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# Knowledge, Attitudes, and Compliance with Chemotherapy Protocols Among Staff Nurses in a Tertiary Hospital in Davao City

## *Implications for Oncology Nursing Practice*

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***Abstract:*** Globally, millions of healthcare workers are at risk of exposure to hazardous antineoplastic agents, making adherence to chemotherapy protocols essential for ensuring both patient and staff safety. This descriptive-correlational study investigated the levels of knowledge, attitude, and compliance with chemotherapy protocols among staff nurses assigned to the cancer institute of a tertiary hospital in Davao City, Philippines. Utilizing complete enumeration, the study involved 52 oncology nurses and was conducted between September and November 2018. Results showed that most respondents were female, aged 26–33 years (80.76%), single (65.38%), and had between 5 to 7 years of clinical experience (50%). The respondents demonstrated a high level of knowledge ($M$ = 3.83) and attitude ($M$ = 3.71), and an even higher level of compliance ($M$ = 4.86) with chemotherapy protocols. Statistical analysis revealed a significant positive relationship between attitude and compliance ($p$ = 0.003, $r$ = 0.403), indicating that nurses with a more favorable attitude towards chemotherapy protocols were more likely to adhere consistently to safety and procedural guidelines. In contrast, no significant relationship was found between knowledge and compliance ($p$ = 0.786), suggesting that having knowledge alone does not necessarily translate into compliant behavior. The study concludes that cultivating a positive attitude toward chemotherapy practices may play a more pivotal role in ensuring protocol adherence than knowledge alone. These findings underscore the need for comprehensive educational and behavioral interventions aimed not only at increasing nurses' knowledge but also at enhancing their attitudes and motivation to comply with established safety protocols.

***IndexTerms*** **- Chemotherapy Protocol, Knowledge, Attitude, Compliance, Oncology Nursing, Davao City, Philippines**

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## 1. INTRODUCTION

Cancer continues to pose one of the most serious public health challenges of the 21st century, affecting individuals across all ages and socioeconomic backgrounds. The Global Cancer Statistics 2022 report by Bray et al. (2024) paints a sobering picture: approximately 20 million new cancer cases were recorded globally in 2022, including nonmelanoma skin cancers, with 9.7 million people losing their lives to the disease in the same year. These figures affirm cancer's persistent role as a leading cause of death worldwide. Moreover, the lifetime risk of being diagnosed with cancer is estimated at 1 in 5 individuals, with 1 in 9 men and 1 in 12 women expected to die from it. These statistics highlight not only the widespread nature of the disease but also the urgent need for improved cancer care, especially in low- and middle-income countries (LMICs), where resources are scarce and health disparities remain pronounced.

Regional data reveal significant variations in cancer burden and outcomes. Asia accounts for nearly half of the world's new cancer cases and over 56% of global cancer deaths, driven largely by population size, late detection, and limited treatment accessibility. In Africa, although cancer incidence is relatively lower, mortality rates are alarmingly high due to poor healthcare infrastructure. Meanwhile, Europe experiences a disproportionately high burden of cancer cases and deaths compared to its population size, yet it benefits from advanced diagnostic and therapeutic services (Bray et al., 2024). In the Philippines, cancer remains the third leading cause of both morbidity and mortality, with lung and breast cancers ranking among the most prevalent types. In urban regions such as Davao City, these trends are reflected in clinical case loads, further highlighting the need for robust and context-specific cancer control strategies (Laudico et al., 2015; Ngelangel & Wang, 2002).

Chemotherapy remains a cornerstone of cancer treatment, with over half of all cancer patients worldwide receiving it as part of their management plan (Mohamed et al., 2021; Wilson et al., 2019). As a systemic treatment, chemotherapy works by targeting rapidly dividing cancer cells and is often the first line of defense in managing both localized and metastatic cancers. However, its benefits are accompanied by serious occupational hazards for healthcare workers, particularly nurses, who are directly responsible for preparing, administering, and disposing of these hazardous drugs. Chemotherapy agents are cytotoxic, mutagenic, and potentially carcinogenic, and exposure to even small amounts over time can result in adverse health effects such as skin irritation, reproductive disorders, and secondary cancers (Josiah et al., 2024; National Cancer Institute, 2015).

Globally, the Pan American Health Organization (2013) estimates that more than 5.5 million healthcare workers are potentially exposed to hazardous chemotherapy drugs. While international and institutional protocols have long been established to ensure safety, numerous studies indicate that compliance with these protocols remains suboptimal. Josiah et al. (2024) emphasize that incorrect handling, insufficient knowledge, and poor compliance among nurses are ongoing concerns, and these behaviors are not without consequence. Reports of chemotherapy-related contamination, inadequate use of personal protective equipment (PPE), and improper waste disposal persist, even in well-resourced environments (VerStrate, 2015). The literature further reveals that knowledge deficits, negative attitudes toward safety protocols, and limited institutional support contribute to poor adherence to safe handling practices (Hennessy & Dynan, 2014; Orujlu et al., 2016). In some cases, nurses possess theoretical knowledge but fail to apply it in practice due to discomfort with PPE, workload constraints, or a perceived lack of risk.

In the Philippine context, particularly in Mindanao, there is a scarcity of localized studies that examine nurses' knowledge, attitudes, and compliance regarding chemotherapy protocols. In Davao City, where lung and breast cancer are prevalent (Capon, 2013; Casas, 2014), nurses in tertiary hospitals play a central role in chemotherapy administration. However, challenges such as inconsistent protocol implementation, lack of formal training, and limited access to safety equipment expose nurses to heightened occupational risks. A study by Simons and Toland (2017) reported that nearly half of nurses surveyed experienced adverse events linked to chemotherapy handling, underscoring the urgent need for structured interventions. Knowledge is critical to safe nursing practices in all settings, but it is especially significant when a knowledge deficit of the nurse practices threatens personal safety or the safety of the patient (Qadir et al., 2016). Without reliable baseline data on nurses' competencies and behaviors, health institutions are left without the evidence necessary to inform policy updates or targeted educational programs. This lack of data contributes to a reactive, rather than proactive, approach to occupational safety and patient care in oncology settings.

This study was therefore undertaken to investigate the relationship between staff nurses' knowledge and attitudes toward chemotherapy protocols and their compliance with safe handling and administration practices in a tertiary hospital in Davao City. It aims to provide a comprehensive profile of staff nurses, assess their level of knowledge and attitudes, evaluate their compliance in handling and administering chemotherapy agents, and explore the association between demographic factors and these variables. Ultimately, the goal is to use the findings to inform the development of a policy enhancement program that strengthens chemotherapy safety protocols, reduces occupational risks, and improves both patient and nurse outcomes. By identifying areas of strength and gaps in current practice, the study seeks to contribute to a safer, more competent, and responsive oncology nursing workforce.

The theoretical foundation of this study draws from David DeJoy's Behavioral Diagnostic Model (DeJoy, 1996) and Florence Nightingale's Environmental Theory (Gilbert, 2020). DeJoy's model explains how nurses' compliance with chemotherapy protocols is shaped by a combination of individual factors (such as knowledge and attitudes), organizational support (like access to training and PPE), and reinforcing influences (such as peer norms and supervision). This framework highlights that behavior change is not solely a matter of knowledge, but also of workplace systems and culture. Nightingale's Environmental Theory complements this view by emphasizing the importance of a clean, safe, and structured environment in promoting health and preventing harm. Applied to chemotherapy handling, this includes proper waste disposal, contamination control, and environmental safeguards that protect both patients and nurses. Together, these theories reinforce the study's view that improving chemotherapy safety requires both behavioral competence and environmental readiness, forming a dual foundation for effective policy and practice improvement.

## 2. RESEARCH METHODOLOGY

### 2.1. Research Design

This study employed a descriptive-correlational research design, which is appropriate for examining the nature and strength of relationships among variables without manipulating any of them (Nieswiadomy & Bailey, 2018). The descriptive component of the design was utilized to assess the respondents' levels of knowledge, attitude, and compliance regarding chemotherapy protocols. It enabled the researchers to systematically describe how nurses perceive and practice safe chemotherapy handling and administration within the context of their clinical environment.

The correlational component of the design aimed to determine the relationship between nurses' levels of knowledge and attitude toward chemotherapy protocols and their level of compliance with established safety standards. It also sought to explore any significant associations between demographic variables such as age, sex, civil status, and length of service, and the respondents' knowledge, attitude, and compliance levels. This approach allowed for a comprehensive analysis of potential influencing factors on nurses' safety behaviors.

By identifying these relationships and associations, the study was able to draw meaningful insights that informed the development of a proposed policy enhancement program. This program was grounded in empirical data gathered through the research process and was designed to strengthen institutional safety practices, improve nurses' adherence to protocols, and ultimately protect both healthcare workers and patients from the harmful effects of hazardous chemotherapy drugs.

**2.2. Setting**

The study was conducted at the Cancer Institute of a tertiary government hospital in Davao City, located along J.P. Laurel Avenue in Bajada. This hospital, operated under the supervision of the Department of Health of the Republic of the Philippines, has a 1,500-bed capacity and serves as one of the largest and most comprehensive public healthcare institutions in the region. The Cancer Institute within this tertiary hospital is a specialized facility that caters to patients with various types and stages of cancer. It is staffed by a multidisciplinary team composed of oncologists, surgeons, radiologists, nurses, and allied health professionals who collaboratively manage the care of cancer patients. The institute offers a broad range of services, including preventive screenings, diagnostic procedures, chemotherapy, radiotherapy, palliative care, and patient education. Its infrastructure and services are designed to provide accessible, affordable, and evidence-based cancer treatment, particularly to indigent and underserved populations in Davao City and neighboring provinces (Constancia, 2024; Presidential Broadcast Staff – Radio Television Malacañang, 2017; Vega et al., 2019).

The setting was chosen for its high patient volume, specialized oncology services, and the presence of a dedicated group of nurses actively involved in chemotherapy administration. These characteristics made it an appropriate site for examining nurses' knowledge, attitudes, and compliance with chemotherapy protocols in a real-world clinical context.

**2.3. Respondents**

The respondents of this study were oncologic nurses assigned at the Cancer Institute of a tertiary government hospital in Davao City. These nurses were selected based on their direct involvement in the care of patients diagnosed with cancer, particularly those engaged in the preparation, administration, and monitoring of chemotherapy treatments.

A universal sampling technique was employed, wherein all eligible nurses meeting the inclusion criteria were included in the study. This approach ensured that the entire population of oncology nurses working within the cancer institute at the time of data collection was represented. A total of 52 staff nurses participated as respondents. Their insights and experiences provided critical data for evaluating the levels of knowledge, attitude, and compliance with chemotherapy protocols, as well as for informing the proposed policy enhancement program.

**2.4. Instruments**

To gather the necessary data for this study, the researchers utilized a researcher-made survey questionnaire specifically developed to assess nurses' knowledge, attitude, and compliance with chemotherapy protocols. The instrument was designed to align with the study objectives and consisted of four major parts.

The first part focused on the demographic profile of the respondents, gathering essential information such as age, sex, civil status, and length of service. These variables were examined to identify possible associations with the respondents' knowledge, attitudes, and compliance levels. The second part of the instrument consisted of a knowledge assessment, presented as a 10-item multiple-choice quiz aimed at evaluating the respondents' understanding of chemotherapy protocols. This section focused on key concepts such as safe handling practices, drug preparation, and the administration of hazardous drugs. The quiz items were developed based on the institution's official anti-neoplastic therapy guidelines to ensure alignment with current clinical standards in 2019.

The third section of the questionnaire measured the respondents' attitudes toward chemotherapy protocols through 19 statements rated on a 4-point Likert-type scale, ranging from "Strongly Disagree" to "Strongly Agree." This section was designed to capture the nurses' beliefs, values, and perceptions related to the importance and implementation of safety practices in chemotherapy administration, also grounded in institutional guidelines in 2019.

The fourth and final section assessed compliance with chemotherapy protocols, using 20 items rated on a 5-point Likert-type scale from "Never" to "Always." These items were also derived from the institution's anti-neoplastic therapy guidelines and focused on evaluating the actual practices of nurses, including adherence to safe handling procedures, correct drug administration techniques, and compliance with institutional and national standards for chemotherapy drug safety in 2019.
To ensure the validity and reliability of the instrument, it was subjected to expert validation by four professionals with expertise in oncology nursing and healthcare research. A pilot study was conducted among 20 nurse respondents who shared similar characteristics with the target population. The reliability of the questionnaire was then tested using Cronbach's alpha. The knowledge section yielded Cronbach's alpha value of 0.70, which was interpreted as acceptable. Both the attitude and compliance sections produced Cronbach's alpha of 0.812, indicating good internal consistency. These results confirmed that the instrument was both valid and acceptable (Tavakol & Dennick, 2011). making it suitable for full implementation in the study.

**2.5. Data Gathering Procedure**

The researchers followed a systematic process in conducting this study to ensure methodological rigor and adherence to ethical standards. The initial step involved securing formal permission to conduct the study. A letter of request was submitted to the Program Chair of the Master of Arts in Nursing at Davao Doctors College, Inc., as well as to the Department of Health XI Cluster Ethics Review Committee (CERC) Chair, the Chief Nurse, Nurse V, and the Unit Managers of the participating tertiary hospital.

Upon approval, the researchers developed a structured, researcher-made questionnaire tailored to assess the knowledge, attitude, and compliance of nurses with chemotherapy protocols. This instrument underwent validation by four experts in nursing research and oncology practice to ensure content relevance and clarity. The 10-item knowledge section, designed in quiz format, underwent a test-retest procedure to assess its reliability. The 39-item attitude and compliance sections were tested using Cronbach's alpha, yielding reliability coefficients that confirmed the instrument's internal consistency.

Following validation and reliability testing, the researchers proceeded to the data collection phase. Nurses assigned at the cancer institute of the tertiary hospital were approached and invited to participate in the study. The researchers thoroughly explained the study's objectives, procedures, potential risks and benefits, and the rights of the participants, including their voluntary participation, right to withdraw at any time, and assurance of confidentiality. Informed consent was obtained from all willing participants prior to the administration of the questionnaire.

Once consent was secured, the survey questionnaires were distributed to the participants. The researchers were available to address any clarifications while ensuring that responses were completed independently and honestly. Upon completion, the answered questionnaires were collected, organized, and subjected to statistical analysis. The data were then tabulated, analyzed, and interpreted to address the research objectives.

Based on the findings of the study, a policy enhancement program was developed and proposed. This program was designed to address the identified gaps in knowledge, attitude, and compliance among nurses, with the goal of improving occupational safety and the quality of chemotherapy administration in the hospital setting.

### 2.6. Ethical Considerations

This study strictly adhered to established ethical standards to ensure the protection, dignity, and rights of all participants. Prior to the commencement of data collection, formal approval to conduct the study was secured from the Chair of the Master of Arts in Nursing Program of Davao Doctors College, Inc., as well as from the Chair of the Cluster Ethics Review Committee (CERC) and the Chief Nurse of the participating tertiary hospital in Davao City. Following these approvals, the researchers sought and obtained informed consent from all respondents.

Participation in the study was entirely voluntary. Only those who provided written informed consent after a thorough explanation of the research purpose, procedures, potential risks, and anticipated benefits were included. Participants were given adequate time to review the research information sheet and were assured that declining or withdrawing from the study at any time would bear no consequences to their professional standing or employment. No participants were subjected to physical, psychological, or emotional harm throughout the course of the research.

The rights of the respondents were fully upheld, with particular emphasis on their right to autonomy, privacy, and confidentiality. The study ensured that all identifiable information was kept strictly confidential and used solely for research purposes, except in cases where disclosure was required to protect the welfare of the participants. No names or personally identifying information appeared in the final thesis, data reports, or publications resulting from the study.

Furthermore, the researchers conducted all communications and procedures related to the study with honesty, transparency, and integrity. The study avoided any form of deception or misrepresentation of data. The records and data gathered were securely stored and accessible only to the researchers, in accordance with applicable data protection and privacy laws.

### 2.7. Statistical Treatment of Data

To analyze the data gathered from the respondents, appropriate statistical tools were employed to address the research questions and test the hypotheses of the study. Frequency and percentage were used to describe the respondents' demographic profile, specifically in terms of age, sex, civil status, and length of service. These descriptive statistics helped provide a clear understanding of the sample characteristics.

To assess the respondents' level of knowledge, attitude, and compliance with chemotherapy protocols, the mean was computed. The mean scores allowed for the interpretation of the general tendencies of the nurses' responses regarding their awareness, perceptions, and practices related to safe chemotherapy administration. To determine whether there were significant associations between the demographic variables and the respondents' level of knowledge, attitude, and compliance, the Pearson Chi-square test was utilized. This non-parametric test was appropriate for examining the relationships between categorical variables. Lastly, the Pearson product-moment correlation coefficient was used to assess the strength and direction of the relationship between the level of knowledge and attitude, and the level of compliance with chemotherapy protocols. This inferential statistical tool provided insights into how knowledge and attitude may influence adherence to safety practices among the respondents.

All statistical analyses were conducted with appropriate rigor to ensure the reliability and validity of the results, serving as the basis for the formulation of a proposed policy enhancement program to improve chemotherapy safety practices in the clinical setting.

## 3. RESULTS

### 3.1. Demographic Profile of the Respondents

**Table 1**
*Demographic profile of the respondents*

| Baseline Characteristic | *n* | % |
|---|---|---|
| Age | | |
| 18 to 25 years old | 5 | 9.61 |
| 26 to 33 years old | 42 | 80.76 |

| | | |
|---|---|---|
| 34 to 40 years old | 5 | 9.61 |
| Sex | | |
| Male | 16 | 30.76 |
| Female | 36 | 69.23 |
| Civil Status | | |
| Single | 34 | 65.38 |
| Married | 18 | 34.61 |
| Length of Service | | |
| 8 to 10 years | 14 | 26.92 |
| 5 to 7 years | 26 | 50.00 |
| 2 to 4 years | 8 | 15.38 |
| 1 year and below | 4 | 7.69 |

**Note.** *N* = 52

Table 1 presents the demographic characteristics of the respondents, including age, sex, civil status, and length of service. In terms of age, most of the respondents – that is, 42 out of 52 nurses (80.76%), were between 26 to 33 years old, followed by 5 respondents (9.61%) aged 18 to 25 years, and another 5 (9.61%) aged 34 to 40 years. These findings indicate that most of the nurses working in the Cancer Institute are within the young adult age group, specifically in their late twenties to early thirties. Regarding sex, the data show a predominance of female respondents, accounting for 36 out of 52 nurses (69.23%), while 16 respondents (30.76%) were male. In terms of civil status, the study revealed that a significant majority of the respondents were single (34 out of 52, or 65.38%), while 18 respondents (34.61%) were married. As for length of service, half of the respondents, or 26 out of 52 (50.00%), had been working in the cancer institute for 5 to 7 years, indicating a relatively experienced cohort. In contrast, only four nurses (7.69%) had less than one year of service.

Overall, the demographic profile of respondents suggests that the oncologic nursing workforce in this tertiary hospital is predominantly composed of young, single, female professionals with moderate experience in the field. These characteristics provide valuable context for understanding the patterns in knowledge, attitudes, and compliance explored in the succeeding sections of the study.

### 3.2. Knowledge of the Respondents on Chemotherapy Protocols

**Table 2**
*Knowledge of the Respondents on Chemotherapy Protocols*

| Knowledge Item Description (Shortened) | Mean | Knowledge Level |
|---|---|---|
| 1. Proper response to extravasation injury | 3.86 | High |
| 2. Discontinuation if vein patency is in doubt | 3.89 | High |
| 3. Incorrect roles in drug preparation | 2.90 | Average |
| 4. Prohibited practices in chemotherapy preparation area | 4.00 | High |
| 5. Eligibility for direct admission to Oncology unit | 3.90 | High |
| 6. Incorrect response to lab requirements before chemotherapy | 3.95 | High |
| 7. Incorrect treatment end point for adjuvant therapy | 3.95 | High |
| 8. Use of sclerosed/inflamed veins for IV chemo | 3.95 | High |
| 9. Incorrect checking method for vein patency during direct push | 3.98 | High |
| 10. Incorrect drug mixing method for infusion drips | 3.98 | High |
| Overall Mean | 3.83 | High |

**Note.** *Knowledge levels were interpreted using the following scale: 4.00–3.25 = High, 3.24–2.50 = Average, 2.49–1.75 = Low, 1.74–1.00 = Very Low*

Table 2 presents the level of knowledge of the staff nurses in relation to chemotherapy protocols. Based on the tabulated data, the respondents obtained an overall mean score of 3.83, indicating a high level of knowledge regarding the safe and proper handling of chemotherapeutic agents, the general institutional policies on chemotherapy safety, and the administration of intravenous antineoplastic drugs. This suggests that most nurses in the Cancer Institute possess a strong foundational understanding of the chemotherapy protocol implemented in their clinical setting.

The findings show that the highest mean score (4.00) was observed on the item related to the hospital's safety guideline prohibiting eating, drinking, smoking, chewing gum, applying cosmetics, or storing food in areas where chemotherapy drugs are prepared or administered. This reflects that respondents are particularly well-informed about standard precautionary measures aimed at minimizing inadvertent exposure to hazardous substances in the workplace.

Conversely, the lowest mean score (2.90) was recorded on the item concerning the proper preparation of antineoplastic drugs. This suggests that while general knowledge on institutional safety measures is high, there may be knowledge gaps in more technical or

specialized aspects of chemotherapy drug handling, such as reconstitution, dilution, and aseptic preparation techniques. This finding highlights a potential area for further training and competency development.

Overall, the results of this study affirm that nurses in the Cancer Institute are relatively knowledgeable about chemotherapy safety protocols. However, specific technical areas such as drug preparation may require targeted training interventions to close existing knowledge gaps and ensure consistent, evidence-based chemotherapy practices in the clinical setting.

### 3.3. Attitudes of the Respondents on Chemotherapy Protocols

**Table 3**
*Attitudes of the Respondents on Chemotherapy Protocols*

| Attitudes Item Description | Mean | Attitude Level |
|---|---|---|
| I. Safe & Proper Handling of Chemotherapy Drugs | | |
| 1. I believe it is important to prepare chemotherapeutic drugs in a designated, well-lit, and well-ventilated area equipped with a sink and cleaned after use. | 3.90 | High |
| 2. I consistently value the use of complete protective clothing (goggles, masks, gloves, and gown) during chemotherapy drug preparation. | 3.67 | High |
| 3. I consider it essential to prepare chemotherapy drugs using aseptic techniques while adhering to manufacturer's instructions regarding compatibility, dilution, and stability. | 3.69 | High |
| 4. I believe that reconstituted chemotherapy drugs should always be clearly and legibly labeled before administration. | 3.61 | High |
| 5. I support the proper disposal of all materials used in chemotherapy drug preparation by using a separate, designated container for antineoplastic waste. | 3.73 | High |
| 6. I recognize the importance of preventing the spread of spills and ensuring contaminated areas are thoroughly cleaned multiple times. | 3.55 | High |
| 7. I find it necessary to wash all potentially exposed skin surfaces with soap and water after accidental exposure to chemotherapeutic agents. This includes the use of isotonic eyewash for at least 15 minutes when the eyes are exposed to chemotherapy agents. | 3.84 | High |
| 8. I believe that all personnel involved in chemotherapy spill clean-up must wear appropriate protective clothing and ensure contaminated waste is properly discarded. | 3.82 | High |
| 9. There will be no eating, drinking, smoking, chewing of gum, application of cosmetics or storage of food. | 3.90 | High |
| Category Mean | 3.74 | High |
| II. Proper Administration of Intravenous Antineoplastic | | |
| 1. I believe it is necessary to use large veins and begin distally before moving proximally, while avoiding recently accessed, sclerosed, inflamed, or compromised veins. | 3.86 | High |
| 2. I consider it important to avoid using the antecubital fossa and wrist area when administering chemotherapy drugs. | 3.69 | High |
| 3. I believe administering anti-emetic drugs and waiting 15–20 minutes before starting chemotherapy is essential to patient safety and comfort. | 3.69 | High |
| 4. I believe that regularly checking for vein patency during direct push administration by assessing blood return is an important safety measure. | 2.09 | Low |
| 5. I support the use of a free-flowing line for direct push administration to ensure proper dilution, while avoiding pinching of the tubing. | 3.82 | High |
| 6. I believe it is necessary to flush IV lines with fluid between direct push drugs to prevent drug interactions. | 3.86 | High |
| 7. I find it essential to ensure that infusion drugs are properly mixed with the appropriate vehicle before administration. | 3.90 | High |
| 8. I believe frequent monitoring of the infusion drip rate is important in ensuring safe and effective chemotherapy delivery. | 3.98 | High |
| 9. I believe chemotherapy administration should be discontinued immediately if there is any uncertainty about vein patency or drug infusion. | 3.94 | High |
| 10. I agree that treatment should be stopped right away if a patient reports any untoward symptoms during chemotherapy. | 3.86 | High |
| Category Mean | 3.66 | High |
| Overall Mean | 3.71 | High |

**Note.** *Attitude levels were interpreted using the following scale: 4.00–3.25 = High, 3.24–2.50 = Average, 2.49–1.75 = Low, 1.74–1.00 = Very Low*

Table 3 presents the level of attitude of the staff nurses toward chemotherapy protocols. The data revealed an overall mean score of
Table 3 presents the level of attitude of the staff nurses toward chemotherapy protocols. The data revealed an overall mean score of
3.71, indicating that the respondents generally possess a positive or very good attitude regarding the safe and proper handling of

chemotherapeutic agents, adherence to institutional policies, and the correct administration of intravenous antineoplastic drugs. This finding suggests a strong alignment between the nurses' attitudes and the expected standards for safe chemotherapy practices.

The highest mean score was recorded on the item indicating that "drips must be checked frequently," which obtained a score of 3.98. This reflects a high degree of vigilance among the respondents in monitoring chemotherapy infusions, highlighting their awareness of the critical importance of continuous assessment during drug administration to prevent complications such as infiltration or adverse reactions. The data suggest that nurses are attentive to key safety behaviors and recognize the significance of frequent monitoring as a component of patient-centered oncology care.

However, the item with the lowest mean score (2.09) pertained to "checking the vein patency" prior to chemotherapy administration. This finding is notable and may indicate a gap in practice attitude or perceived importance regarding this crucial safety step. While frequent drip monitoring is strongly emphasized, there appears to be a diminished emphasis on assessing venous access before initiating treatment, which could pose risks such as extravasation and tissue damage. This discrepancy suggests an area where reinforcing protocols and safety attitudes may be needed.

### 3.4. Compliance of the Respondents with Chemotherapy Protocols

**Table 4**
*Compliance of the Respondents with Chemotherapy Protocols*

| Compliance Item Description | Mean | Compliance Level |
|---|---|---|
| I. Safe & Proper Handling of Chemotherapy Drugs | | |
| 1. I prepare chemotherapeutic drugs in a designated, well-lighted, and well-aerated area equipped with a sink with running water. | 4.92 | High |
| 2. I wear complete protective clothing (goggles, mask, gloves, and gown) during chemotherapy drug preparation. | 4.78 | High |
| 3. I use aseptic technique when preparing chemotherapy drugs and take appropriate precautions when diluting, shaking the vial, and extracting the drug. | 4.78 | High |
| 4. I ensure that syringes are properly and legibly labeled with the name of the drug(s) after reconstitution. | 4.92 | High |
| 5. I wash my hands immediately after completing any procedure involving chemotherapeutic drugs. | 4.82 | High |
| 6. I dispose of all materials used in the preparation or those contaminated with chemotherapy drugs in the appropriate waste containers. I also use absorbent towels to manage drug spill. | 4.88 | High |
| 7. I clean all contaminated surfaces at least three times in the event of a chemotherapy drug spill. | 4.48 | High |
| 8. I wash all potentially exposed skin surfaces with soap and water after a spill. If an eye is exposed to chemotherapy agents, I flush it with water or isotonic eyewash for at least 15 minutes. | 4.75 | High |
| 9. I ensure that all personnel involved in cleaning up chemotherapy spills wear proper protective clothing. | 4.73 | High |
| 10. I consistently enforce the policy prohibiting eating, drinking, smoking, chewing gum, applying cosmetics, or storing food in areas where chemotherapy drugs are handled. | 4.80 | High |
| Category Mean | 4.78 | High |
| II. Proper Administration of Intravenous Antineoplastic | | |
| 1. I use large veins for chemotherapy administration, beginning distally and moving proximally, while avoiding veins that are inflamed, sclerosed, or have been accessed within the last 24 hours. | 4.86 | High |
| 2. I avoid using the antecubital fossa and wrist area for intravenous chemotherapy administration whenever possible. | 4.65 | High |
| 3. I ensure that the cannula insertion site remains visible at all times during chemotherapy administration. | 4.88 | High |
| 4. I administer anti-emetic drugs and wait 15–20 minutes before starting chemotherapy to allow the anti-emetic to take effect. | 4.76 | High |
| 5. I perform direct push administration using a free-flowing IV line to ensure proper dilution, and I avoid pinching the tubing. | 4.42 | High |
| 6. I flush the IV line with fluid between administering different direct push chemotherapy drugs. | 4.69 | High |
| 7. I ensure that chemotherapy drugs used for infusion drips are properly mixed with the correct vehicle before administration. | 4.88 | High |
| 8. I frequently check the rate of chemotherapy infusion drips throughout the treatment. | 4.90 | High |
| 9. I discontinue chemotherapy administration immediately if there is any doubt about vein patency or the drug infusion process. | 4.88 | High |

| | | |
|---|---|---|
| 10. I stop chemotherapy administration immediately if the patient reports any untoward symptoms during the infusion. | 4.78 | High |
| Category Mean | 4.77 | High |
| Overall Mean | 4.86 | High |

Table 4 presents the level of compliance of the staff nurses with established chemotherapy protocols. The respondents demonstrated a high level of compliance, with an overall mean score of 4.86, which is interpreted as "high", indicating that most of the nurses consistently adhere to institutional guidelines on the safe and proper handling of chemotherapeutic drugs, including general policy adherence and the administration of intravenous antineoplastic agents.

In Part I of the compliance assessment, which focused on the safe and proper handling of chemotherapy drugs, the respondents obtained a mean score of 4.78. Among the items assessed, the highest mean score (4.92) was observed in the item regarding the establishment of a well-lighted and well-ventilated permanent drug preparation area, including proper labeling of syringes after reconstitution. This reflects a strong organizational and personal commitment to creating an environment that supports safe chemotherapy preparation practices.

However, the item with the lowest compliance score (4.48) was related to washing contaminated surfaces in cases of drug spillage. While still categorized as “high,” this slightly lower score suggests a relative gap in the consistent practice of environmental decontamination, a crucial safety measure in minimizing surface contamination and occupational exposure. This finding highlights the need for reinforced compliance in environmental hygiene procedures, particularly when managing cytotoxic spills.

Part II of the compliance assessment focused on the proper administration of intravenous antineoplastic drugs, where the respondents achieved a mean score of 4.77, still indicative of consistently high compliance. The highest score (4.90) was found in the practice of frequently checking the rate of infusion drips, reflecting strong clinical vigilance. However, the lowest score (4.40) was noted in the item assessing whether direct push administration was performed with a free-flowing line to ensure proper dilution and avoid occlusion, suggesting a potential area for clinical reinforcement and continuing education.

In conclusion, while the staff nurses in the Cancer Institute demonstrate consistently high levels of compliance with chemotherapy protocols, specific areas such as spill response procedures and direct IV push technique require targeted improvement. Strengthening institutional training programs and enhancing access to refresher courses and hands-on competency checks are essential in maintaining and elevating compliance standards across all facets of chemotherapy care.

### 4.5. Associations Between Demographic Variables and Knowledge, Attitude, and Compliance with Chemotherapy Protocols

**Table 5**
*Associations Between Demographic Variables and Knowledge, Attitude, and Compliance with Chemotherapy Protocols*

| Variable | Knowledge | | Attitude | | Compliance | |
|---|---|---|---|---|---|---|
| | *p*-value | $\chi 2$ | *p*-value | $\chi 2$ | *p*-value | $\chi 2$ |
| Age | < .01 | 27.82 | .88 | 0.24 | .16 | 23.59 |
| Sex | .55 | 2.09 | .50 | 0.45 | .69 | 6.43 |
| Civil Status | .13 | 5.49 | .46 | 0.54 | .73 | 6.09 |
| Length of Service | < .01 | 40.54 | .42 | 2.76 | .73 | 21.99 |

Table 5 presents the results of the test for association between the respondents’ demographic profile and their levels of knowledge and attitude regarding chemotherapy protocols. The statistical analysis revealed that age and length of service were significantly associated with the nurses’ knowledge of chemotherapy protocols, with p-values less than 0.01, indicating a statistically significant relationship at the 0.05 level of significance. This suggests that older nurses and those with longer service experience tend to possess higher levels of knowledge, possibly due to greater clinical exposure and accumulated training opportunities over time. In contrast, sex and civil status yielded p-values greater than the 0.05 threshold, indicating no significant p association with knowledge levels. This implies that gender and marital status do not significantly influence how knowledgeable nurses are about chemotherapy safety protocols.

With regard to attitude, the study found no statistically significant association between any of the demographic variables and the respondents’ attitudes toward chemotherapy protocols. The p-values for age, sex, civil status, and length of service were all above the level of significance, suggesting that attitudes toward chemotherapy safety are uniformly distributed regardless of demographic characteristics. Furthermore, the analysis showed no significant association between compliance and age, sex, civil status, and length of service. This indicates that regardless of demographic background, the nurses displayed relatively similar levels of compliance with institutional protocols.

### 4.6. Relationship Between Level of Knowledge and Attitude, and Compliance with Chemotherapy Protocols

**Table 6**
*Relationship Between Level of Knowledge and Attitude, and Compliance with Chemotherapy Protocols*

| Variable | Compliance | | | |
|---|---|---|---|---|
| | *p*-value | *r* | Decision | Interpretation |

| | | | | |
|---|---|---|---|---|
| Knowledge | .786 | .039 | Accept Ho | Not Significant |
| Attitude | .003 | .403 | Reject Ho | Significant |

Table 6 presents the statistical analysis of the relationship between the respondents' level of knowledge and attitude and their compliance with chemotherapy protocols. The findings reveal that the relationship between attitude and compliance is statistically significant, with a p-value of 0.003, which is well below the 0.05 level of significance. Furthermore, the Pearson correlation coefficient (r = 0.403) indicates a moderate positive correlation, suggesting that as nurses' attitudes toward chemotherapy protocols improve, their compliance with safety guidelines also tends to increase.

In contrast, the analysis found no significant relationship between the level of knowledge and the level of compliance, with a p-value of 0.786. This suggests that possessing knowledge about chemotherapy protocols does not necessarily translate into compliant behavior. In other words, a nurse may be well-informed about the guidelines yet still fail to consistently apply them in practice.

**4. DISCUSSION**

This study sought to evaluate the knowledge, attitudes, and compliance of oncology nurses in relation to chemotherapy protocols, while also exploring the associations between these variables and the demographic characteristics of the respondents. The findings offer critical insight into the preparedness and safety practices of nurses handling chemotherapeutic agents within a tertiary cancer care institution, providing a valuable contribution to ongoing discussions on occupational safety, competency, and quality in oncology nursing.

The demographic analysis revealed that the majority of respondents were between the ages of 26 and 33, predominantly female, single, and had worked in the Cancer Institute for 5 to 7 years. This profile is consistent with demographic trends reported in similar studies conducted in developing regions, where the oncology workforce often consists of early-career female nurses with moderate clinical experience (Josiah et al., 2025; Qadir et al., 2016). The predominance of younger nurses may reflect both the attractiveness of oncology nursing to recent graduates and the demanding nature of the field, which may affect long-term retention.

Notably, a significant portion of the nurses had been in service for over five years, indicating a reasonably seasoned cohort. This demographic context is crucial, as age and length of service were found to have a statistically significant association with knowledge levels in the current study. The association is logical and supported by findings in previous research, which indicated that clinical exposure and accumulated experience enhance familiarity with chemotherapy handling protocols and institutional safety practices (Abu-Sharour et al., 2021; Zaman et al., 2024). However, no significant associations were found between demographic variables and attitudes or compliance, implying that while experience builds knowledge, it does not necessarily shape behavior or values in the absence of institutional reinforcement.

In terms of knowledge, results revealed that the staff nurses have a high level of understanding of chemotherapy safety protocols. This finding is more favorable than several other studies in similar contexts, where poor to moderate knowledge was reported (Zaman et al., 2024; Ahmad et al., 2025). It resonates with the findings of Orujlu et al. (2015), who emphasized that nurses' knowledge about chemotherapy protocols directly influences their adherence to safety practices. Similarly, Nwagbo et al. (2017) and VerStrate (2015) noted that inadequate education and experience increase the risk of occupational exposure and medication errors.

However, a critical gap was identified in the area of drug preparation, which garnered the lowest mean score. These are consistent with previous findings (Nwagbo et al., 2017; Khan et al., 2012), which highlighted that technical skills deficiencies can lead to critical errors and compromise safety. While the present study suggests effective hospital-based training in general safety, the variation in knowledge across domains points to the need for continuous, targeted education.

Regarding attitudes, the respondents demonstrated a generally positive disposition, with particularly high agreement on the need for frequent drip monitoring during chemotherapy administration. This result is encouraging, as a positive safety culture has been strongly linked to reduced adverse events and improved compliance (Rao & Cheema, 2020). Nevertheless, the low attitude score regarding checking vein patency prior to administration raises a red flag. This procedural lapse is significant, as neglecting to confirm access integrity can lead to severe complications such as extravasation (Koulounti et al., 2019; Kumari, 2018). Such findings call for a reinforcement of the importance of comprehensive pre-administration assessments in both policy and practice. Contrasts arise with the findings of Orujlu et al. (2015), who noted unfavorable attitudes among oncology nurses in Iran due to the absence of structured training. This underlines the importance of institution-driven programs to promote attitude shaping through routine education and supportive environments.

Compliance with chemotherapy protocols was rated high. This indicates that institutional standards are largely followed, which is a promising finding given the high-risk nature of chemotherapy drug handling. However, slight reductions in compliance scores in areas such as spill management and direct IV push with a free-flowing line suggest lapses in specific technical practices. These findings are in line with the work of Zuo et al. (2024), who reported that compliance, while often high in general procedures, tends to falter in specialized tasks due to constraints such as inadequate staffing, workload, or insufficient reinforcement of protocol specifics.

The statistical analysis further revealed that age and length of service were significantly associated with knowledge, supporting earlier assertions that experience fosters understanding. Interestingly, none of the demographic variables, including sex and civil status, were associated with either attitude or compliance. This suggests that personal factors may be less predictive of safety-related

behaviors than institutional and environmental ones, such as training access, leadership support, and perceived organizational safety climate (Abu Sharour et al., 2021).

Most notably, a moderate and statistically significant positive correlation was found between attitude and compliance, while the correlation between knowledge and compliance was not statistically significant. This suggests that shaping nurse behavior may rely more on reinforcing attitudes than solely increasing factual knowledge. DeJoy's (1996) Behavioral Diagnostic Model (BDM) is particularly relevant here, as it emphasizes the role of threat-related beliefs, response efficacy, and self-efficacy in guiding self-protective workplace behavior. The significant relationship between attitude and compliance aligns with this framework, implying that interventions should be designed to target attitudes at various stages of behavior change, which include hazard appraisal, decision-making, initiation, and adherence.

In parallel, Florence Nightingale's Environmental Theory (Gilbert, 2020) provides a complementary lens. Nightingale posited that optimizing environmental conditions, such as cleanliness, ventilation, and organization, is vital for health promotion. The study's findings on the importance of proper infrastructure for drug preparation and challenges in contamination control underscore this theory's relevance.

In response to the identified gaps in chemotherapy safety practices, the implementation of a Chemotherapy Safety Enhancement Program (CSEP) is proposed. Evidence from Pathak et al. (2016), Kermani et al. (2015), and Alehashem and Baniasadi (2018) underscores the effectiveness of structured training in improving nurses' knowledge, attitudes, and practices related to chemotherapy administration. Additionally, research by Neuss et al. (2016) and Hennessy and Dynan (2014) highlights the critical role of workplace culture, perceived risk, and peer modeling in influencing compliance with safety protocols. While foundational knowledge is essential, these findings collectively suggest that lasting behavior change is most effectively achieved through a combination of educational strategies, attitude-shaping interventions, and institutional support. Accordingly, the proposed CSEP is theoretically grounded in DeJoy's Behavioral Diagnostic Model and Nightingale's Environmental Theory, integrating both behavioral and environmental modifications to enhance safety, reinforce compliance, and promote a culture of excellence in chemotherapy nursing practice.

Key components include:
**1. Skills Enhancement Workshops:** Emphasizing practical demonstrations and return demonstrations on drug preparation and IV administration techniques, aligned with response efficacy and self-efficacy constructs from BDM.
**2. Reflective Safety Huddles**: Facilitating structured debriefings post-chemotherapy sessions to assess compliance and attitudes, targeting the decision-making and adherence stages.
**3. Environmental Audits and Redesign:** Assessing drug preparation areas for lighting, ventilation, and layout to ensure optimal conditions, in accordance with Nightingale's environmental hygiene principles.
**4. Mentorship and Peer Coaching:** Leveraging the influence of senior nurses to reinforce normative safety behaviors, facilitating the social reinforcement described in DeJoy's model.
**5. Feedback and Monitoring System:** Real-time compliance tracking and feedback loops to identify trends, support adherence, and inform continuous improvement.

Limitations of this study include its reliance on self-reported data, which may be subject to response bias, and the single-institution sample, which limits generalizability. Nevertheless, this study contributes to the growing body of evidence on chemotherapy safety by highlighting critical disparities between knowledge, attitude, and compliance. It underscores the value of theoretically grounded interventions and the integration of behavioral science and environmental health theories in oncology nursing. Future studies may adopt mixed-method designs to further explore the underlying motivations behind noncompliance and assess the longitudinal impact of the CSEP model on safety outcomes.

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