



Original Article



Assessment of Knowledge, Attitude and Practice among Nurses Regarding Safe Administration of Chemotherapy at Tertiary Care Hospitals of Peshawar

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ABSTRACT

It is well known that many anti-cancer medications can cause teratology and mutation in humans. The primary groups exposed to these drugs in a hospital setting are nurses. Typically, handling patient waste, administering and preparing antineoplastic agents, and cleaning up chemotherapy spills are the jobs that carry the highest risk of exposure. **Objectives:** To assess nurses' attitudes, practices, and Knowledge related to the safe administration of cytotoxic drugs. **Methods:** Descriptive and inferential statistics were used to analyze the data collected from 51 nurses who participated in a descriptive cross-sectional study conducted at Peshawar public sector hospitals. The study was conducted using a structured questionnaire and the Universal sampling technique. **Results:** The result shows that 49.0 % of total nurses have excellent Knowledge, and 41.2% of nurses have good Knowledge, regarding the safe administration of cytotoxic drugs. 29.4% of nurses have good practice. In comparison, 70.6% of total nurses have poor practice. Most nurses have a positive attitude towards safely handling chemotherapy drugs. **Conclusions:** It was concluded that this study comes to the following conclusion after a thorough analysis of a review of nurses' administration of chemotherapy to patients. The majority of samples had poor practice for giving chemotherapy drugs. As a result, it's essential to increase workplace safety, provide protective gear, and create best practices for oncology nurses.

INTRODUCTION

Of all forms of death and disability in the world, cancer tops the list [1]. According to estimates made by the World Health Organization (WHO), nearly 10 million deaths occurred due to cancer alone in 2020. Between 70 to 80 percent of global cancer deaths turn out to originate from low- and middle-income countries. Thus, an anticipated aggravation of that disproportionate burden projected for the next 10 years would be expected to happen in low- and middle-income countries [2]. In Asia, Pakistan has the highest rate of breast cancer. One in every nine women has a lifetime risk of being diagnosed with breast cancer [3, 4]. The surge in mortalities, especially in developing countries is likely due to delayed diagnosis, and limited access to

effective therapies and/or healthcare facilities, amongst other reasons. Although various cancer treatments, such as radiation therapy, targeted therapies, chemotherapy, and immunotherapy can be utilized, their availability or use may be delayed due to a lack of public awareness and late detection [4]. Antineoplastic drugs are currently the most used modality in cancer treatment all over the world. It destroys cancer cells in their cytotoxic effects. Chemotherapy is a type of cancer treatment that employs drugs to eliminate cancer cells [5]. Chemotherapy acts after preventing or retarding the growth of multiplication of cancer cells, which proliferate quickly. This type of unhealthy process has also affected healthy cells under



chemotherapy treatment, causing side effects to the individual [6]. In most chemotherapy applications, cytotoxic drugs (CDs) have been used for their cancer-carrying cell-killing functions. They have mutagenic, teratogenic, and carcinogenic effects on humans. Direct contact with healthcare providers is possible through mixtures, transportation, preparation, and administration, in addition to waste handling procedures, equipment maintenance, and repair [7]. Chemotherapeutic drugs are toxic to human tissues. Destruction of cells making possible the proliferation of an abnormal tissue is the primary goal of chemotherapy. Traditional chemotherapies kill quickly dividing cells. Damage is done to healthy fast-growing cells as well: mucous membrane cells lining the entire body's surfaces, including those of the mouth and throat, the stomach, blood-forming cells in the bone marrow, hair follicles, and others [8]. Nurses are the backbone of cancer care and their main roles include delivering therapy, managing side effects, educators to patients and their families about the adverse effects of chemo-treatment, and emotional support during the demanding process [9]. Guidelines for the safe handling of chemotherapy drugs (CDs) were put in place over 20 years ago, yet modern studies continue to show that the environment and healthcare workers get contaminated by such drugs, particularly in developing countries [10]. Lack of knowledge and economic and socio-cultural factors make the most contribution towards unsafe behaviours among healthcare workers (HCWs) when it comes to handling infectious materials. An epidemiologic study done in 2016 determined the immediate and contributing causes of exposure of HCWs to antineoplastics [11]. It was classified into 4 categories for immediate causes such as direct contact with CDs without personal protective equipment, needle-stick injury, spills, and other unintended exposures; and 3 categories of contributing causes such as lack of training, inadequate controls, and poor communication. Short-term health hazards arising from occupational exposure to CDs include skin rashes, sore throat, cough, dizziness and headache, eye irritation, hair loss, and allergic reactions while chronic health effects in unprotected HCWs who handle these drugs without following safety measures include genotoxicity, mutagenicity and carcinogenicity, poor reproductive outcomes such as spontaneous abortion, infertility and poor neonatal outcome; and organ toxicity such as bone marrow, liver, kidney, lung, and cardiac toxicity [12]. Unsafe or poor handling practices are indicated in several studies. Poor compliance may be linked to a lack of understanding and beliefs that there is a minimal likelihood of an immediate injury, nurses may believe they are immune to the risks of chemotherapy exposure. Moreover, no specialized training regarding chemotherapy and curriculum are provided to nurses, thus they learn these at

the bedside which increases the risk of these adverse effects both for patients and nurses. In all situations, Knowledge is essential for safe nursing practices. However, it becomes crucial when a nurse's lack of Knowledge endangers their or the patient's safety. According to a prior study, Chemotherapy may have unintentionally harmed the oncology work environment for more than thirty years [13]. A lot of work has been done in the past exploring the knowledge, attitude, and practice of healthcare professionals regarding the treatment and management of patients with cancer. On the contrary, very little work has been done to evaluate the parameters here in Pakistan.

Although chemotherapy safety guidelines have been established globally, there is limited evidence from developing countries like Pakistan assessing the combined knowledge, attitude, and practice (KAP) of nurses regarding safe chemotherapy administration. Existing studies suggest variability in knowledge and significant gaps in practice, but the extent of this discrepancy and its contributing factors remain underexplored in local tertiary care settings. This gap limits the ability to design targeted interventions to ensure occupational and patient safety. Therefore, the present study aimed to assess the knowledge, attitude, and practice of nurses regarding the safe administration of chemotherapy and to identify gaps between theoretical knowledge and clinical practice.

METHODS

A descriptive cross-sectional study was conducted in a tertiary hospital in the Peshawar region, Pakistan (No. KMU-INS/14-/5785). The study duration was from 1st September 2020 to 1st Feb 2021. The calculated sample size was n=51 nurses based on n=510 as the total population of nurses working within the oncology unit, 95% CI and 5% marginal error. Participants were selected using a non-probability convenience sampling technique. All full-time nurses including those involved in patient care, having experience greater than 1 year working were included whereas, nursing internees' nurses who have faced significant personal trauma, were diagnosed with any mental disorder (depression, schizophrenia etc.) and severe medical conditions in the last 6 months were excluded. A written informed consent was taken from all the participants, and followed by data collection on a pre-designed adopted data collection tool having four parts e.g. Demographic data of the participants, questions related to Knowledge, practice and attitude related to safe handling of chemotherapeutic drugs. Among demographic variables age, marital status, gender, and education level were assessed. Strict exclusion criteria were used to exclude any bias or confounding factor from the study. Data were analyzed through SPSS version 26.0. The mean and standard deviation were calculated for numerical variables and frequency and percentages for categorical variables. A

score of 80% to 100% was considered excellent, 60% to 80% was considered good and below 60% was taken as low knowledge and above 50 % was taken as good practice.

RESULTS

The descriptive statistics of the demographic data of nurses are shown. Most participants were male, n=28 (54.9%), compared to female participants n=23 (45.1%). Male make up the majority of the nursing workforce in the oncology unit. The largest age groups were 21-25 Years old n=23(45.1%), 26-30 years old n=23(45.1), followed by the age group >35 Years old n=3 (5.9%), and lastly 31-35 Years age group was n=2(3.9%). Most of the oncology nurses are from the young age group. Single people made up 74.5% of the total participants (n=38), followed by married participants (n=13)(25.5%). The majority of participants were Bachelor of Science in Nursing (BSN) nurses n=32(62.7%), followed by Diploma nurses, n=10 (19.6%), nurses having Master of Science in Nursing (MSN) degrees n=1 (2.0%) and Post Registered Nurse (RN) n=8(15.7%). Most nurses have experience in the 1-5-year range, with n=44 (86.3%), followed by the 6-10-year range, n=4 (7.8%), and the last 11-15-year range, n=3(5.9%). The majority of the nurses who responded to the survey were from A(n=40; 78.4%), B(n=6; 11.8%), C(n=4; 7.8%)and lastly D n=1(2%)(Table 1).

Table 1: Demographic Data of the Nurses

Demographic Variables	Category	Frequency (%)
Gender	Female	23 (45.1%)
	Male	28 (54.9%)
Organization	A	6 (11.8%)
	B	1 (2.0%)
	C	4 (7.8%)
	D	40 (78.4%)
Age	21-25 Years	23 (45.1%)
	26-30 Years	23 (3.9%)
	31-35 Years	2 (3.9%)
	Greater Than 35	3 (5.9%)
Qualification	BSN	32 (62.7%)
	Diploma	10 (19.6%)
	MSN	1 (2.0%)
	Post RN	8 (15.7%)
Marital Status	Married	13 (25.5%)
	Single	38 (74.5%)
Job Experience	1-5 Years	44 (86.3%)
	11-15 Years	3 (5.9%)
	6-10 Years	4 (7.8%)

The knowledge score of nurses ranges from min=40 to mix=100. The median is 70, the standard deviation is 14.84, and the mean is 73.92 (Table 2).

Table 2: Descriptive Statistics of Nurse's Knowledge Regarding Safe Chemotherapy Handling

Variables	Knowledge Score
Valid	51
Missing	0
Mean	73.9216
Median	70.0000
Mode	60.00 ^a
SD	14.84297
Minimum	40.00
Maximum	100.00

As a result, it demonstrates that nurses are knowledgeable regarding the safe administration of chemotherapy drugs (Figure 1).

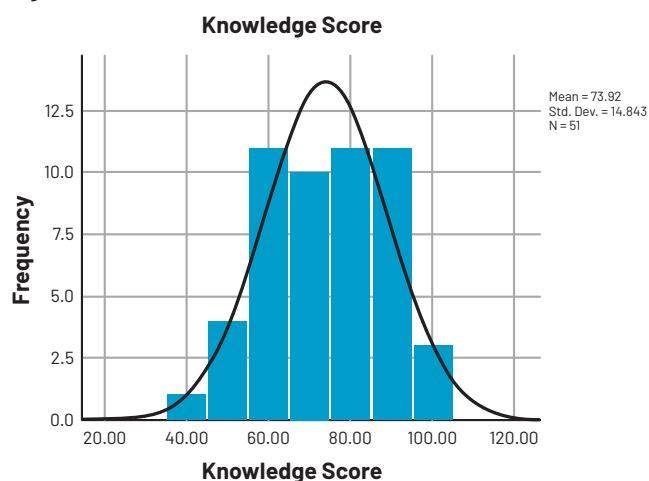


Figure 1: Descriptive Statistics: Mean, Mode, Median and SD of Nurse's Knowledge Regarding Safe Administration of Chemotherapy

The knowledge of nurses regarding safe chemotherapy drugs is highlighted. Only n=25(49%) participants were able to get 80% -100% scores, which is considered excellent Knowledge, n=21(41.2%) was able to get 60%-80% scores which are considered Good Knowledge, and n=5(9.8%) was able to get 60% and below score in the administration of chemotherapy knowledge (Table 3).

Table 3: Level of Nurse's Knowledge Regarding Safe Administration of Chemotherapy

Variables	Frequency (%)	Valid Percent	Cumulative Percent	
Valid	Excellent Knowledge	25 (49.0%)	49.0	49.0
	Good Knowledge	21 (41.2%)	41.2	90.2
	Poor Knowledge	5 (9.8%)	9.8	100.0
	Total	51 (100.0%)	100.0	-

Percentage of knowledge level was analyzed (Figure 2).

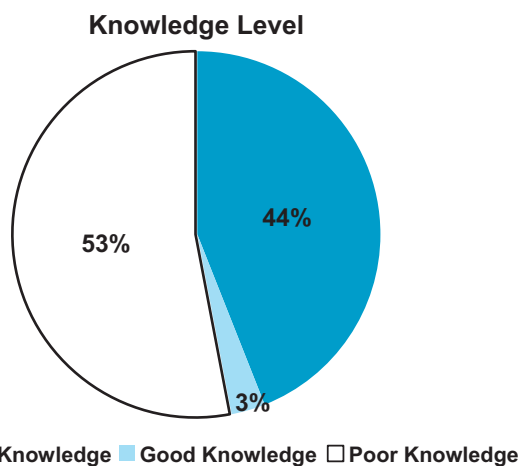


Figure 2: Level of Nurse's Knowledge Regarding Safe Administration of Chemotherapy

The descriptive statistics of the Nurse's Practice are presented. The average practice score of nurses on the safe handling of chemotherapeutic drugs is 44.90, which indicates that the nurses are following moderately safe practices. The score at the median level, which is 50, implies that half of the respondents scored at or below this figure, while the mode is 30, showing that this was the score that most frequently appeared. The standard deviation of 15.92 indicates that there is considerable variance in the scores, suggesting dissimilarity in the practice of nurses. The scores therefore range from a minimum of 10 to a maximum of 70. This shows that the range of practice includes very poor practice to excellent (Table 4).

Table 4: Descriptive Statistics of Nurse's Practice Regarding Safe Administration of Chemotherapy

Variables	Practice Score
Valid	51
Missing	0
Mean	44.9020
Median	50.0000
Mode	30.00
SD	15.92138
Minimum	10.00
Maximum	70.00

In the total of 51 participants, as mentioned, n=15 (29.4%) participants were able to get a 60%–80% score which is considered in the good practice category, and n=36 (70.6%) participants were able to get a score below 60 percent which is considered in poor practice level (Table 5).

Table 5: Level of Nurse's Practice Regarding Safe Administration of Chemotherapy

Variables	Frequency (%)	Valid Percent	Cumulative Percent
Valid	Good Practice	15 (29.4%)	29.4
	Poor Practice	36 (70.6%)	100.0

Total	51(100.0%)	100.0	-
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The level of Nurse's Practice Regarding the Safe Administration of Chemotherapy is analyzed (Figure 3).

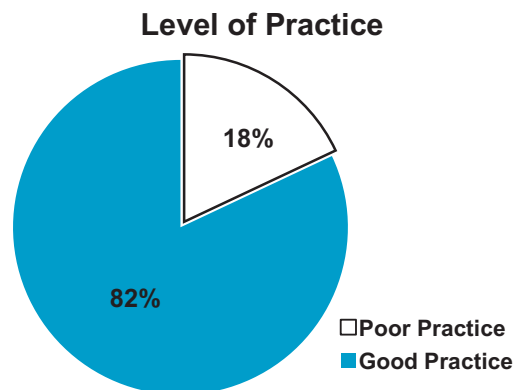


Figure 3: Level of Nurse's Practice Regarding Safe Administration of Chemotherapy

The first question "When a patient is on chemotherapy comes to you, you feel with chemotherapy". 88.2 % of nurses selected the option (Patient's disease is going to be cured), 2% selected the option (Any way patient is going to die), and 5.9% of participants selected the option (Not concerned about the outcome). In 2nd question "While handling cytotoxic drugs person needs" in which 98% of nurses selected the option (Self-protection), and 2% selected the option (None of the above). In 3rd question "Along with the patient's other family members also must be counselled regarding the disease and treatment". 96.1% of nurses selected the option (Yes), and 2% selected the option (No). In the 4th question "Administration of analgesic to the patient for pain relief must be" 45.1 % of nurses selected the option (Liberal as per the requirement of the pt.), 3.9% selected the option (Not important, it's part of the disease and should be told to the patient), and 51% participant selected the option (As per prescribed schedule only). In 5th question "Explanation of the Diagnosis to the patient and his relatives" 88.2 % of nurses selected the option (Must be explained in detail.), 7.8% selected the option (Need not necessary to explain.), and 2% of participants selected the option (It's not my duty). The majority of nurses have positive attitudes toward chemotherapy administration, whereas fewer have negative attitudes (Table 6).

Table 6: Descriptive Statistics of Nurse's Attitude Items Regarding Safe Administration of Chemotherapy

Question	Answer	Count	%
When a patient is on Chemotherapy comes to you, you feel with Chemotherapy	The patient's disease is going to be cured.	45	88.2%
	Any Patient is going to die.	1	2.0%
	Not concerned about the outcome	3	5.9%
	None of the above	2	3.9%
While handling cytotoxic drugs person needs	Self-protection	50	98.0%
	None of the above	1	2.0%
Along with the patient's other family members also must be counselled regarding the disease and treatment	Yes	49	96.1%
	No	1	2.0%
	Not sure	1	2.0%
Administration of analgesic to the patient for pain relief must be	Liberal as per the requirement of the pt.	23	45.1%
	Not important, it's part of the disease and should be told to the patient	2	3.9%
	As per the prescribed schedule only.	26	51.0%
Explanation of the Diagnosis to the patient and his relatives.	Must be explained in detail.	45	88.2%
	It is not necessary to explain.	4	7.8%
	It's not my duty.	1	2.0%
	None of the above	1	2.0%

DISCUSSION

In general, the research shows that nurses know, practice, and demonstrate positive attitudes regarding the safe administration of chemotherapy, which is the most comprehensive evidence of their competency in this critical aspect of healthcare. The descriptive statistics show that even though the nurses have adequate knowledge regarding chemotherapy administration, they do not seem to apply all safety precautions consistently. A mean knowledge score of 73.92 (SD=14.84) establishes that indeed, the participants have sufficient knowledge, with nearly half (49%) scoring excellently. In contrast, practice scores induce concern, with an average of 44.90 (SD=15.92) indicating most nurses do not practice competent safety methods consistently, with 70.6% falling under poor practice. The attitude assessment picture, however, appears positive, with most nurses reporting a constructive attitude towards the administration of chemotherapy, which is evidenced in their responses to various questions relating to attitude. The identified differences between knowledge and practices are attributable to various factors. First, while theoretical knowledge is almost always emphasized, converting that knowledge into actual practice necessitates ongoing clinical supervision and periodic training. This disparity could also relate to systemic issues concerning disallowed resource or staffing levels and barriers to access to personal protective equipment (PPEs) with these being very common in health systems in developing countries. Besides, the variance in practice score across respondents (as shown by SD of 15.92) indicates that individual factors such as work experience, access to professional

development and institutional policies have a significant impact on practice behaviour [7]. While comparing the results with available reviews that point to targeted interventions, a study conducted discussed a low knowledge-practice gap among the nurses handling chemotherapy agents. In their study, the average knowledge score and practice scores were still below acceptable levels, mirroring the present results for the practice. Such comparisons indicate that the gap between theoretical knowledge and practical application needs full treatment for its pervasion [2]. Around the world, studies have reported different levels of knowledge and practice among nurses about chemotherapy safety. The study, nevertheless, acknowledged the marked increase in practice scores among institutions that had chemotherapy safety guidelines with frequent training, indicating the role of organization support in promoting safer practices [3]. The attitude of the nurses, as shown in the present study, is overwhelmingly positive, with 88.2% of the participants believing that chemotherapy could cure the patient's disease, which translates into optimistic approaches toward their role in patient care. A study showed that the knowledge levels of nurses regarding the safety administration of intravenous chemotherapy were poor which is not consistent with our study [12]. Also, another Pakistani study consistent with the result of this study revealed that more than half of the nurses had poor practice indicating issues surrounding patient safety [8]. The finding of another study in Bangladesh resonates with results showed that nurses have average knowledge of chemotherapy handling, however, the use of personal

protective equipment and biological safety cabinet, following guidelines, medical surveillance and training appear to be a hindrance [14, 15]. More fundamentally, it requires that nurses are educated and professionally trained about chemotherapy agent handling in nursing schools and service continuing education, and the required facilities are also adopted [16, 17]. To connect those gaps, regular competency-based training, providing sufficient resources, and developing clear and easily accessible chemotherapy handling guidelines should be instituted in healthcare institutions [18, 19]. Studies have found that simulation-based training programs significantly improve both knowledge and practice levels [20].

This study is limited by its small sample size, single-region setting, and use of non-probability sampling, which may affect generalizability. Self-reported data may also introduce response bias. Future studies should include larger, multi-center samples and adopt observational or interventional designs to assess actual practices. Additionally, structured training programs and evaluation of their impact on improving safe chemotherapy practices are recommended.

CONCLUSIONS

It was concluded that this study brings to the limelight the satisfactory knowledge and positive attitudes of nurses toward administering chemotherapy. However, a huge gap in practice, which means that systemic and individual-level interventions should be required. Continuous education, resource allocation, and establishment of supportive institutional policies toward converting these challenges into strengths meant that healthcare systems could render chemotherapy Administration Safer and More Efficacious Within Their Overall Operations.

Authors' Contribution

Conceptualization: AA

Methodology: AA, A, MZ, SH, IWA

Formal analysis: AA

Writing and Drafting: IWA

Review and Editing: AA, A, MZ, SH, IWA

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

The authors declare no conflict of interest.

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