followed by 11.30% had a moderate level of knowledge and no one had poor level of knowledge regarding health hazards of cytotoxic agents. While, contrast finding was found on the study conducted at Queen Elizabeth Hospital in Kota, Malaysia, which showed good level of knowledge was 6.5%, moderate 73.8% and poor 19.6% and concluded that nurses have insufficient knowledge of chemotherapy safety, with an average score of 59.22%.¹⁴

CONCLUSIONS

Based on the findings and discussion of this study, it is concluded that nurses working at B.P. Koirala Memorial Cancer Hospital had a good level of knowledge regarding health hazards of cytotoxic agent. Respondents had better level of knowledge

regarding exposure of cytotoxic agents than hazardous effects of cytotoxic agents.

Limitations

The study was conducted in one setting and limited to the sample size. So, the result of the study cannot be

generalized to the large population. Non-probability purposive sampling was adopted to select required samples. There could be biases in sample selection.

Conflict of Interest: None

REFERENCES

1. Nabhani Gebara S, Barton S, Appleford I, McCalla P, Sewell G, Sabbagh Dit Hawasli R. Consensus recommendations for the safe handling of cytotoxic agents in cytotoxic academic research laboratories (CARL). *Journal of Oncology Pharmacy Practice*. 2020 Dec;26(8):1953-63.
2. Capoor MR, Bhowmik KT. Cytotoxic Drug Dispersal, Cytotoxic Safety, and Cytotoxic Waste Management: Practices and Proposed India specific Guidelines. *Indian Journal of Medical and Paediatric Oncology*. 2017 Apr;38(02):190-7.
3. Momeni M, Danaei M, Askarian M. How do nurses manage their occupational exposure to cytotoxic drugs? A descriptive survey in chemotherapy settings, Shiraz, Iran. *International Journal of Occupational & Environmental Medicine*. 2013 Apr 1;4(2).
4. Mahdy NE, Abdel Rahman A, Hassan HA. Cytotoxic drugs safety guidelines: Its effect on awareness and safe handling practices of oncology nurses. *J NursHlth Sci*. 2017 May;6(3):22-33.
5. Dhungana A. Knowledge and practice regarding precautions of Cytotoxic drug administration among nurses working in BPKMCH Chitwan. 2003.103.69.126.140
6. Asefa S, Aga F, Dinegde NG, Demie TG. Knowledge and practices on the safe handling of cytotoxic drugs among oncology nurses working at tertiary teaching hospitals in Addis Ababa, Ethiopia. *Drug, healthcare and patient safety*. 2021 Mar 29:71-80.
7. Hosen MS, Hasan M, Saiful Islam M, Raseduzzaman MM, Tanvirul Islam M, Tazbiul Islam M et al. Evaluation of knowledge and practice of handling chemotherapy agents by Medicine And Public Health. 2019 Oct;6(10):4175. nurses: a multi-center studies in Bangladesh. *International Journal of Community*
8. HA Z, SM S, RM ES, WM S. Knowledge, attitudes and practices of safe handling of cytotoxic drugs among oncology nurses in tantaUniversity hospitals. *Egyptian Journal of Occupational Medicine*. 2019 Jan 1;43(1):75-92.
9. Sargidy AA, Yahia A, Ahmad M, Abdalla A, Khalil SN, Alasiry S et al. Knowledge of safe handling, administration, and waste management of chemotherapeutic drugs among oncology nurses working at Khartoum Oncology Hospital, Sudan. *PeerJ*. 2022;10:e14173. Published 2022 Oct 21. doi:10.7717/peerj.14173RESEARCH
10. Rai DK, Lama S, Badu A, Mandal GN. Impact of educational intervention on knowledge regarding safe handling of cytotoxic drugs among the nursing personnel working in BPKIHS. *Health Renaissance*. 2015;13(1):13-22.
11. Sheikh YA. Knowledge and practice on safe handling of cytotoxic drugs among health care workers at Kenyatta National Hospital (Doctoral dissertation, University of Nairobi). 2016
12. Meleha AE, Ghazal A, Elsherbini E, Elsheredy A. Evaluation of Handling of Cytotoxic Drugs and Potential Occupational Risk among Health Care Workers in Pediatric Hematology/Oncology Unit. *The Egyptian Journal of Hospital Medicine*. 2023 Jan 1;90(2):3041-6.
13. Aziza M. Chemotherapy health hazards among oncology nurses and its possible relation to

malpractice and workplace environment.
Evidence-Based Nursing Research.
2019;1(3):182-91

Handling of Chemotherapy among the nurses
in Queen Elizabeth Hospital, Kota Kinabalu,
Sabah. 2022

14. Sator P, Yee AY, Wider W. Knowledge of Safe

Citation: Neupane L, Bogati K, Upadhyay HP. Knowledge Regarding Health Hazards of Cytotoxic Agent among Nurses Working in a Tertiary Care Hospital of Central Nepal. IJSIRT. 2024; 2(1):42-48.