

## RESEARCH COMMUNICATION

# Knowledge, Attitude and Safe Behaviour of Nurses Handling Cytotoxic Anticancer Drugs in Ege University Hospital

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### Abstract

Many antineoplastic drugs are known to be carcinogenic, teratogenic and mutagenic to humans. There is thus a potential risk due to occupational exposure to cytotoxic drugs (CDs). Nurses and pharmacists are the main groups that are exposed to these drugs in the ambulatory care and hospital settings. An analytic cross sectional study was here carried out in order to evaluate the level of knowledge of nurses on the health effects and the routes of exposure to CDs, to clarify the protective measures while handling these agents and to determine the influence of this knowledge on clinical attitudes, behaviour and actual usage of safety measures. The level of knowledge of the nurses concerning antineoplastics was not satisfactory. Findings for nurses' safety behaviour and usage of recommended health safety measures showed that, notwithstanding the rules and regulations pertaining to CDs, nurses did not comply with them fully. In service training is a very effective tool to increase the level of knowledge. This study also revealed the necessity for improvement of the working environment and the availability of appropriate protective equipment.

**Key Words:** Cytotoxic drugs - occupational exposure - oncology nurses - knowledge - attitude-safe behaviour

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### Introduction

Today cancer patients are diagnosed earlier than in the past, and many receive multiple courses of chemotherapy for a longer period of time (Ben-Ami et al, 2001). Many antineoplastic drugs are known to be carcinogenic, teratogenic and mutagenic to humans (Ben-Ami et al, 2001; IARC, 1976, 1981, 1987; OSHA, 1986,1999; Schreiber C et al, 2002; Burgaz et al,1999). Recent studies show the increase in the potential risks due to occupational exposure to Cytotoxic Drugs (CDs). Occupational exposure is important because physical, economic and sociocultural factors are major determinants of behaviour relevant to cancer (Aydemir et al, 2003). Exposure and absorption occur during the preparation and administration in health care practice (Ensslin A et al,1997; Pethran et al, 2002; Martin et al, 2002; Mastour et al, 1997; Kubilay et al,1997). Nurses and pharmacists are the main groups that are exposed to these drugs in the ambulatory care and hospital settings (OSHA,1999; Pethran et al, 2002; Sessink et al, 1992; Sessink et al, 1997; Vollono et al, 2002).

Exposure may result from direct contact via skin or eyes (Sessink et al, 1992; Sessink et al, 1994; Sessink et al, 1997) and inhalation of droplets aerosolization, mainly because of inappropriate hygienic behaviour such as eating, drinking or smoking during preparation, administration, or disposal of CDs (Nygren et al, 1997; Micoli G, 1997; American Society of Hospital Pharmacists, 1990). Among the possible chronic effects of CDs are cancer, fertility problems, long term genetic changes in off-spring, abortion and abnormalities in the fetus (American Society of Hospital Pharmacists, 1990; OSHA, 1999; Saurel-Cubizolles et al, 1993; Kristev et al, 2003).

Interest in the issue of safe handling of CDs began in the late 1970s. More recently, in many countries, national health authorities' concern has been focused on promoting actions aimed to protect health of the personnel handling these drugs. In order to promote compliance among health care providers for better use of safety measures, guidelines and clear procedures were established by institutions such as OSHA (Occupational Safety and Health Administration) . Ministry of Health and Turkish Society of Oncology Nursing are

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working on the guidelines on handling and preparing of CDs.

Although there has been an increased awareness and concern regarding the issue of safe handling of CDs, many nurses still do not follow the guidelines and procedures in the hospital settings and are not using the recommended safety equipment (Ben ami et al,2001; Guney B, 2000; Kubilay et al, 1997; Mastour et al,1997; OSHA, 1986; Valanis et al, 1991;Vollano et al,2002). In our hospital especially nurses are exposed while preparing and administrating the CDs. For that reason nurses' information about the possible toxicities and the protection measures used while preparing and administering these drugs is gaining more and more importance.

The aims of this study were: 1) to evaluate the level of knowledge of nurses on the health effects and the way of exposure of CDs; 2) to describe the protective measures for handling these agents; 3) to determine the influence of this knowledge on their clinical attitudes, behaviour and actual usage of safety measures.

### Materials and Methods

An analytic cross sectional study carried out in February 2003 in Ege University teaching hospital. The target group of the study was 137 nurses who work with Cytotoxic Drugs (CDs). The nurses were from internal medicine(55), chest diseases(19), pediatrics(14), gynaecology(13), radiation oncology(10), urology (6) and neurosurgery (3) departments. 120 of the nurses participated in the study. The coverage was 86.9 %.

Two self reported questionnaires were used in order to collect the data of the study. The questionnaire was tested in a pilot study and was discussed in a specialists' panel and some of the questions were modified according to the results. The first questionnaire covered following items of socio demographic data such as age, education, marital status, fertility history, number of years as registered nurse and oncology nurse, personal, occupational and exposure history, safe behaviour while dealing with the CDs, complaints due to CDs exposure and the source of information on CDs. The second questionnaire aimed to evaluate the level of knowledge of the nurses on the health effects, the way of exposure of CDs and the protective measures.

The level of knowledge was assessed in two categories using the mean knowledge score as cut off point. The scores above the mean were assessed as sufficient.

Direct observations were made over a period of half a day in different clinical settings. The purpose of the observation was to validate the exposed nurses compliance with the guidelines in practice and their actual use of protective measures while handling the CDs.

Student's t test and variance analysis were used to compare the data for the groups.

### Results

120 registered nurses participated in this study. The mean

age of the study population was 33.9±8.32. Two third of the nurses were married. The fertility history of the nurses was analyzed in terms of the abortions, still births and congenital abnormalities. 12.5 % of the nurses had abortions, 30.8 % of the abortions occurred while the nurses were handling CDs.

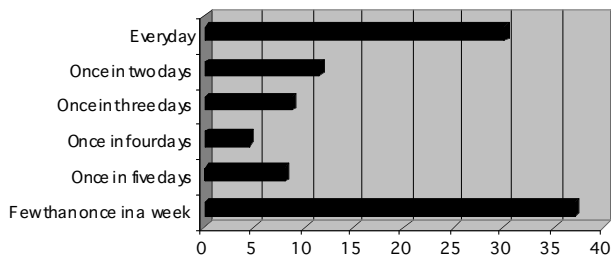
83.1 % of the nurses had university degree. 47.5 % of the nurses worked in different clinical settings during an 8 hour day shift. Mean duration in the profession was 12.31±8.58 (range 16-35 years) and mean duration of work with CDs was 6.52±5.88 (range 0-22 years). Only 11 of the nurses have worked in other sectors than health care. But non of them had a contact with CDs during these activities. The practice of CDs preparation of the study group is shown in figure 1.

The nurses' habits were examined in order to show the nurses' general and health behaviour as a predictor of their actual safe behaviour while dealing with the CDs. The 44.8 % of the respective group of nurses were smokers. The 18.2 % of the nurses had undergone a regular health examination in the work place.

A list of possible symptoms which may seen due to CDs' exposure were given to the nurses with the first questionnaire. They were asked to select the symptoms that made them apply to a physician. The symptoms in the list are shown in Figure 2. 54.1 % of the nurses declared that

**Table 1. The Characteristics of the Study Population**

Characteristics	Mean	
Age of nurses	33.9±8.32	Range 22-61
Status		
Married	80	67.2 %
Single	35	29.4 %
Divorced	4	3.4 %
Fertility history (No.)		
Abortion	15	12.5 %
Still birth	1	0.8 %
Congenital abnormality	2	1.7 %
University degree	98	83.1 %
Duration in the profession (years)	12.31±8.58	Range 16-35
Duration of work with CDs (years)	6.52±5.88	Range 0-22
Type of work		
Shift work	63	52.5 %
8 hour day shift	57	47.5 %
Primary Practice Setting (No.)		
Internal medicine	55	45.9 %
Chest diseases	19	15.8 %
Pediatrics	14	11.7 %
Gynecology	13	10.8 %
Radiation oncology	10	8.3 %
Urology	6	5.0 %
Neurosurgery	3	2.5 %



**Figure 1. Nurses' practice of CD preparation (%)**

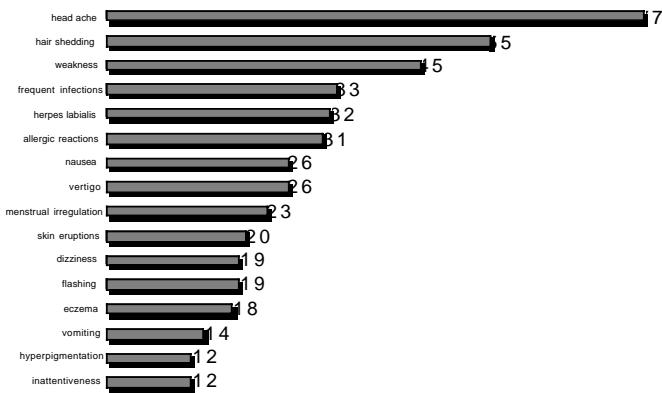
their complaints increased during the work hours.

Smoking, eating food, drinking beverages, storing food and beverages and using cosmetics in the CDs handling area were evaluated as risky behaviours. The nurses' risky behaviours in the working environment were given in the table 2.

49.6 % of the nurses were drinking beverages, 43.0 % were storing food and beverages and 40.5 % were eating food in the CDs handling area. 46.9 % of the nurses have at least one risky behaviour in working environment.

The nurses are asked for the places that they prepare the CDs. Only 32.5 % of the nurses declared that they prepare the CDs in proper preparation cabins. Only 45.1 % of the nurses reported that their working environment had proper aspiration system.

Changing the bed sheets and/or the nasogastric and



**Figure 2. Symptoms Reported by the Nurses**

uretral sonds of the patients who are in CD therapy is categorised as the risky clinical activities. Evaluation of the "risky clinical activities" during the daily routine is given in Table 3.

**Table 2. Nurses' Risky Behaviour in Working Environment**

Risky behaviour in working environment	%
Drinking beverages	49.6
Storing food and beverages	43.0
Eating food	40.5
Using cosmetics	7.4
Smoking	4.2

Usage of protective equipment during CDs therapy preparation and "risky clinical activities" was evaluated. The frequencies of each protective measurement's usage are given in the Table 4.

97.4 % of the nurses used gloves, 86.8 % used surgical masks during CDs therapy preparation. Only 4.4 % of the nurses used all of the protective equipments, while 62.3 % used gloves and surgical mask together.

Disposal of the CDs contaminated wastes are evaluated. Only 15.0 % of the related wastes have been disposed properly.

Only 30.6 % of the nurses had participated in a training program about CDs. Their sources of information about CDs are given in Table 5.

**Table 3. Nurses' Practice of "Risky Clinical Activities"**

"Risky clinical activities"	%
Changing the bed sheets	42.0
Changing nasogastric and uretral sonds	46.5

The mean knowledge score of the nurses was 61.32±17.12 (minimum 0, maximum 88). Only 58 % of the study group was above the groups' mean score.

According to the topics the mean scores were as follows;

**Table 4. Nurses' Usage of Protective Equipment**

Protective equipment	During Cds preparation	During risky clinical activities
	%	%
Gloves	97.4	70
Surgical mask	86.8	27
Working suit	22.8	2
Goggles	5.3	1
None	1.7	0

Mean score of knowledge about antineoplastic agent is 46 ± 23, about the prevention is 55 ± 18; about the health effects is 70 ± 25, about the way of exposure is 73 ± 26.

Significant differences were found between the mean scores of knowledge of the nurses who had participated in a training program, compared with the groups who had no formal information about CDs. The knowledge score of the nurses who use at least one protective measure was significantly higher than who don't use any protective measure (Table 6).

**Table 5. Nurses' Source of Information about CD's**

The source of information	%
Hospital administration	35.2
Mass media	21.0
Nurses' Association	12.6
Union	1.7
Others (university, textbook, internet...)	15.9

**Discussion**

The aim of this study was to evaluate the level of knowledge of nurses on CDs, its influence on their attitudes and their actual usage of safety measures while handling the CDs. The findings indicate that the level of knowledge of the nurses on this issue is not satisfactory. The topics “properties of antineoplastics” and “the prevention” were the subjects where the nurses got the lowest scores. In previous studies, it is reported that the staff handling the CDs don’t have a satisfactory level of knowledge regarding the risk factors ( Vollono et al, 2002; Habib et al, 1992). This lack of knowledge on preventive measures is of concern because it increases the health workers’ unsafe behaviour. Participating in a training program created significant difference on the level of knowledge; the training of all staff involved with any aspect of the handling of hazardous drugs is one of the three essential elements described in the Occupational Safety and Health Administration (OSHA) guidelines (OSHA, 1999; ASHP, 1990). The main source of information remains to be the hospital administration while Vollono’s study reported that the health structure wasn’t the main source of information for their respondents (Kubilay et al, 1997; Vollono et al, 2002). No significant differences were found in the mean scores of knowledge by preparation area of CDs, and frequency of risky behaviours in working environment.

Results about the nurses’ safety behaviours and usage of recommended health safety measures showed that, notwithstanding the rules and regulations pertaining to CDs, nurses did not comply to them fully. Valanis reported that beliefs about what protection was required had a stronger correlation with actual use than did policy content (Valanis et al, 1991). In this study, nearly half of the nurses (46.9 %) had at least one of the risky behaviours in the CDs handling area. In a previous study, it was reported that 94 % of the nurses drink and smoke in the preparation area of CDs (Ben-Ami et al., 2001).

The findings about the use of personal protective equipment showed that only 4.4 % and 1.4% were using the four protective equipment necessary during the handling of CDs and the “risky clinical activities”, respectively. The training received by only one third of the nurses, was found to influence the compliance of nurses to the use of at least one protective equipment. As reported in the previous studies, the majority of the nurses have integrated glove use into their practice (Martin et al, 2003; Krstev et al, 2003; Mastour et al, 1997). The current study noted an increase in the use of gloves and mask versus the previous study of Oncology Nursing Society in Turkey (Kubilay et al, 1997). The use of working suit and goggles continue to be limited. Nurses who had higher knowledge scores reported using at least one personal protective equipment significantly more frequently than the nurses who had lower knowledge scores.

The findings showed that the working place was not a safe environment; Only 32.5 % of the nurses declared that they prepare the CDs in proper preparation cabins. Only 45.1 % of the nurses reported that their working environment had proper aspiration system. Although some of previous studies report similar findings (Krstev et al., 2003; Mastour et al, 1997) some studies especially in the most developed countries reported that the majority were preparing CDs in a laminar air flow hood (Martin et al, 2003, Pethran et al, 2002; Ensslin et al, 1997). Based on this survey, the use of proper preparation cabins has increased dramatically since 1997(Kubilay et al, 1997). Only 15.0 % of the related wastes have been disposed properly. Similar findings were reported in the previous study of Oncology Nursing Society in Turkey (Kubilay et al, 1997).

**Conclusion**

The level of knowledge of the nurses about antineoplastics is not satisfactory. The awareness of the nurses handling the CDs is of concern because it is important in raising standards of safety. In service training is a very

**Table 6. Nurses’ Knowledge Mean Scores According to Influencing Factors**

		n	Mean ± sd	T test /
Receival formal information about CDs	Received	34	68.82±10.07	t=3.41
	Not received	76	60.42±15.24	p=0.001
Preparation area of CDs	Proper	39	65.53±11.95	t=2.21
	Not proper	80	59.25±18.76	p=0.29
Preparation/ Administration frequency of CDs	Every day/ Once in two days	52	65.92±12.30	t=2.29
	Other	62	59.41±17.02	p=0.24
Preparation frequency of CDs	Every day*	34	68.47±10.73	F=3.73
	Once in two days	12	62.33±12.82	p=0.027
	Others*	65	60.43±15.51	
Risky behaviours in working environment	At least one	70	62.80±12.18	t=0.42
	None	26	64.15±18.29	p=0.68
Usage of protective measures	At least one	110	63.38±14.04	t= 4.70
	None	2	16.00±22.63	p=0.000

effective tool to increase the level of knowledge. This study revealed also the necessity of the improvement of the work environment and the availability of the protective equipment. As the primary prevention measures involve the least possible exposure to CDs, information regarding the updated guidelines should be disseminated both at the practice and administration levels. A safety committee in the hospital should ensure the appropriate implementation of safety policies, keep the staff informed about the procedures for safety handling of CDs.

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