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RESEARCH ARTICLE

A STUDY TO ASSESS THE PRACTICES REGARDING SAFE HANDLING OF CHEMO- THERAPEUTIC DRUGS AMONG NURSING PERSONNEL

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ABSTRACT

Introduction: Cancer is one of the most prevalent diseases around the world. According to recent reports by World Health Organization (WHO), the incidence of cancer will increase in future decades. In fact, this condition is expected to be the second most common cause of mortality. Hazardous drugs have been used for many years in cancer treatment. Nursing personnel have a major responsibility in ensuring safe handling of chemotherapeutic agents. This study was undertaken to assess the knowledge, attitude and practices regarding safe handling of chemotherapeutic drugs among nursing personnel in tertiary care hospital, India. **Aim:** The aim is to assess the practices regarding safe handling of chemotherapeutic drugs among nursing personnel. **Material and Methods**: - Non-experimental descriptive approach was used. Through convenient sampling, 60 subjects were selected. Self reporting practices rating scale to assess was used to assess practices. Descriptive statistics, Pearson correlation and ANOVA /t- tests were used to analysis data. **Results: -** The result revealed that the majority of nursing personnel (51.7%) had average practices regarding safe handling of chemotherapeutic drugs. The statistically highly significant association was found between practices regarding safe handling of chemotherapeutic drugs and oncology work experience of nursing personnel, and challenge in safe handling of chemotherapeutic drugs. **Conclusion**: - The results of the present study reveal that there were average practices regarding safe handling of chemotherapeutic drugs among nursing personnel of tertiary care hospital, India.

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INTRODUCTION

At present cancer is becoming one of the most prevalent diseases around the world. According to recent reports by World Health Organization (WHO), the incidence of cancer will increase in future decades. In fact, this condition is expected to be the second most common cause of mortality (Ali Taghizadeh Kermani, 2015). Throughout the world cancer ranks third important health problem. Unlike other illnesses the treatment of cancer is for long duration and it is interspersed with complications and frequent admissions to hospital (Abhishek Purkayastha, 2018). Recent advances in cancer treatment, especially the production of novel chemotherapeutic and bio-therapeutic agents, have led to the prolongation of survival in cancer patients (Ali Taghizadeh Kermani, 2015). Chemotherapeutic drugs have been used for many years in cancer treatment. Occupational health and safety has been a major concern since many years and how to avoid exposure of employees to hazards during work is a crucial demand from all employers. During preparation, transportation, administration, and disposal of chemotherapy waste and bodily fluids, nurses can be affected by risks of chemotherapeutic drugs exposure. Since the preparation of drugs was determined as the stage with the utmost average contamination (Azza Ibrahim Abd Elkader Habiba, 2018). Nursing personnel have a major responsibility in ensuring safe handling of chemotherapeutic agents. Because of the significance of this responsibility, nursing personnel should be appropriately trained, ensure that their knowledge is current with developments in the field, and follow all applicable discipline-specific guidelines when handling chemo-therapeutic agents (Goodin). The Oncology Nursing Society recommends that in order to provide quality care and maintain safety standards, nurses must be competent in oncology nursing practice and have an awareness of risks amid their workplace. A major facet of this competency is that nurses must be remaining educated and regularly engage in mandatory updates. Contamination may be occurring due to a lack of enforcement of existing policies. The condition of the work environment is strongly associated with the quality of care provided and the safety of the patient as well as the health of the workforce. The influence of workplace conditions must be included as a factor when exploring occupational safety

issues. Other contributing factors to organizational system failures that may result in unsafe work environments include lack of awareness of one's surroundings; poor communication; and direct interruptions and distractions while preparing to administer chemotherapy (VerStrate, 2015). Chemotherapy exposure and workplace contamination can occur in a variety of forms and health outcomes differ based on the level of contact. Routes of exposure include drug inhalation; direct dermal contact with the drug; indirect contact via contaminated surfaces or bodily fluids; accidental injection via needle stick injury; ingestion of contaminated food or drink; or from hand-to-mouth actions. The most common method of exposure is by way of skin or mucous membrane contact which is why personal protective equipment is highly recommended. However, even nurses that wear recommended protection can be exposed to chemotherapy when unintentionally touching contaminated surfaces with their bare hands. These surfaces often include counters, floors, drug storage areas, waste containers and drug vials (Polovich Martha, 2010).

The main role of nurses in the field of oncology is chemotherapy preparation and administration which is sensitive area in oncology nursing where little negligence or mistake may lead to adverse health hazards for patients, staff and environment (Sarita Devi, 2019). The fatal incidences such as over dose of chemotherapy, wrong calculations of drugs, wrong route of transfusion which sometimes results in patient's death all are the result of lacking of knowledge and training of the staff (Najma Khan, 2012). Studies of exposed female healthcare workers have shown a variety of adverse pregnancy-related outcomes including infertility, miscarriage, and birth defects (Lawson, 2012 and Skov, 1992). In response, both professional organizations and government agencies have issued guidelines for the safe handling of hazardous drugs, including antineoplastic drugs. These national guidelines address specific procedures and equipment for safeguarding workers who handle these highly toxic substances (National Institute for Occupational Safety and Health, 2015 and Occupational Safety and Health Administration, 2015).

Although there has been an increased awareness and concern regarding the issue of safe handling of Chemotherapeutic drugs, many nurses may still not follow the guidelines and procedures in the hospital settings and may not use the recommended safety equipment (Vollono, 2002). The concern of potential exposure and subsequent effects in healthcare workers who handle chemotherapeutic or antineoplastic drugs is from many years (E Ziegler, 2002). Till date, the challenge of protecting workers' health is persisting and expanding, with an increasing number of publications demonstrating that contamination of chemotherapeutic drugs is still present on work surfaces after cleaning procedures are concluded (Abbasi, 2016). Friese and his colleagues suggest the overall rate of chemotherapy exposure decreases when oncology nurses report adequate staffing and resources (2011). These data substantiate the need for adequate staffing and resources. The study also recognizes the role of increased staff compliance and the acknowledgment of practice standards regarding the protection of oncology nurses (Friese, 2012). The influence of workplace conditions must be included as a factor when exploring occupational safety issues. Other contributing factors to organizational system failures that may result in unsafe work environments include lack of awareness of one"s surroundings; poor communication; and direct interruptions and distractions while preparing to administer chemotherapy (Ashley, 2013). Several recent publications have documented the ongoing failure of employers to adopt, or consistently use, recommended safety practices for handling chemotherapeutic drugs (Connor, 2010). These guidelines recommend the application of hierarchy of control technologies to mitigate workplace hazards, which include engineering controls, administrative controls, work practice controls, and personal protective equipment (PPE) (Polovich, 2011). All healthcare workers who work with antineoplastic drugs (ANDs) have been advised to adhere to these safety guidelines (Al-Azzam, 2015). The 2011 NIOSH Health and Safety Practices Survey of Healthcare Workers provided an opportunity to examine how pertinent organizational safety practices and safety climate perceptions influence the use of both PPE and engineering controls to reduce exposure risks among nurses who administer chemotherapeutic drugs (Steege, 2014). In our hospital especially nurses are exposed while preparing and administrating the chemotherapeutic drugs. For that reason nurses' information about the possible health hazards and the protection measures used while preparing and administering these drugs is gaining more and more importance. The aims of this study was to assess the practices regarding safe handling of chemotherapeutic drugs among nursing personnel exposed to chemotherapeutic drugs.

MATERIAL AND METHODS

A quantitative research approach and non experimental descriptive cross sectional design was used for the study. The present study was conducted at department of radiation oncology of tertiary care hospital of India. Total sample size was 60 nursing personnel (nursing personnel are staff nurses and intern nursing students), who were working in the radiation oncology department and were exposed to chemotherapeutic drugs while providing care to patient. Total three tools were used for the study. Tool 1 was socio-demographic profile sheet consisted of 11 items to measure demographic data of the subjects was used. These variables were age, gender, marital status, type of family, total income of family (in rupees per month), place of residence, education, working / training experience in nursing, working experience in oncology ward, formal training and challenge in safe handling of chemotherapeutic drugs. Tool 2 was Self structured three point rating scale to assess self reported practices regarding safe handling of chemotherapeutic drugs. In this tool total item were 54 under five categories. First category consisted 16 items regarding preparation of chemotherapeutic drugs. Second category consisted 19 items regarding administration of chemotherapeutic drugs. It included Intravenous, Intramuscular, Subcutaneous and oral drug administration. Third category consisted 8 items regarding management of side effects during administration of chemotherapeutic drugs. Fourth category consisted 6 items regarding post administration and disposal of waste. Fifth category consisted 5 items to assess practices regarding chemotherapy drugs post exposure care. The reliability of three point rating scale to assess self reported practices was checked by test re-test method and acceptable at r value 0.95.

Ethical Considerations

Ethical approval was taken from Institutional Ethical Committee. A written informed consent was taken from each participant.

Statistical Methods

The data was analyzed by using the descriptive and inferential statistics, karl pearson correlation and ANOVA/t-test.

RESULTS

Table 1 depicts socio-demographic characteristic of study participants and near to all (96.7%) nursing personnel were female. About less than third fourth (73.3%) of them were single, and three fourth (75%) belonged to nuclear family. More than one third of nursing personnel (35%) were from rural area and more than half (65%) from monthly family income group of 10,000-30,000/- Rs. Half (50%) of nursing personnel had Post Basic Nursing education and more than half (51.7%) had >3-5 year working/training experience in nursing.

Table 1. Sample characteristics of the sample N=60

Socio demographic characteristics		Frequency (n) & Percentage (%)
Age (in years)		25.65±5.34
Gender	Female	58 (96.7%)
	Male	2 (3.3%)
Marital status	Single	44 (73.3%)
	Married	16 (26.7%)
Family type	Nuclear	45 (75%)
	Joint	15 (25%)
Residence place	Urban	29 (48.3%)
	Rural	31 (51.7%)
Family income	10,000-30,000 Rs	39 (65%)
	>50,000 Rs	21 (35%)
Education	Graduate nursing	48 (80%)
	Diploma nursing	12 (20%)
	Professional characteristics	
Groups of nursing personnel	Staff nurse	20 (33.3%)
	Student trainee	40 (66.7%)
	< 1 year	4(6.6%)
Work experience in nursing	>1 to 3 years	13 (21.6%)
	>3 to 5 years	31 (51.6%)
	> 5 years	12 (20%)
	Staff Nurse oncology work experience	
Oncology experience	< 1 year	4 (6.6%)
	>1 to 3 years	9 (15%)
	>3 to 5 years	2 (3.33%)
	> 5 years	5 (8.33%)
	Student Trainee oncology training experience	
	< 1 week	5 (8.33%)
	>1 to 3 weeks	14 (23.3%)
	>3 to 5 weeks	17 (28.3%)
	> 5 weeks	4 (6.66%)
Formal training in safe handling of chemotherapeutic drugs	No	54 (90%)
	If yes, Workshop	4 (6.7%)
	In service education	1 (1.7%)
	Induction classes	1 (1.7%)
Challenge in safe handling of chemotherapeutic drugs	Lack of management support	20 (33.3%)
	High workload	17 (28.3%)
	Non Availability of PPE	17 (28.3%)
	Lack of provision of knowledge	• (10%)

Professional characteristics of the study participants are shown in the table 1. Here it is found that more than half of study participants (66.7%) were student trainee, from that eighty percent nursing personnel graduated Nurse and more than half (51.6%) had >3-5 year working/training experience in nursing. Majority of nursing personnel (90%) did not receive any formal training regarding safe handling of chemotherapeutic drugs. One third of nursing personnel (33.3%) reported lack of management support as a barrier to safe handling of chemotherapeutic drugs. Table 2 depicted practices regarding safe handling of chemotherapeutic drugs revealed that the total mean score of practices of nursing personnel regarding safe handling of chemotherapeutic drugs was 77.00. An obtained minimum practice score was 50 and obtained maximum practice score was 96. More than half of nursing personnel (51.7%) had average practices regarding safe handling of chemotherapeutic drugs. Table 3 depicted the mean score of practices of category I (during drug preparation) was 20.75. The mean score of practices of category II (during drug administration) was 25.98. The mean score of practices of category III (during side effects management) was 12.80. The mean score of practices of category IV (during post administration and disposal of waste) was 8.78. The mean score of practices of category V (during chemotherapy drug post exposure care) was 8.83. Table 4 depicted frequency and mean score of practices during drug preparation. The mean score of practices during drug preparation was 20.75.±6.06. Table 6 depicted frequency distribution and mean score of practices during side effects management was 12.8±02.34.

Table 7 depicted frequency distribution and mean score of practices during post administration and disposal of waste was 8.78±2.98, and during chemotherapy drugs post exposure care was 8.83±1.35. Table 8 depicted association of practices with selected socio-demographic variables revealed statistically highly significant association of practices with oncology work experience of nursing personnel and challenge in safe handling of chemotherapeutic drugs.

DISCUSSION

Chemotherapy preparation, administration, management of side effects, and post exposure care are key skills in oncology

Table 2. Mean and standard deviation of practices score of nursing personnel, Frequency and percentage distribution of nursing personnel according to practices score N=60

Practices score	Practices category	Mean ± SD	Frequency	Percentage (%)
	Poor practices (<50%)		3	5.0
	Average practices (51% - 74%)	77.00 ± 11.99	31	51.7
	Good practices (75% - 90%)		26	43.3
	Excellent practices (>90%)		0	0

Table 3. Mean and SD of categories of practices score of nursing personnel N=60

Practices categories	Practices Area	Possible score range	Obtained score range	Mean(score) ± SD
Category – I Total questions= 16	During drug preparation	0-32	8-30	20.75 ± 6.06
Category – II Total questions= 19	During drug administration	0-38	17-34	25.98 ± 4.95
Category – III Total questions= 8	During side effects management	0-16	7-16	12.80 ± 2.34
Category – IV Total questions= 6	During post administration & disposal of waste	0-12	2-12	8.78± 2.98
Category – V Total questions= 5	During chemotherapy drugs post exposure care	0-10	5-10	8.83± 1.35

Table 4. Frequency distribution and mean score of practices during drug preparation N=60

	Practices during chemotherapy drug preparation	Always (score=2)	Sometimes (score=1)	Never (score=0)		Mean ± SD
				Due to non availability	Even after availability	
1.1	Gather equipment required for drug administration.	50 (83.3%)	7 (11.6%)	0	3 (5%)	1.78 ± 0.54
1.2	Select appropriate gloves for chemotherapeutic drug preparation	45 (75%)	14 (23.3%)	0	1 (1.6%)	1.78 ± 0.48
1.3	Select appropriate gown for chemotherapeutic drug preparation.	25 (41.7%)	11 (18.4%)	0	24 (40%)	1.27 ± 0.91
1.4	Identify situations when face shield/eye protection is required.	19 (31.6%)	23 (38.3%)	0	18 (30%)	1.24 ± 0.79
1.5	Locate spill kit and mask.	24 (40%)	22 (36.7%)	0	14(23.3%)	1.39 ± 0.65
1.6	Obtain chemotherapeutic waste container.	36 (60%)	17 (28.3%)	0	7 (11.7%)	1.63 ± 0.60
1.7	Receive drug(s) from pharmacy in sealed container.	45 (75%)	9 (15%)	0	6 (10%)	1.84 ± 0.36
1.8	During preparation gloves changed after each administration, OR if contamination or puncture occurs, OR every 60 minutes.	31 (51.7%)	22 (36.6%)	0	7 (11.7%)	1.54 ± 0.56
1.9	Wear mask throughout the process of chemotherapy drug preparation	29 (48.3%)	21 (35%)	0	10 (16.7%)	1.45 ± 0.71
1.10	Separate the other drugs with chemotherapeutic drugs	33 (55%)	22 (36.7%)	0	5 (8.3%)	1.57 ± 0.66
1.11	Wipe off the vials and ampoules with alcohol swab after removing outer covering	9 (15%)	30 (50%)	0	21 (35%)	1.0 ± 0.70
1.12	Use biosafety cabine for preparation of chemotherapeutic drugs	0	0	60 (100%)	0	0
1.13	Label drugs after Preparation	53 (83.3%)	4 (6.7%)	0	3 (5%)	1.90 ± 0.38
1.14	Separate other waste from chemotherapeutic waste	35 (58.3%)	14 (23.3%)	0	11 (18.4%)	1.60 ± 0.74
1.15	During any spillage use spill kit	21 (35%)	18 (30%)	0	21 (35%)	1.27 ± 0.83
1.16	Clean the spillage area with sodium hypochlorite	33 (55%)	16 (26.7%)	0	11 (18.3%)	2 ± 0.70
					Total mean score	SD = 20.75± 6.06

practice. Fifty four actions were observed while the nurses prepared, mixed, and administered chemotherapy in their work surroundings. The overall findings of the study indicated that in majority of skill items nurses have poor performances in all stages including preparation, during administration and post administration of chemotherapy. However, during the self reporting practices, the nursing personnel reported that they were not following the international standards for chemotherapy preparation and administration. The available guidelines had many gaps as per international standards and were not being properly practiced at the clinical setting. In the present study more than ninety i.e. (96.7%) were female nursing personnel. Similar findings are also been reported in study by Chan Huan Keat *et al*(2013) where 93.6% participants were female. In the present study majority of nursing personnel (90%) did not receive any formal training regarding safe handling of chemotherapeutic drugs. Similar findings were revealed by Abbasi, *et al*(2019) and it revealed that almost all of the nurses (91.7%) stated that before working in an oncology unit, they did not receive any education about methods of protection.

Concerning the level of education, majority (80%) of the nurses in this study had graduated in nursing. This was in agreement with other studies done by Marwa G. *et al*(2018).[23] Verity R *et al*. (2008) conducted a descriptive study to explore the work of nurses who administer chemotherapy the findings highlighted the value of formal educational preparation in chemotherapy prior to undertaking the aspect of nursing. With regard, the barriers of safe handling chemotherapy about three quarter of nurses perceived main barrier of PPE is not always available Dler Hamad Esmail (2016). This finding is contrary to present study findings that revealed only 28.3% nursing personnel reported non availability of PPE. The present study revealed that more than half of nursing personnel i.e. (51.7%) had average level of practices regarding safe handling of chemotherapeutic drugs. Similar findings were founded in study by Dler Hamad Esmail (2016) illustrated that more than half i.e. (59.3%) had average practices of safe handling chemotherapy. Controversial findings were founded in similar study by Darshan Kumari (2018) and it illustrated that 74% nurses had excellent practices while administering chemotherapy drugs. In the present study seventy five percent

Table 5. Frequency distribution & mean score of practices during drug administration N=60

Practices during drug administration	Always (score=2)	Sometimes (score=1)	Never (score=0)		Mean ± SD
			Due to non availability	Even after availability	
For IV infusion					
1. Wash hands and wear gown and gloves before opening drug delivery bag.	28 (46.6%)	27 (45%)	0	5 (8.3%)	1.57± 0.50
2. Visually inspect the contents of the delivery bag.	37 (61.6%)	16 (26.7%)	0	7 (11.7%)	1.60± 0.65
3. Don face shield, as indicated.	13 (21.6%)	24 (40%)	0	26 (43.3%)	0.84± 0.79
4. Select IV equipment with locking connections	33 (55%)	14 (23.3%)	0	13 (21.7%)	1.63 ± 0.74
5. Place plastic-backed absorbent pad to protect patient from droplets.	14 (23.3%)	13 (21.7%)	0	33 (55%)	0.57± 0.79
6. Remove cap from IV tubing and connect to patient delivery site.	60 (100%)	0 (0%)	0	0(0%)	2± 0
7. Tighten locking connections.	43 (71.7%)	9 (15%)	0	8 (13.3%)	1.84± 0.50
8. Cover the tubing & bottle of photosensitive drugs	37 (61.7%)	14 (23.3%)	0	9 (15%)	1.54± 0.75
9. When complete, dis-continue IV bag/bottle/ tubing intact and re-cap patient delivery site.	50 (83.3%)	4 (6.7%)	0	6 (10%)	1.81± 0.52
10.Use yellow chemo- therapeutic container to discard disposable gloves and gown	30 (50%)	15(25%)	0	15 (25%)	1.36± 0.85
For IV push medication					
2.11 rap gauze around connection to catch drug droplets.	26 (43.3%)	22 (36.7%)	0	12 (20%)	1.27± 0.83
2.12 Tighten locking connection	47 (78.3%)	9 (15%)	0	4 (6.7%)	1.84± 0.44
2.13 When complete, remove syringe from needleless connection.	60 (100%)	0	0	0	1.72 ± 0.57
2.14 Discard syringe and waste in a puncture-proof/leak proof container	48(80%)	11(18.3%)	0	1 (1.7%)	1.84± 0.36
For IM/SC injections:					
2.15 Tighten locking connection.	49 (81.7%)	7 (11.7%)	0	4 (6.6%)	1.93± 0.24
2.16 When complete, do not re-cap needle.	32 (53.3%)	15 (25%)	0	13 (21.7%)	1.33± 0.85
2.17 Discard syringe-needle unit in puncture-proof/leak proof container.	47 (78.3%)	10 (16.7%)	0	3 (5%)	1.87 ± 0.33
For oral drugs:					
2.18 Wear gloves.	30 (50%)	22 (36.7%)	0	8 (13.3%)	1.45 ± 0.66
2.19 Open unit dose package and place into medicine cup (avoid touching drug or inside of package).	0 (0%)	0 (0%)	60 (100%)	0	0
				Total mean score ± SD = 25.98±4.95	

Table 6. Frequency distribution and mean score of practices during Side effects management N=60

Practices during Side effects management	Always (score=2)	Sometimes (score=1)	Never (score=0)		Mean ± SD
			Due to non availability	Even after availability	
3.1Educate patient regarding possible side effects of chemotherapy before starting initial infusion.	43 (71.7%)	17 (28.3%)		0	1.81 ± 0.39
3.2Check the patient's vitals before starting chemotherapy infusion.	42 (70%)	14 (23.3%)	0	4 (6.7%)	1.63 ± 0.65
3.3Perform hypersensitivity test before starting new hemotherapeutic agent.	0	0	0	60 (100%)	0
3.4Observe the patient for first 15 minutes of starting the chemotherapy infusion.	47 (78.3%)	11 (18.3%)	0	2 (3.4%)	1.87 ± 0.33
3.5On extravasation stop & disconnect infusion.	50 (83.3%)	10 (16.6%)	0	0	1.87 ± 0.33
3.6Elevate the limb (extravasated),	29 (48.3%)	25 (41.7%)	0	6 (10%)	1.33 ± 0.73
3.7Report the physician if there is any flu like symptoms occurs during infusion of chemotherapy drugs.	48 (80%)	12 (20%)	0	0	1.84 ± 0.36
3.8Educate the patient to do not break, crush, or chew the oral chemotherapy tablets.	36 (60%)	18 (30%)	0	6 (10%)	1.60 ± 0.60
				Total mean score ± SD = 12.80±2.34	

Table 7. Frequency distribution and mean score of practices during post administration & disposal of waste, Chemotherapy drugs post exposure care N=60

Practices during post adminis-tration, disposal of waste & chemo-therapy drugs post exposure care	Always (score=2)	Sometimes (score=1)	Never (score=0)		Mean ± SD
			Due to non availability	Even after availability	
1.Don gown, gloves, and face shield, during disposal of chemotherapeutic waste.	31 (51.6%)	17 (28.4%)	0	12 (20%)	1.33 ± 0.73
2.Seal contact material in plastic bag for transport to chemotherapeutic waste container.	34 (56.7%)	11 (18.3%)	0	15 (25%)	1.45 ± 0.83
3.Place sealed plastic bag in chemo-therapeutic waste container.	33 (55%)	15 (25%)	0	12 (20%)	1.39 ± 0.82
4.Remove PPE properly; seal it in a plastic bag, and dispose of it in the chemotherapeutic waste container.	32 (53.3%)	14 (23.3%)	0	14 (23.4%)	1.45 ± 0.79
5.Close lid on waste container.	43 (71.7%)	9 (15%)	0	8 (13.3%)	1.72 ±0.57
6.Wash hands thoroughly after removal and disposal of PPE.	56 (93.3%)	3 (5%)	0	1 (1.7%)	1.9 ± 0.33
Total mean score ± SD = 8.78±2.98					
5. Chemotherapy drugs post exposure care:					
5.1 Immediately wash hands with soap and water on contact with chemotherapeutic drugs spillage.	54 (90%)	6 (10%)	0	0	1.9 ± 0.30
5.2 Immediately flush the eyes for 15 minutes using tap water if drug enter the eyes	56 (93.3%)	1(1.7%)	0	3 (5%)	1.91 ± 0.46
5.3 Immediately clean the cuts and scrapes with soap and water on contact with chemotherapeutic drugs spillage.	53 (88.3%)	5 (8.3%)	0	2 (3.4%)	1.85 ± 0.44
5.4 Immediately change the Chemo- therapeutic drugs spillage soiled linen	33 (55%)	21 (35%)	0	6 (10%)	1.45 ± 0.67
5.5 Immediately report the incident to physician.	47(78.3%)	11 (18.3%)	0	2 (3.4%)	1.75 ± 0.50
Total mean score ± SD = 8.83 ±1.35					

Table 8. Relationship of Practice score with selected socio demographic variables N=60

Socio Demographic characteristics		Mean ±SD	Df	F/t/r value	P value
Age		77.00 ±11.99		r=0.27	0.33^{NS}
Gender	Female	76.67±12.06	58	-1.142	.258^{NS}
	Male	86.50± 2.12			
Marital status	Single	74.84± 11.70	1	5.78	.055^{NS}
	Married	82.94± 11.04			
Family type	Nuclear	75.29± 11.70	1	3.84	. .055^{NS}
	Joint	82.13±11.74			
Residence place	Urban	78.28± 12.72	58	.804	.425^{NS}
	Rural	80.94± 12.88			
Family income	10,000-30,000 Rs	74.79± 11.14	58	-1.98	.051^{NS}
	>50,000 Rs	81.10± 12.70			
Education	Graduate nursing	75.98± 11.97	58	-1.327	.190^{NS}
	Diploma nursing	81.08±11.65			
Professional characteristics					
Group of nursing personnel	Staff nurse	75.79±12.44	58	-0.751	0.45^{NS}
	Student trainee	78.13± 11.65			
Work / training experience	< 1 year	79.33 ±13.99	3	2.37	.080^{NS}
	>1 to 3 years	79.00 ± 3.80			
	>3 to 5 years	73.26±11.61			
	> 5 years	82.11±11.99			
Oncology work experience	Staff nurse	63.00 ±12.49	3	3.843	0.03*
	< 1 year				
	>1 to 3 years	80.89 ±12.71			
	>3 to 5 years	88.50± 4.95			
	> 5 years	86.40 ± 8.73			
	Student trainee	81.80±18.62	3	5.895	.002*
	< 1 week				
	>1 to 3 weeks	67.36± 6.22			
	>3 to 5 weeks	79.59 ±9.58			
	> 5 weeks	81.50±18.28			
Formal training in safe handling of chemo-therapeutic drugs	No	76.70±12.20	3	.793	.503^{NS}
	If yes, Workshop	77.50± 9.11			
	In service education	95.00± 0			
	Mass media education	0			
	Induction classes	73.00± 0			
Challenge in safe handling of chemo-therapeutic drugs	Lack of management support	76.85±12.73	2	2.94	.041*
	High workload	79.88±10.49			
	Non availability of PPE	71.24±10.25			
	Lack of provision of knowledge	85.67±12.67			

*=Significant at p <0.05

nurses always wear gloves during preparation of drugs. This result was supported by the findings of Chaudhary Ramanand *et al* (2012) and it revealed that majority of participants i.e. 92% reported usually wearing gloves during chemotherapy handling. Present study revealed that none of personnel never use biosafety cabinet for preparation of chemotherapeutic drugs, opposite findings were reported by another study Martin and Larson (2003) and revealed that 99% staff nurses were preparing chemotherapeutic drugs in laminar air flow. In the present study less than half of nursing personnel i.e. 41.7% always wore gown and none of them ever use biosafety cabinet during drug preparation. Opposite findings was revealed in the study done by Demirkan K *et al* (2018) which showed that Almost 90% of respondents 'always' use a coat, mask and biological safety cabinets. This study revealed that near to half (43.3%) nursing personnel never use face shield during handling of chemotherapeutic drugs. At The Same Line, HE *et al* (2017) found that nurses never used the eye protection during handling of chemotherapeutic drugs. The present study reflected that over half of nurses (51.6%) were always using gloves while disposal of chemotherapeutic waste. These findings were supported by same study done by Azza Ibrahim (2018). More than half (55%) of nursing personnel never place plastic backed absorbent pad to protect patient from droplets. Similar study by James M *et al.,* (2014) revealed that more than half 59% always Use a plastic backed absorbent pad under injection site. Present study revealed that none of nursing personnel never use medicine cup to provide oral chemotherapeutic drugs to cancer patient.

A study by Bolbol SA *et al*(2016) revealed that 56% nursing personnel never counting uncoated oral tablets from multi-dose bottles, this is because most nurses give oral tablets to the relatives to give them to the patients. In the present study there is no association of practices with demographic variables and there is significant association of oncology work experience with practices of nursing personnel. Similar findings was revealed in previous study done by Bolbol SA *et al.* (2016) which showed that the practice of nurses was not affected by socio-demographic characteristics. In the present study there was significant association of practices with work experience. Supporting findings were founded in the similar study Zayed HA *et al*. (2019) and revealed that work experience was associated with adequate practices. In the present study there is significant association with lack of provision of knowledge and non availability of PPE with practices. Similar findings was revealed in the study Soheir Mohamed Waheida *et al.,* (2015). and it revealed that the nurses did not comply with recommended safety behavior (rules and regulations) due to workload, lack of knowledge and lack of equipment and facilities. Another study revealed poor safety protective measures among nurses handling cytotoxic drugs which had negative effect on their health.

Conclusion and Recommendation

After the detailed analysis this study leads to following conclusions, chemotherapeutic drugs have been widely used clinically.

In addition, nursing personal exposed to chemotherapeutic drugs do not generally attach enough importance to self protection. To raise the self protection consciousness and ability of nursing personal exposed to chemotherapeutic drugs, hospitals should build a perfect monitoring system, set standard training programs, and introduce protective facilities, so that the hazards could be limited to the least. Presently nurses had average practices regarding safe handling of chemotherapeutic drugs. Therefore, there is a need to improve the safety of the work environment; make available protective equipment develop standard practice guidelines for oncology nurses.

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