

## ORIGINAL RESEARCH

# Knowledge about Safety Measures regarding Handling of Chemotherapeutic Agents among Staff Nurses in a Tertiary Care Teaching Hospital

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## ABSTRACT

**Introduction:** Chemotherapy is the use of cytotoxic drugs in the treatment of cancer that provides cure, control, and palliation. The study was conducted with the aim of assessing knowledge about safety measures regarding handling of chemotherapeutic agents among staff nurses.

**Materials and methods:** A descriptive research approach was used with one point of data collection. Through convenience sampling with random assignment, 40 study subjects were selected. Structured knowledge questionnaires were prepared and validated.

**Results:** This revealed that 60% of the staff nurses had adequate knowledge and 40% had inadequate knowledge regarding handling of chemotherapeutic agents. The chi-squared test value was found to be statistically significant at p-value <0.05 regarding knowledge of chemotherapeutic agents with educational status and work experience.

**Conclusion:** Health talks, in-service education, and seminar and workshop programs should be conducted and staff nurses should be certified to handle the chemotherapeutic agents.

**Keywords:** Chemotherapeutic agents, Safety measures, Staff nurses, Structured knowledge questionnaires.

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## INTRODUCTION

Cancer is the uncontrolled growth of abnormal cells in the body. Treatment of cancer with chemotherapeutic drugs started in the early 20th century. Chemotherapeutic agents, administered as infusions or bolus injections, are usually prepared individually for each patient.

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Chemotherapy is a systematic treatment rather than localized therapy. The toxicity of chemotherapeutic agents has been well known since the 1940s because these agents are nonselective in their mechanism of action and affect non-cancerous as well as cancerous cells, resulting in chromosomal damage, necrosis of comprised skin rashes, itching, and dyspnea.<sup>1</sup> Worldwide, more than 11 million new cases of cancer are diagnosed each year and that number is expected to rise to 16 million by 2020.<sup>2</sup> According to the World Health Organization, 7.56 lakh Indians died with cancer by 2014 to 2015 and mostly the patients die without medical attention. Year 2015 data show that India has one of the highest cancer rates in the world. Proper training and use of personal protective equipment are critical to ensure the safety of health workers who handle chemotherapeutic agents.<sup>3</sup> Sotaniemi et al<sup>4</sup> showed that liver damage was reported in three consecutive head nurses of a particular oncology unit who worked with chemotherapeutic agents for several years. Longe<sup>5</sup> revealed that health care workers exposed to chemotherapeutic agents reported acute symptoms, such as skin irritation, sore throat, cough, dizziness, headache, allergic reaction, diarrhea, nausea, and vomiting. Polovich<sup>6</sup> published that patients who received chemotherapy as well as nurses who administered chemotherapy were found positive for mutagenic activity (as measured by Ames test) in their urine. The Ames test measures genetic mutations in bacteria after exposure to compounds. About 90% of known carcinogens test positive in this test. The test is reliable during drug excretion in urine. Rizalar et al<sup>7</sup> conducted a study in Turkey to determine the safety measures for personal and environmental protection taken by nurses during chemotherapy preparation and administration. About 73 nurses were included in the study group. Data were obtained via a questionnaire form. The finding showed that nurses are not withstanding the rules and regulations pertaining to use of chemotherapeutics. The result clearly highlighted the importance of the need for regular education programs. This study also revealed the necessity for improvement in the working environment because staff nurses are mainly present with the patient during administration of drug therapy. The present study was, therefore, undertaken to assess the level of knowledge about safety measures regarding handling of

chemotherapeutic agents among staff nurses in a tertiary care teaching hospital. The study also tried to find out the relationship of knowledge with sociodemographic variables among staff nurses.

## MATERIALS AND METHODS

A quantitative research approach with descriptive design having one point data collection was used. The study was conducted at Sri Guru Ram Das Rotary Cancer Hospital, Amritsar, Punjab, India, in May 2015. Convenience sampling with random assignment was used to select 40 study subjects. The tool consisted of two sections, i.e., sociodemographic profile sheet and self-structured questionnaire. Sociodemographic profile sheet included age, gender, religion, marital status, educational status, working experience, working area, in-service education, and needle prick injury. Thirty self-structured questionnaires were prepared and finalized from extensive review of literature. Questionnaire items include chemotherapeutic agent's preparation, administration, spillage, and care of patient receiving chemotherapy. Questionnaire was validated by doctors in the radiotherapy department as well as senior nursing faculty. Each correct answer was given 1 mark. Questionnaire was used to assess the knowledge regarding handling of chemotherapy agents among staff nurses. After maintaining rapport and explaining the purpose of study to staff nurses, structured knowledge questionnaire was distributed.

### Statistical Analysis

Data were collected, organized, and analyzed by Statistical Package for the Social Sciences version 16. Computation of frequencies and percentage was done for the analysis of sociodemographic variables. For assessing the level of knowledge regarding handling of chemotherapeutic agents among staff nurses, arithmetic mean and standard deviation (SD) were calculated. To find out the relationship of knowledge with sociodemographic variables among staff nurses, nonparametric chi-squared test was applied at  $p$ -value  $< 0.05$ .

### Ethical Consideration

The study had been approved by the ethical committee of Sri Guru Ram Das Institute of Medical Sciences & Research Amritsar, Punjab, India. Written informed consent was taken from each study subject after informing them about the study. The confidentiality was maintained throughout the study.

## RESULTS

Totally, 30 structured questionnaires were administered to staff nurses. The questionnaire and responses to them

are given in Table 1. Total marks obtained by staff nurses are 723.

Table 2 shows that a total of 30 self-structured questionnaires were given to staff nurses to assess their level of knowledge. Out of 30, the maximum score obtained was 26 and the minimum was 08, with 18.08 mean and 4.45 SD.

Graph 1 shows that 24 (60%) staff nurses had adequate knowledge and 16 (40%) had inadequate knowledge about safety measures regarding handling of chemotherapeutic agents.

Table 3 reveals that there is nonsignificant relationship of knowledge score with age, residential area, religion, marital status, working area, in-service education, and needle prick injury at  $p$ -value  $< 0.05$ , which means that there is no relationship of knowledge score regarding handling of chemotherapeutic agent with the above sociodemographic variables among staff nurses. As per educational status and working experience, there is a significant relationship of knowledge score at  $p$ -value 0.04 and 0.01 respectively, which means that degree-holding staff nurses had more knowledge as compared with diploma-holding staff nurses. Also, more experienced staff nurses had more knowledge than less experienced staff nurses regarding handling of chemotherapeutic agents.

## DISCUSSION

The study result showed that 24 (60%) staff nurses had adequate knowledge and 16 (40%) had inadequate knowledge about safety measures regarding handling of chemotherapeutic agents. A similar study was done by Polovich and Clark,<sup>8</sup> which revealed that exposure knowledge about safety measures regarding self-efficacy for using personal and protective equipment and perceived risk of harm from hazardous drugs was high; total precaution use was low. Another descriptive correlational study by Jezewski<sup>9</sup> was done on 794 nurses. The mean total knowledge score based on three subscales was 17.4, which showed that the nurse's knowledge score was low and they were not highly confident in their ability to assess the patient with advanced directives.

The study enumerated that 32.6% nurses use safety cabinet device and 27.8% nurses had received in-service education about chemotherapeutics. A similar descriptive study by Kosgeroglu et al<sup>10</sup> showed that nurses' actual administration method of chemotherapeutic agents was insufficient and according to their level of information, with average administration evaluations of 5.46 for protection of the environment and 6.59 for self-protection. The ratio for nurses' usage of the safety cabinet device during the preparation of chemotherapeutic drugs was

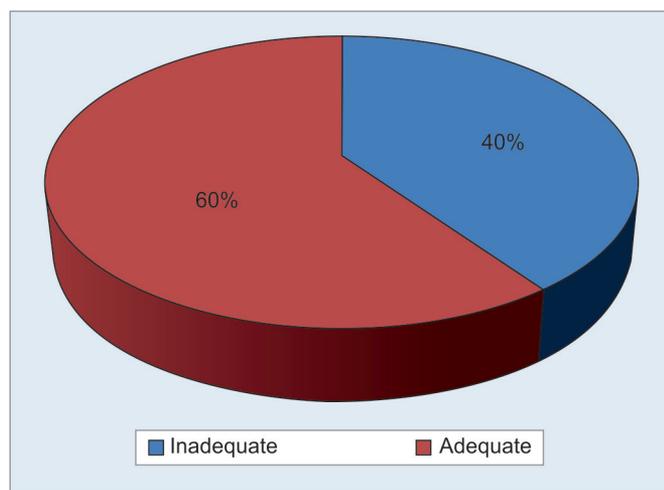
**Table 1:** Response of staff nurses to structured knowledge questionnaire on the safety measures regarding handling of chemotherapy agents

Question number	Questionnaire	Correct response by subjects	Wrong response by subjects
1	Define cancer	15	15
2	Which is the category type of chemotherapy?	19	11
3	What is the action of chemotherapeutic drugs?	18	12
4	What are the classifications of chemotherapeutic drugs?	19	11
5	Chemotherapeutic agents must be kept in which BSC class?	15	15
6	Which advanced technique is used for preparation of chemotherapeutic agents?	17	13
7	What is the full form of CIPN?	14	16
8	What are the contraindications of chemotherapeutic agents?	17	13
9	Chemotherapy dose preparation is based on what?	15	15
10	Chemotherapy directly or indirectly disrupts what?	14	16
11	Which drug is administered before chemotherapy?	18	12
12	Which route is preferred for administration of chemotherapy?	16	14
13	Alkylating agents act on which part of cell cycle?	17	13
14	Nursing responsibilities before starting chemotherapy are?	09	21
15	Define extravasation.	13	17
16	Factors considered in chemotherapy selection for cancer treatment include	14	16
17	Chemotherapeutic agents that have potential for cardiac toxicity include	11	19
18	Chemotherapy-vesicant drugs with extravasation potential used	14	16
19	Clinical features that may occur during hypersensitivity reaction are	19	11
20	Chemotherapeutic agents that cause neurotoxicity symptoms include	15	15
21	Interventions for CINV	08	22
22	Nursing interventions for chemotherapy drug extravasations includes	08	22
23	Circadian variables in concept of circadian rhythm includes	12	18
24	Critical elements of chemotherapy documentation includes	15	15
25	Which are the nonvesicant chemotherapy drugs?	13	17
26	Which type of needle and route is preferably used for giving antidote?	11	19
27	Which is the preferable site for chemotherapy drug infusion?	17	13
28	Which is the antidote of alkylating agents?	10	20
29	Disposed chemotherapy containers are incinerated at	12	18
30	Which specific interventions are taken to control hematopoietic toxicity?	09	21

Total number of questionnaires is 30. Total number of study subjects is 40.

**Table 2:** Level of knowledge about safety measures regarding handling of chemotherapy agents among staff nurses

Questionnaire	Maximum score	Minimum score	Mean ± SD
30	26	08	18.08 ± 4.45



**Graph 1:** Percentage distribution of the knowledge score among staff nurses regarding handling of chemotherapeutic agent

**Table 3:** Relationship of knowledge with sociodemographic variables among staff nurses

Sociodemographic variable	$\chi^2$	df	$p < 0.05$
Age	15.58	26	0.94
Residential area	15.91	13	0.25
Religion	14.73	13	0.32
Marital status	14.43	13	0.34
Educational status	12.56	26	0.04*
Working experience	60.44	39	0.01*
Working area	24.44	26	0.55
In-service education	16.57	13	0.21
Needle prick injury	9.85	13	0.70

$\chi^2$ , Square of deviations; df: degree of freedom; p-value < 0.001 HS; p-value > 0.05 NS; HS: Highly significant; NS: Nonsignificant

very low at 14.2%. Only 7.4% of nurses had received in-service education about chemotherapeutics.

The study revealed that only 8% nurses use personal protective equipment while handling chemotherapeutic agents. Similar results by Martin and Larson<sup>11</sup> concluded that normal use of face and respiratory protection was less than 6%. Chemotherapy was reported to be prepared in laminar air flow hoods in 59% of work settings.

Only 46% of sites reportedly provided any type of medical monitoring, but medical monitoring of exposed employees still is neither widely practiced consistent with the Occupational Safety Health Administration guidelines.

The study findings show that educational status had significant effect on knowledge score among staff nurses are supported by Brown et al,<sup>12</sup> who conducted a prospective study to assess the value of oncology nursing certification. Certification in nursing education increases institutional reorganization and financial support could improve nurse's certification rate and ultimately result in improved patient care. Svard et al<sup>13</sup> revealed that only 53.4% reported that they have annual medical check-ups and only 33% reported having received specialized training. While the level of knowledge about antineoplastic agents is low among nurses, along with the level of personal protective equipment use being low, medical surveillance and employee training seem to be lagging behind.

The study concluded that there should be health talks and in-service education; seminar and workshop programs should be conducted for staff nurses. A similar study by Ben-Ami et al<sup>14</sup> supports the need to promote primary prevention by providing a safe environment for the employee by means of education, training with regard to safety measures, clear policy and written guidelines and their enforcement. Polovich and Martin<sup>15</sup> concluded that only 32.7% staff nurses had adequate knowledge regarding handling of chemotherapeutic agents working in a Turkey hospital, and circumstances in the workplace interfere with nurses' use of hazardous drug precautions.

### Implications for Nursing

Interventions should include fostering a positive workplace safety climate, reducing barriers, and providing appropriate nurse-patient ratios.

### CONCLUSION

Study result concluded that there should be health talks, in-service education, seminars, and workshop programs conducted for staff nurses. Chemotherapeutic agent preparation administration guidelines should be included in the curriculum of nursing programs. Nurses trained

for this program should be certified as to handling the chemotherapeutic agents.

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