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Chemotherapy Safety Protocol for Oncology Nurses: It's Effect on Their Protective Measures Practices

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***Abstract*—**Background: Widespread use of chemotherapeutic drugs in the treatment of cancer has lead to higher health hazards among employee who handle and administer such drugs, so nurses should know how to protect themselves, their patients and their work environment against toxic effects of chemotherapy. Aim of this study was carried out to examine the effect of chemotherapy safety protocol for oncology nurses on their protective measure practices. Design: A quasi experimental research design was utilized. Setting: The study was carried out in oncology department of Menoufia university hospital and Tanta oncology treatment center. Sample: A convenience sample of forty five nurses in Tanta oncology treatment center and eighteen nurses in Menoufiya oncology department. Tools: 1. an interviewing questionnaire that covering socio-demographic data, assessment of unit and nurses' knowledge about chemotherapy. II: Obeservational check list to assess nurses' actual practices of handling and adminestration of chemotherapy. A base line data were assessed before implementing Chemotherapy Safety protocol, then Chemotherapy Safety protocol was implemented, and after 2 monthes they were assessed again. Results: reveled that 88.9% of study group I and 55.6% of study group II improved to good total knowledge scores after educating on the safety protocol, also 95.6% of study group I and 88.9% of study group II had good total practice score after educating on the safety protocol. Moreover less than half of group I (44.4%) reported that heavy workload is the most barriers for them, while the majority of group II (94.4%) had many barriers for adhering to the safety protocol such as they didn't know the protocol, the heavy work load and inadequate equipment. Conclusions: Safety protocol for Oncology Nurses seemed to have positive effect on improving nurses' knowledge and practice. Recommendation: chemotherapy safety protocol should be instituted for all oncology nurses who are working in any oncology unit and/ or center to enhance compliance, and this protocol should be done at frequent intervals.

***Keywords*—**Chemotherapy Safety protocol, Effect, protective measure practice.

I. Introduction

CYTOTOXIC drugs sometimes known as antineoplastic, anticancer or cancer chemotherapy drugs include a wide range of chemical compounds. Because of their ability to kill tumor cell by interfering with cell division, they are extensively used to treat cancer [1].

More than 11 million cancer cases diagnosed each year worldwide and expected to rise to 16 million by the year 2020. The rising patient' number leads to an increase in the use of chemotherapy drugs [CDs) and so much more possibility of exposure of the health-care workers to these drugs. The number of staff potentially exposed to hazardous effect of the chemotherapy drug was more than 5.5 million [2]. Moreover the wide spread use and complexity of chemotherapy has raised concerns about the risks to health care workers involved in preparing and administrating these drugs and/or caring for patients undergoing treatment [3]-[4].

Many of these drugs are known to be carcinogenic, teratogenic and mutagenic to humans [5]. Recent studies show the increase in the potential risks due to occupational exposure to these drugs. These may include hair loss, headache, acute irritation as well as adverse reproductive outcomes including infertility, spontaneous abortion and congenital malformation. Exposure mainly occurs during preparation and administration in health care practice. Nurses and pharmacists are the main groups that are exposed to these drugs in the ambulatory care and hospital setting [6].

Exposure may results from direct contact via skin or mucous membrane as eyes[e.g. splashes] and inhalation of droplet aerosolization mainly because of inappropriate hygienic behavior such as eating, drinking or smoking during preparation, administration or disposal of CDs in contaminated areas. Less likely routs of exposure include needle stick injuries [7].

The potential occupational risks for health care professionals may vary due to differences in the frequency and duration of use and individual vulnerability [8]. All hospital staff working with chemotherapy drugs should take protective measures to protect themselves from possible exposure which is greatly increase during administration of these drugs, therefore strict safety protocol is required at all times [9].

Chemotherapy safety protocol are important in handling, administration and as well as patient care after treatment such measure include using good hygiene practices such as avoiding eating, drinking and smoking in area where drugs are prepared, providing washing facilities, also personnel protective equipment should be provided to prevent direct contact with drugs and should be suitable to the wearer and in good condition [1]. Moreover the drugs should be available in a form that is ready to administer without additional manipulation and all used supplies should be disposed of in the proper receptacles [7].

Safety should also be stressed when handling patients' excrement. Because excreta from treated patient may contain unchanged cytotoxic drugs or active metabolites, so when handling these wastes, staff should wear suitable personnel protective barriers [10]. Although there has been an increased awareness and concern regarding these issues, many nurses still don't' follow the guidelines and procedures in the hospital settings [7]. Nurse's awareness of hazards of chemotherapy is

associated with improvement of protective measures practice [11].

II. Aim of the Study

The aim of the present study was to examine the effect of chemotherapy safety protocol for oncology nurses on their protective measure practices.

III. Research Questions

1- What is the effect of chemotherapy safety protocol for oncology nurses on knowledge about protective measures practice for chemotherapy handling and administration?
2- What is the effect of chemotherapy safety protocol for oncology nurses on their protective measures practice?
3- What are the barriers preventing oncology nurses to adhere to chemotherapy safety protocol?

IV. Operational Definition

Chemotherapy safety protocol: is a protocol that is carried by oncology nurses during handling and administration of chemotherapy as well as patients' care after the treatment to protect them from hazardous effect of chemotherapy.

V. Subjects and Method

A. Subjects

Design

A quasi experimental research design was utilized.

Setting

The study was conducted at oncology department of Menoufia university hospital and Tanta oncology treatment center- Ministery of Health and Population.

Subjects

A convenience sample of 63 nurses from the pervious setting was chosen to achieve the aim of the study. It consisted of:

- Study group I: 45 nurses in Tanta oncology treatment center.
- Study group II: all nurses in Menoufia oncology department [18 nurses]. All participants should be involved in handling and administrating chemotherapeutic drugs.

Tools

Two tools were utilized for data collection. These tools are as follow:

Tool I : An interviewing questionnaire

It was constructed by the researchers to assess nurses' knowledge about safe handling and adminestration of chemotheraputic drugs. It include four parts:

Part one : sociodemographic data**.** It comprised of information about : Nurses' age, sex, marital status, educational level, years of experience as oncolgy nurse, fertility history, smoking history, frequency of regular medical checkup, complains due to chemotherapeutic exposure and previous training about safe handling and adminestration of chemotheray.

Part two : Oncology unit assessment. It included data about assessment of oncology unit by the subjects as adequacy of personnel protective barriers in the unit: gloves, gowns and masks, adequacy of time to follow the precautions, head nurse' role in correcting wrong practices, adequate chance for training about chemotherapy safety protocol, presence of strict polices and procedure in the unit to decrease hazards' exposure to chemotherapy and cleanliness, tidiness and crowdness of the unit.

Part three: knowledge about chemotherapy**.** It included twelve questions to assess nurses' knowledge about chemotherapy protective measures such as definition; types; objectives for use and methods of adminestrations of chemotherapy, time for appearance of chemotherapy' hazards, the most affected body parts, types of occupational hazards, routs of hazards exposure, methods of protective measures during handling, adminestration, dealing with splashes of chemotherapy to eyes and skin and dealing with patient' excreata.

Scoring system: Each question was given a score from zero to two in which zero indicated wrong answer or I don't know, while 1 indicated correct and incomplete answer and 2 indicated correct and complete answer. All scores were summed with a higher score indicated good knowledge as follow:

- A score of zero to 12 indicated poor total score.
- A score of 13 to 18 indicated fair total score.
- A score of 19 to 24 indicated good total score.

Part four : barriers for not following the chemotherapy safety protocol.

Tool II : observational check list:

It was developed by the researchers to assess nurses' actual practice of handling and adminestration of chemotheraputic drugs and dealing with patients' excreata. It consisted of ten statement to be checked by the researchers if it carried out by the subjects or not such as: no eating, drinking, smoking or doing make up at areas of drug administration, wearing personnel protective barriers, immediate change of any contaminated personnel protective barriers after contact with chemotherapy, dispose patients' excreta correctly, washing hands thoroughly after any contact with chemotherapy, washing skin and eye immediately after chemotherapy splashes and cleaning solid surfaces correctly**.**

Scoring system: each statement was given a score of one if the action is made correctly and zero if it is not done or incorrectly. The total score were summed with a higher score indicated good practice as follow:

- A score of zero to 6 indicated poor total score.
- A score of 7 to 10 indicated good total score.

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B. Method

- After an explanation of the aim of the study, a written permission was obtained from hospitals directors and the head nurses of both setting.
- Tool development: all tools were developed by the researchers after extensive review of literature, and then they were tested for its content validity by five experts in the field of Nursing and Oncology specialty to ascertain relevance and completeness.
- Reliability of the tools was done by test- retest method and Pearson correlation coefficient formula to ascertain the consistency of the tools to measure the items. It was 89 %(r=.89) for tool I and 86% (r=.86) for tool II.
- The researchers designed a chemotherapy safety protocol in a formal booklet that includes information about chemotherapy such as definition, types, methods of administration, and aims of chemotherapy. Also it includes information about time of appearance of chemotherapy hazards, susceptible system for hazards, types of hazards on health care workers, methods of exposure, and ways of protection during handling, administration and or dealing with patients' excretion. Moreover the protocol included the way the nurse should deal with drug splashes on eye and skin and ways of cleaning solid surfaces from chemotherapy contamination.
- Nurses' verbal approval to participate in the study was obtained after explanation of the aim of the study to each subject. The researchers introduced themselves to all subjects then they were reassured that any information obtained would be confidential and only will be used for the study's aim. The researchers emphasized that participation in the study is entirely voluntary and anonymity of subjects were assured through coding data.
- A pilot study was conducted prior to data collection on seven nurses to test clarity and applicability of the tools and the designed protocol, estimate the time needed to collect data and then the necessary modifications were done accordingly. Subjects included in the pilot study were also included in the actual study due to limitation in the number of study sample.

Data Collections

a. Data were collected over a period of five months from beginning of November 2012 to the end of March 2013.
b. A convenience sample was taken that consisted of forty five nurses in Tanta oncology treatment center who were selected by the head nurse and all nurses in Menoufia oncology department.
c. Each subject of both study groups was interviewed individually to collect their sociodemographic data and also collect data about their oncology unit by using part one and two of tool I.
d. Each subject of both study groups was assessed for his/her knowledge about chemotherapy and ways of safe handling and administration of these drugs by interviewing them individually and using part three of tool I. gathering data of tool I took about 30 minutes for each subject.
e. Each subject of both study groups was observed individually by the researchers for caring for five patients during handling and administration of chemotherapy and dealing with patients' excreta to assess their actual practice regarding these issues by using tool II.
f. All subjects of both study groups were divided into subgroups to help nurses to carry their duties without interruption, and then the researchers illustrated the designed chemotherapy safety protocol for each subgroup. Also the designed booklet was distributed to each subject of both study groups.
g. After two months**,** all subjects of both study groups were assessed for knowledge and practice about safe handling and administration of chemotherapy as well as dealing with patients' excreta using part three of tool 1 and tool 11 to determine the effectiveness of the given protocol. A comparison between subjects' knowledge and practice before and after the given protocol for both study groups was done.
h. All subjects of both study groups were asked about their barriers to follow chemotherapy safety protocol using part four of tool I.

Statistical Analysis

Data was collected, tabulated and statistically analyzed using SPSS version II statistical program. Comparison between data was done using a T. test and chi- square test. Change in qualitative data with time for the same group was done using Mc- Nemar test. Statistical significance was considered at 5% level.

Limitations of the Study

Numbers of nurses were very small especially in Menoufia oncology department that don't not allow for generalization of the study' results.

VI. Results

Table I showed that, the mean age of both study groups were 31.91± 7.49 and 29.06 ± 4.28 years respectively. Almost all of both study groups were female [97.8% for study group I and 100% for study group II]. All almost all of both study groups were married (91.1% and 100%) respectively. Regarding education, 64.4% of study group I and 50 of study group II had diploma degree. Moreover the majority of both groups didn't be trained previously about chemotherapy.

Table II showed that, the majority of both study groups didn't have abortion, handicapped and dead children (84.5%, 97.8 and 93.3% respectively for group I and 88.9%, 100% and 88.9% respectively for group II). Also the majority of both groups didn't carry out regular medical check up.

Fig. 1 revealed that about one fourth (24.4%) of study group I and more than one third (38.4%) of study group II complained of recurrent headache.

Table III presented that 80% of study group I reported that personnel protective barriers were available adequately, the head nurses always correct their wrong practices; the unit is clean, tidy and not crowded. While all (100%) of study group II assessed their unit negatively except for the presence of personnel protective barriers. There were significant differences between both groups related to all items of unit assessment.

Table IV revealed that before educating the subjects of both study groups the chemotherapy safety protocol, about three fourth of study group I (77.8%) had fair total knowledge score but 61.1% of study group II had poor total knowledge score. While after the protocol, 88.9% of study group I and 55.6% of study group II improved to good total knowledge score. This table answers the research question number 1.

Fig. 2 showed that the majority of both study groups (71.1% and 94.4% respectively) had poor total practice score before educating them the safety protocol. While after the protocol, the majority of both study groups (95.5% and 88.9% respectively) II improved to good total practice score. This table answers the research question number 2.

Table V illustrated that there were statistical significant improvements in total knowledge score for both study groups before and after educating them the safety protocol. This table answers the research question number 1.

Table VI illustrated that there were statistical significant improvements in total practice score for both study groups before and after educating them the safety protocol. This table answers the research question number 2.

Tables VII revealed that less than half of study group I (44.4%) reported that heavy workload is the most barriers for them. While the majority of study group II (94.4%) found that all items were considered barriers for them to adhere to the safety protocol. This table answers the research question number 3.

TABLE I
DISTRIBUTION OF STUDIED GROUPS ACCORDING TO THEIR SOCIO-DEMOGRAPHIC CHARACTERISTICS

Sociodemographic characteristics	Study Group I n=45		Study Group II n=18		Total n=63		p- value of significant	
	No	%	No	%	No	%	Test of significance	P -value
Age Mean ± SD	**31.91±7.49**		**29.06±4.28**				**T=1.51**	>0.05
Sex								
• Male	1	2.2	0.0	0.0	1	1.6	X2=0.4	>0.05
• Female	44	97.8	18	100	62	98.4		
Marital status								
• Single	1	2.2	0.0	0.0	1	1.6	X2=1.7	>0.05
• Married	41	91.1	18	100	59	93.7		
• Widowed	3	6.7	0.0	0.0	3	4.7		
Education								
• Diploma	29	64.4	9	50	38	60.3	X2=1.17	>0.05
• Nursing institute	13	28.9	7	38.9	20	31.7		
• Baccalaureate	3	6.7	2	11.1	5	8.0		
Years of experience Mean ± SD	12.51±6.18		8.33±5.56				T=2.44	<0.01*
Previous training								
• Yes	3	6.7	2	11.1	5	7.9	X2=0.34	>0.05
• No	42	93.3	16	88.9	58	92.1		

* Significant

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TABLE II
DISTRIBUTION OF STUDIED GROUPS ACCORDING TO THEIR MEDICAL DATA

Sociodemographic characteristics	Study Group I n=45		Study Group II n=18		Total n=63		p- value of significant	
	No	%	No	%	No	%	Test of significance	P -value
Number of living children								
• ≤ 2	12	26.7	11	61.1	23	36.5	X2=8.54	<0.01*
• > 2	28	62.2	4	22.2	32	50.8		
• No	5	11.1	3	16.7	8	12.7		
No of abortion								
• ≤ 2	6	13.3	2	11.1	8	12.7	X2=0.48	>0.05
• > 2	1	2.2	0.0	0.0	1	1.6		
• No	38	84.5	16	88.9	54	85.7		
No of handicapped								
• ≤ 2	1	2.2	0.0	0.0	1	1.6	X2=0.40	>0.05
• No	44	97.8	18	100	62	98.4		
No of dead children								
• ≤ 2	3	6.7	2	11.1	3	4.8	X2=0.34	>0.05
• No	42	93.3	16	88.9	60	95.2		
Regular medical check up								
• No								
• Every 2-5 years	42	93.3	16	88.9	58	92.1	X2=1.26	>0.05
• Every more than 5 years	2	4.5	0.0	0.0	2	3.1		
	1	2.2	2	11.1	3	4.8		

NB: All nurses in both groups were nonsmokers * Significant

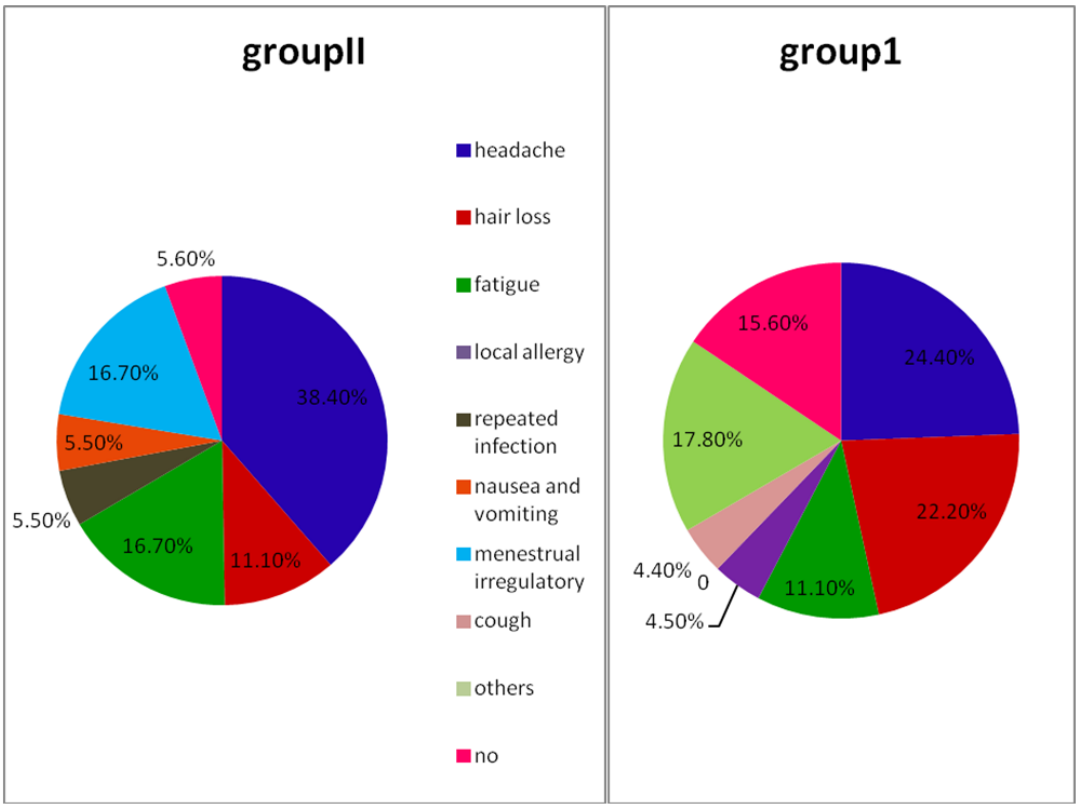


Fig. 1 Distribution of nurses' complains due to chemotherapeutic exposure as expressed by both groups
* Other means that: Some nurses choose all of the following answers: headache, hair loss, local allergy, dizziness and skin inflammation

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TABLE III
DISTRIBUTION OF ONCOLOGY UNIT ASSESSMENT BY STUDY BOTH GROUPS

Items	Study Group I n=45		Study Group II n=18		p- value of significant	
	No	%	No	%	Test of significance	P -value
-Personnel protective barriers	2	4.4	18	100		
-Enough time	36	80.0	0.0	0.0		
-Head nurse always correct wrong practice	36	80.0	0.0	0.0	X2=54.18	<0.001*
-The unit is not crowded and tidy						
-Unit is clean	36	80.0	0.0	0.0		
-Presence of all of items of assessment	36	80.0	0.0	0.0		
	7	15.6	0.0	0.0		

*** Significant**

NB: All subjects of both groups reported that they had adequate chance for training about chemotherapy safety protocol and their unit had strict policies and procedures to decrease hazards of chemotherapy.

TABLE IV
DISTRIBUTION OF TOTAL KNOWLEDGE SCORES OF BOTH STUDY GROUPS BEFORE AND AFTER SAFETY PROTOCOL EDUCATION

Items	Study Group I n=45		Study Group II n=18		Total n=63		p- value of significant	
	No	%	No	%		No	%	No
Total knowledge score [before the protocol]								
• Poor	3	6.7	11	61.1	14	22.2	X2=22.86	<0.0001*
• Fair	35	77.8	7	38.9	42	66.7		
• Good	7	15.5	0	0.0	7	11.1		
Total knowledge score [after the protocol]								
• Fair	5	11.1	8	44.4	13	20.6	X2=8.72	<0.01*
• Good	40	88.9	10	55.6	50	79.4		

* Significant

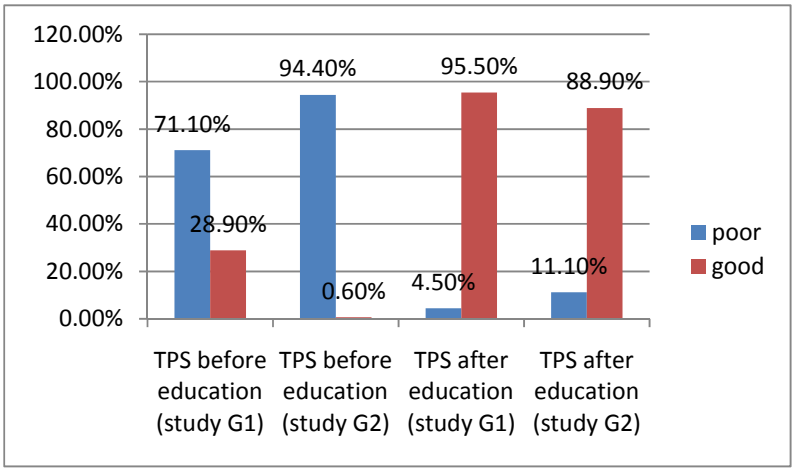


Fig. 2 Distribution of total practice score [tps] of both study groups before and after safety protocol education

NB: X2 [before] =4.05 with $p < 0.05$[significance] and X2[after] =0.96with $p > 0.05$

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TABLE V
DISTRIBUTION OF TOTAL KNOWLEDGE SCORE PRE AND POST THE SAFETY PROTOCOL FOR BOTH STUDY GROUPS

Items	Study Group I[pre] n=45		Study Group I[post] n=45		Study Group II[pre] n=18		Study Group II[post] n=18	
	No	%	No	%	No	%	No	%
Total knowledge score								
• Poor and fair	38	84.4	5	11.1	18	100	8	44. 4
• Good	7	15. 6	40	88. 9	0.0	0.0	10	55. 6
p- value of significant								
• Mc –Nemar test	31.03				0.0			
• P-value	<0.0001*				<0.01*			

* Significant

TABLE VI
DISTRIBUTION OF TOTAL PRACTICE SCORE PRE AND POST THE SAFETY PROTOCOL FOR BOTH STUDY GROUPS

Items	Study Group I[pre] n=45		Study Group I[post] n=45		Study Group II[pre] n=18		Study Group II[post] n=18	
	No	%	No	%	No	%	No	%
Total practice score								
• Poor	32	71.1	2	4.4	17	94.4	2	11.1
• Good	13	28.9	43	95.6	1	5.6	16	88.9
p-value of significant								
• Mc –Nemar test	28.03				0.0			
• P-value	<0.0001*				<0.01*			

* Significant

TABLE VII
DISTRIBUTION OF BARRIERS FOR FOLLOWING CHEMOTHERAPY SAFETY PROTOCOL AS EXPRESSED BY BOTH STUDY GROUPS

Barriers	Study Group I n=45		Study Group II n=18		Total n=63		p- value of significant	
	No	%	No	%		No		
Don't know it	9	20	0.0	0.0	9	14.3	X2=58.3	<0.0001*
The place is not suitable for following the precautions	9	20	0.0	0.0	9	14.3		
Heavy work load	20	44.4	1	5.6	21	33.3		
Inadequate equipment	3	6.7	0.0	0.0	3	4.86		
Others**	4	8.9	17	94.4	21	33.3		

* Significant
** Others means subjects choose all options of the barriers

VII. DISCUSSION

Anti cancer drugs present toxicity risks and some adverse effects for patients as well as health care workers [12]-[13]. The present study showed that, the mean age for study group I was 31.91±7.49 years and for study group II was 29.06±4.28 years. This finding is in line with Turk et al. [14] who mentioned that the mean age of their study population was 33.9± 9.32 years. Also the mean age of Chaudhary and Karn's sample was 28.9±6.32 years [7]. Regarding sex, Kyprianou et al. [15] reported that the majority of their study sample were female. This is consistent with the results of the present study which stated that almost all of both study groups were female.

As regard educational level, the present study revealed that the minority of both study groups had baccalaureate degree. This is in contrast with the result of [7] who mentioned that the majority of the studied nurses had university degree. This may be due to the sample of the present study is so smaller than that study that may not allow us to generalize the results and difference of setting also may affect the results of education.

The finding of the current study showed that the mean years of experience was 12.51±6.18 years for study group I and 8.33±5.56 years for study group II. These results were more than the results of [7] who reported that the mean years of experience was 6.52± 5.88 years and 3.32±0.52 years for both groups respectively. This discrepancy may be due to the majority of the present sample had got diploma degree and graduated from many years.

In relation to reproductive health information, Kyprianou et al. [15] summarized that minority of the sample had still birth

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and only one woman reported having a child with a genetic abnormality. This is in agreement with the result of the present study.

Regarding regular medical check up, Turk et al. [14] mentioned that minority of the studied nurses had undergone a regular health examination. This confirmed the finding of the present study which showed that the majority of both study groups didn't perform regular medical checkup.

In respect to receiving pervious training, the current study illustrated that the majority of both groups didn't receive pervious training about chemotherapy safety precautions. In contrast to this study, [14]-[16] stated that about one third of nurses participating in their studies had undergone specialized training for handling and administrating chemotherapeutic drugs. This highlights the need for giving importance to training of nurses in these setting to protect them from toxic effects of these agents. But the results of the present study is in line with Duzenli [17] who established that only few nurses have attended a training program about protection from the harmful effect of chemotherapy.

In relation to smoking habits, the present study showed that none of both study groups were smokers. This result is differed from turk et al. [14] who mentioned that less than half of their sample were smokers. This discrepancy may be illustrated by almost all of both study groups of the present study were female and our culture showed that smoking habit is not prevalent among female of our society.

It is known that inappropriate handling of chemotherapy can lead to a number of potential health risks [18]. In the current study, the researcher assessed all symptoms reported in the specific literatures as possible adverse health effects associated with inappropriate handling and administration of chemotherapy. The most pronounced symptoms reported in the current study as well as in previous study were headache [14]-[15].

Regarding chemotherapy unit assessment, the current study reported that both setting had personnel protective barriers adequately. This is similar with Kyprianou etal. [15] Who mentioned that availability of personnel protective equipment in their study was high.

The awareness of the nurses handling and administering the chemotherapeutic drugs is of concern because it is important in raising standards of safety [14]. In this respect, the results of the present study concluded that the pretotal knowledge and practice scores among both groups were not as good as permit safety for them. This is consistent with Chaudhary and Karn [7] who summarized that the level of knowledge on this issue is not satisfactory and the nurses didn't comply to the recommended safety behavior to chemotherapy. Also Mohesen et al. [19] reported that almost three fourth of the sample lack any essential knowledge before the educational protocol.

The present study showed that the total pre knowledge score of both groups was statistically significantly improved after educating them the chemotherapy safety protocol. This is in line with Turk et al. [14] who stated that significant differences were found between the mean knowledge scores of nurses who had participated in an educational program compared with the groups who had no formal education about chemotherapy. Also Elshikh [20] found a statistical significant difference between control and study groups as regard to total knowledge score after implementing a protocol of care.

A report showed that the higher the nurses' knowledge, the more they adhere to the use of safety measures in their work and this is in turn contributes to their sense of well being [15]. This is consistent with the finding of the present study which reported that there was statistical significant improvement of total practice score of both study groups after educating them the chemotherapy safety protocol.

Concerning barriers for following the safety precautions, it was noticed from the current study that less than half of study group I mentioned that the heavy work load is the main barrier for follow the precautions. This is consistent with the result of Fareed and Dorgham [21] who mentioned that about half of their sample stated that high work load is the most important factor affecting their compliance to any important behavior. Also Creedon et al. [22] reported that compliance difference is depending on people' areas of work. This result is in line with the finding of the present study which stated that one fifth of study group I reported that they did not know the precautions. This result is consistent with Chaudhay and Karn [7] who illustrated that the staff handling the chemotherapy don't have satisfactory knowledge which is of concern because it increases the heath workers' unsafe behavior. Kosgeroglou et al. [11] added that the overall high rates of adherence to safety guidelines are consistent with the higher level of awareness of hazardous related to chemotherapy.

VIII. Conclusion

The present study concluded that before educating the oncology nurses of both groups, the chemotherapy safety protocol, their knowledge and practice were not satisfactory. Despite this conclusion the total score of knowledge and practice are better among study group I than study group II. But enrichment of these nurses by the safety protocol seemed to have positive effect on improving their knowledge and practice. Also this study showed the necessity of improving the work environment especially for group II as a method to provide a protection for the health care workers especially oncology nurses who are involved in handling and administration of chemotherapy.

IX. Recommendations

1. Chemotherapy safety protocol should be instituted for all oncology nurses who are working in any oncology unit and/ or center to enhance compliance. And this protocol should be done at frequent intervals.
2. Nurses need continuous evaluation and performance feed back on compliance rate of safe handling and administration of chemotherapy to improve their practice.
3. Polices to improve working areas and increase the needed equipment should be instituted.

4. Replication of the study using a large probability sample from different geographical areas must be considered in the development of future research to allow greater generalization of the results.

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