"A STUDY TO ASSESS THE EFFECT OF STRUCTURED TEACHING PROGRAMME ON KNOWLEDGE ON SAFETY MEASURES REGARDING HANDLING OF CHEMOTHERAPEUTIC DRUGS AMONG 3RD YEAR B.SC. NURSING STUDENTS IN SELECTED NURSING COLLEGES OF GUWAHATI, ASSAM"

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HEALTH SCIENCES, ASSAM

2024

CHAPTER-I

INTRODUCTION

"Once you choose hope anything's possible"

-Christopher Reese

Background of the study

Chemotherapy was created in the early 20th century, initially not intended for cancer treatment. It was discovered that during World War II, exposure to nitrogen mustard caused a discernible decrease in white blood cell counts. Scientists are currently investigating the use of mustard compounds to stop the growth of rapidly proliferating cells, such cancer cells, in light of this discovery. In the 1940s, two renowned pharmacologists from Yale, Alfred Gilman and Louis Goodman, looked at the possible medical advantages of "mustard agents" in the treatment of lymphoma. They first induced lymphomas in mice to show the effectiveness of mustard agents against tumors. Subsequently, in partnership with thoracic surgeon Gustav Linskog, they administered mustine (nitrogen), a less volatile form of mustard gas, to a patient with non-Hodgkin's lymphoma. Although the patient required further chemotherapy, the scientists observed a significant reduction in tumor size for several weeks following treatment. This discovery marked the beginning of using cytotoxic drugs for cancer therapy.[1]"

One of the mainstays of cancer treatment is chemotherapy, which uses medications to kill cancer cells. Its main objective is to inhibit the growth and division of cancerous cells in order to prevent their spread. Over the past few decades, there has been a dramatic improvement in cancer survival rates due to the invention and optimization of chemotherapy.[2]

Chemotherapy is tailored to each patient's specific condition and cancer stage, leading to variations in treatment duration and the types of medications used. Cytotoxic drugs, often referred to as cytotoxic chemotherapy, aim to destroy cancer cells. Cytotoxic medications stop cells from proliferating, which kills cancer cells. Nearly all of the body's cells are reached by cytotoxic medications, which kill both malignant and healthy cells by moving through the bloodstream. Chemotherapy produces unfavorable side effects because of this. Treatment commonly leads to fatigue, hair loss, and nausea. The side effects of cytotoxic medications primarily impact rapidly dividing tissues, such as mucous membranes, bone marrow, and hair, as these drugs disrupt those cells. The type and severity of side effects can vary based on the specific medications used, dosages, the patient's overall health, and individual responses to the drugs.[3]

Chemotherapy, or antineoplastic medications, impact both healthy and malignant cells due to their non-selective mechanism of action. Treatment with these drugs has been associated with harmful side effects that are well-documented. Chemotherapy may have adverse effects on the hematological system, liver, kidneys,

heart, and lungs in addition to reproductive, ototoxic, immunotoxin, cutaneous, and particular harm to tissues that regenerate quickly. In the 1970s, it was observed that patients who had received chemotherapy for solid tumors developed second malignancies, with bladder cancer and leukemia being the most common. According to various studies, including those from the National Institute for Occupational Safety and Health (NIOSH) in 2004, Green et al. in 2009, Furlow in 2010, and the Health and Safety Executive (HSE) in 2013, healthcare professionals exposed to cytotoxic medications may also face similar toxic risks. Recent research indicates that nurses and pharmacy staff continue to be exposed to these medications, despite the implementation of comprehensive guidelines and regulations for their safe handling.[4]

According to the American Society of Health-System Pharmacists (2006), hazardous medicines (HDs) are pharmacologic agents that show one or more of the following traits at low doses: carcinogenicity, teratogenicity, genotoxicity, reproductive toxicity, or organ toxicity. The majority of HDs are chemotherapy medications used to treat cancer, hence occupational exposure to HDs poses a serious risk to oncology nurses. HDs can be transferred to nurses when they prepare, administer, or handle patient excrement after use. Exposure to such substances has been associated with both immediate and long-term health consequences, such as immediate symptoms, unfavorable reproductive results, and a higher risk of cancer.[5]

Despite being necessary for the treatment of cancer, chemotherapy medications are categorized as hazardous because they have the potential to be extremely harmful if not used correctly. This categorization is a result of their innate qualities, which effectively inhibit cancer cells but also endangering people, healthcare providers, and the environment.[6]

When handling trash and providing care for patients, healthcare personnel may come into contact with hazardous medications at many stages of production, distribution, receiving, storage, transit, compounding, and administration. Every employee engaged in these tasks, along with equipment upkeep and repair, runs the risk of coming into touch with uncontained drugs.[7]

To reduce exposure, personal protective equipment (PPE) such as gowns, gloves, masks, and eye protection must be used constantly. Chemotherapy medications should also only be prepared in spaces that have been assigned proper ventilation and spill containment. Equipment and surfaces that have become contaminated need to be quickly cleaned and decontaminated according to strict guidelines. To reduce the dangers and guarantee the safety of medical personnel and patients undergoing chemotherapy treatments, routine monitoring and adherence to safety protocols are essential. Healthcare workers can effectively manage the hazards involved with administering chemotherapy and help create safer healthcare environments by adhering to strict safety guidelines.

Need of the Study

Cancer is a disease that impacts individuals of all races, ages, and ethnic backgrounds, characterized by the uncontrolled and unregulated growth of cells within a living organism. It ranks among the second most common causes of death, following heart conditions. In 2018, there were almost 18 million instances reported, with 9.5 million being male and 8.5 million being female.[8] Cancer accounts for about 1 in 6 deaths, contributing an additional 9.6 million cases to overall mortality rates. Nearly two thirds of cancer cases are expected to occur in poorer nations, where the current death rate is 70%. [9-11] Depending on the location, grade, and stage of the tumor, a variety of treatments are available to lessen the severity of this potentially fatal condition, including immunotherapy, chemotherapy, radiation therapy, and monoclonal antibody therapy. Nonetheless, systemic treatment is increasingly the preferred approach these days, and it is wise to note that chemotherapy has revolutionized cancer care and tightly controlled this deadly illness.[12]

More precautions are needed as technology advances since prolonged exposure to these substances could be hazardous to those who use them.[13] By preventing cell division, cytotoxic medications destroy tumor cells; yet, because of this property, they may also be hazardous to healthy cells. Hospital staff who utilize cytotoxic drugs have grown concerned about the risks associated with their widespread use. Recent research indicates that 17% of nurses working in chemotherapy departments may have been exposed to these medications through their eyes or skin. Moreover, unintentional exposure to chemotherapy medications may impair the reproductive system twice, delay the nervous system, and raise the risk of blood malignancies.[14] According to a Brazilian study, all nursing officers exposed to chemotherapy treatments had altered caloric test results (100%), 56.25% reported feeling lightheaded, and 75.75% exhibited audiometric notch changes [15]. A large-scale randomized controlled trial (RCT) including about 56,000 registered nurses in Canada revealed that they were at risk for acquiring rectal and breast cancer as a result of their job exposure to cytostatic drugs.[16]

Frontline health workers who frequently handle chemotherapeutic agents are especially vulnerable due to the ongoing harmful effects of these mutagens and teratogens. Many medical professionals handle these medications in violation of prescribed guidelines, even though doing so carries risk. on 40% of the staff members in a tertiary care facility in India were found to lack enough understanding on handling cytotoxic drugs, according to a cross-sectional study [16]. According to a recent study by Devi S. et al., nearly half (51.7%) of nursing officers had average practice skills, while the majority (55%) had poor knowledge. In general, it has been claimed that the biggest risk to health has always been linked to the manufacture and handling of cytotoxic drugs.[17]

When administering and preparing chemotherapy, nursing staff members are crucial. These medical personnel ought to be highly knowledgeable about safe chemotherapy administration practices and exhibit positive behaviors in this regard. Consequently, one of the main safety concerns is the degree of awareness and application of safe chemotherapeutic drug handling practices.[18]

According to a study, nurses are more vulnerable when administering and preparing cytotoxic medicines. The understanding of antineoplastic medications among nurses is insufficient, which is concerning given its importance in enhancing safety standards when handling cytotoxic drugs. In-service training is an effective tool for increasing knowledge and awareness in this area. This study also demonstrated how important it is to upgrade the working environment and have safety gear available. Given that the primary preventive strategies emphasize minimizing exposure to cytotoxic medications, it is essential to share information about the updated guidelines with both practitioners and administrators. Because of this, nurses' awareness of possible toxicities and the precautions that must be taken when preparing and giving these medications is becoming more and more crucial.[19]

This study aimed to evaluate the genotoxicity in nurses from an oncology department at a South Indian hospital who were frequently exposed to antineoplastic medications. The comet assay and the micronucleus test were used to evaluate DNA damage in whole blood, while the micronucleus test was used exclusively on buccal epithelial cells. There were 60 age- and sex-matched controls and 60 nurses who managed antineoplastic drugs among the participants. The nurses' urine was also tested for cyclophosphamide levels, a sign of drug absorption. Results showed that exposed nurses had significantly greater DNA damage in their lymphocytes compared to the controls. Additionally, the frequency of micronuclei in "peripheral blood lymphocytes and buccal cells was notably higher ($P < 0.05$) among the exposed nurses compared to the controls". Age and occupational exposure were found to have a substantial impact on both the mean comet tail length and the frequency of MN, according to multiple regression analysis. Nurses who handled antineoplastic drugs had an average urine content of 0.44 micrograms of cyclophosphamide per milliliter, with a standard variation of 0.26 micrograms. Our work has demonstrated that occupational exposure to antineoplastics has resulted in higher DNA damage in nurses. This information supports the requirement for assistance in this case as well as the maintenance of safety precautions to prevent exposure when using and handling antineoplastic drugs.[20]

The Health of Nurses Study, according to a recent large study, nurses who handle chemotherapy medications experience twice as many spontaneous abortions as nurses who do not touch the treatments. Previous research has reported similar findings; however, this study focused on pregnancy outcomes and occupational exposures among 8,461 participants from the Nurses' Health Study, which was conducted in collaboration with the National Institute for Occupational Safety and Health (NIOSH). 6,707 live births and 775 spontaneous abortions (10%) that happened before 20 weeks were reported by the participants. Six Many chemotherapy medications are thought to be dangerous for healthy individuals. Because of this, the medical professionals who administer chemotherapy will take care to keep you away from the medications while they are administering them.[21]

Studies have indicated that nurses are the primary healthcare providers who must deal with the side effects of cytotoxic medications when they are being administered. The investigator has prior experience working in an oncology unit with nurses who are skilled in the administration of cytotoxic medications. Despite this, the nurses only use protective gear, such as gloves and masks, when administering drugs, which is insufficient to

fully protect patients from the potentially harmful effects of these drugs. Furthermore, in the event of an emergency, they are unable to apply the safe handling standards, which could result in health issues down the road. Because of this, the researcher thought it would be a good idea to assess each nurse's level of expertise in order to enhance their understanding of the safe administration of cytotoxic medications and lower the likelihood of future adverse drug reactions.

While working with the cancer patients, the investigator noticed that the nursing students had shown reluctance to handle chemotherapy patients during their clinical posting because they were afraid of the risks associated with the medication. Because of the investigator's insight into the need to familiarize nursing students with cancer and chemotherapy concepts and practices in order to better equip them for their future roles as nurses, this study was chosen.

Statement of the problem

A Study to assess the Effect of Structure Teaching Programme on Knowledge on Safety Measures regarding Handling of Chemotherapeutic Drugs among 3rd Year B.Sc. Nursing students in selected Nursing Colleges of Guwahati, Assam.

Objectives of the study

1. To assess the pre-test level of Knowledge on Safety Measures regarding Handling of Chemotherapeutic Drugs among 3rd year B.Sc. Nursing students in selected Nursing Colleges of Guwahati, Assam.

2. To assess the post-test level of Knowledge on Safety Measures, regarding Handling of chemotherapeutic drugs among 3rd year B. Sc. Nursing students in selected Nursing Colleges of Guwahati, Assam.

3. To evaluate the effect of Structured Teaching Program on Knowledge on Safety Measures regarding Handling of Chemotherapeutic Drugs among 3rd year B.Sc. Nursing students in selected Nursing Colleges of Guwahati, Assam.

4. To find out the association betwen pre-test level, of Knowledge on Safety Measures regarding Handling of Chemotherapeutic Drugs with selected demographic variables.

Operational definition

Assess

According to Oxford dictionary, assess means to evaluate the nature or quality.[22]

The term "assess" in this study refers to the methodical measurement and tracking of knowledge levels both before and after the Structured Teaching Programme utilizing a structured knowledge questionnaire that is self-administered.

Effect

According to the Oxford Dictionary, "effect" refers to the degree to which something successfully produces a desired result.[22]

In this study, "effect" refers to the degree to which the Structured Teaching Programme has successfully achieved its goals, specifically in terms of enhancing knowledge about safety measures for handling chemotherapeutic drugs.

Structured Teaching Programme

According to the Oxford Dictionary, a "Structured Teaching Programme refers to a systematically developed instructional program that utilizes instructional aids to convey information effectively.[22]

In this study, "structured teaching programme" refers to a systematically developed instructional program aimed at providing knowledge about safety measures for handling chemotherapeutic drugs to third-year B.Sc. Nursing students.

Knowledge

According to the Oxford Dictionary, "knowledge" describes the facts, comprehension, and abilities that one has gained by education or experience, as well as the awareness of a certain circumstance or truth.[22]

In this study, "knowledge" refers to the understanding and appropriate responses related to safety measures for handling chemotherapeutic drugs.

Safety measures

According to the Oxford Dictionary, "safety measures" refer to any actions, conditions, or procedures implemented to ensure compliance with safety standards.[22]

In this study, "safety measures" refer to the procedures implemented while handling chemotherapeutic drugs to reduce the risk of harm to individuals and the environment.

Hypotheses

The hypotheses were tested at 0.05 level of significance

H₁: There is significant difference between pre-test and post-test knowledge on Safety Measures regarding Handling of Chemotherapeutic Drugs among 3rd Year B.Sc. Nursing students of Guwahati, Assam as measured by Structured self-administered knowledge questionnaire at 0.05 level of significance.

H$_2$: There is significant association between pre-test knowledge on Safety Measures regarding Handling of Chemotherapeutic Drugs among 3rd Year B.Sc. Nursing students with selected demographic variables as measured by structured self-administered knowledge questionnaire at 0.05 level of significance.

Assumptions

- 3rd year B.Sc. Nursing students may possess some knowledge of safety measures for handling chemotherapeutic drugs.

- A structured teaching program will enhance their understanding of safety measures related to handling these drugs.

Delimitation

- The study was delimited only to Private "Nursing colleges" in Guwahati, Assam.

Conceptual framework

The conceptual framework serves as the foundation of a research study. Its purpose is to make scientific findings meaningful and applicable in a broader context.[23]

A conceptual framework addresses the ideas that have been grouped together due to their applicability to the research question, offering a specific framework for clinical practice, investigation, and teaching. General System Theory serves as the foundation for conceptual framework chosen for study, explaining how its elements relate to one another. In 1968, Ludwig von Bertalanffy made the proposal.

To guarantee goal realization, the process can be divided into consecutive tasks using general system theory. The system's four main components are:

- Input

- Throughput

- Output

- Feedback

Input- Input refers to the matter, energy, and transformations that enter the system. [23]

In this study, the term input refers to the amount of information processed by 3rd year B.Sc. Nursing students at specific nursing institutes in Guwahati, Assam, after completing a structured training program on safe handling practices for chemotherapy medications.

Throughput- Biological, psychological, and sociocultural subsystems are used in throughput to modify the inputs.[23]

In this study, the term "throughput" refers to the amount of information processed by 3rd year B.Sc. Nursing students at specific nursing institutes in Guwahati, Assam, after completing a structured training program on safe handling practices for chemotherapy medications.

Output- The return of matter, energy, and information to the environment in the form of behavioral patterns, both psychological and physical, is referred to as output. It is assessed in relation to change.[23]

The increase in post-test knowledge levels among 3rd year B.Sc. Nursing students after the implementation of a structured teaching program is referred to as the study's "output." A standardized, "self-administered knowledge questionnaire" is used to collect post-test knowledge scores, which are subsequently categorized as adequate, moderate, or inadequate.

Feedback- The process of sharing the system's findings is called feedback. The output can be used to determine whether the knowledge is deemed adequate, moderate, or inadequate.[23]

In this study, it was believed that refreshing 3rd year B.Sc. Nursing students' understanding of safety precautions related to handling chemotherapy medications would be beneficial if they received sufficient information after participating in a structured training program on the topic. However, the study does not consider the need to reevaluate the input and throughput of the system if the knowledge gained is found to be moderate or inadequate.
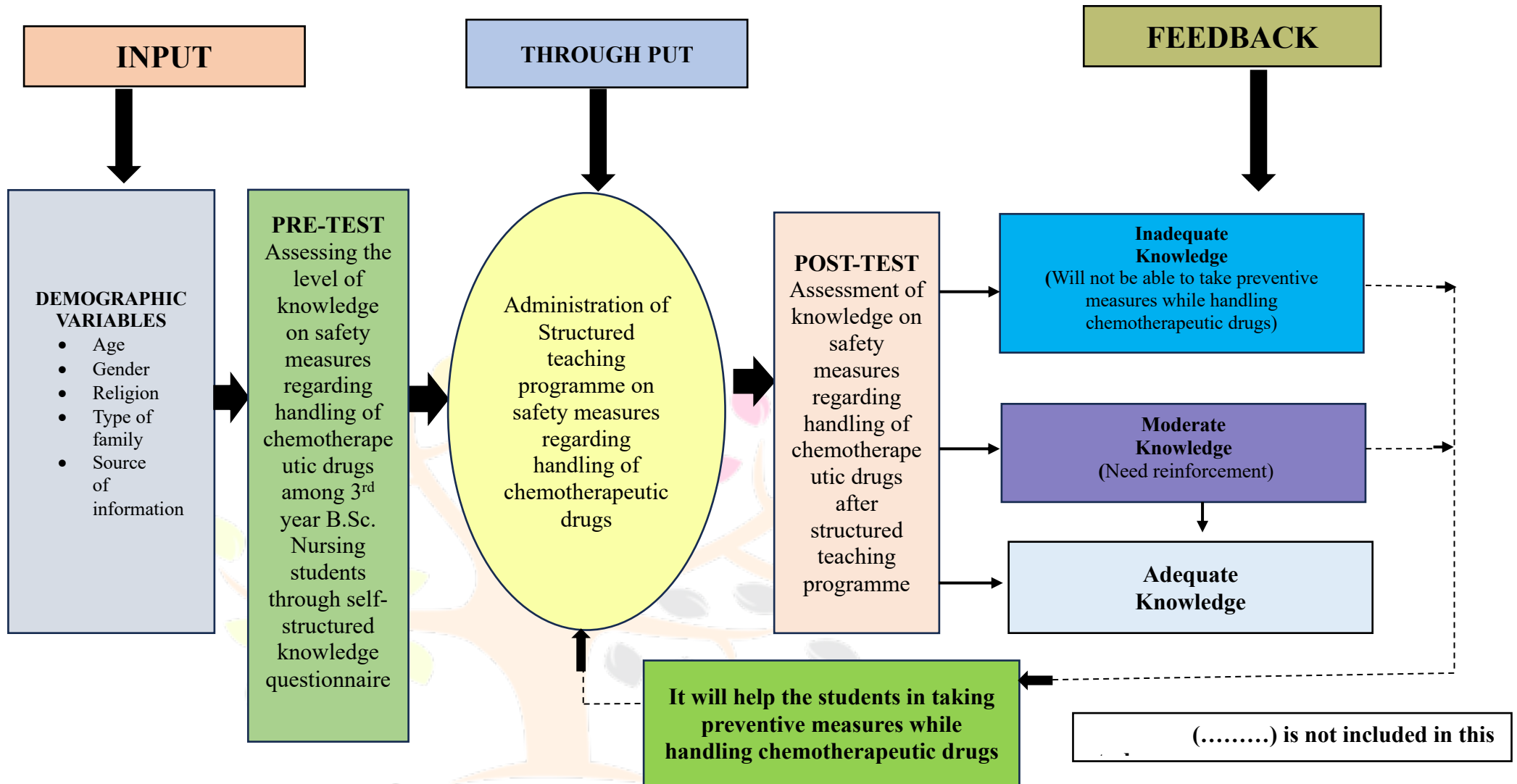
INPUT

THROUGH PUT

FEEDBACK

DEMOGRAPHIC VARIABLES
- Age
- Gender
- Religion
- Type of family
- Source of information

PRE-TEST
Assessing the level of knowledge on safety measures regarding handling of chemotherapeutic drugs among 3rd year B.Sc. Nursing students through self-structured knowledge questionnaire

Administration of Structured teaching programme on safety measures regarding handling of chemotherapeutic drugs

POST-TEST
Assessment of knowledge on safety measures regarding handling of chemotherapeutic drugs after structured teaching programme

Inadequate Knowledge
(Will not be able to take preventive measures while handling chemotherapeutic drugs)

Moderate Knowledge
(Need reinforcement)

Adequate Knowledge

It will help the students in taking preventive measures while handling chemotherapeutic drugs

(………) is not included in this

Figure 1. A General System Theory Model by Ludwig von Bertalanffy's (1968)

Summary

The context of the study, the necessity of the research, the problem description, the particular objectives, operational definitions, theories, presumptions, and the conceptual framework are all covered in this chapter.

CHAPTER – II

REVIEW OF LITERATURE

A critical component of any research project, from beginning to end, is the literature review. It offers a unique perspective on the issue and assists in selecting the appropriate approach, instrumentation, and data analysis methods. A thorough assessment of the literature has been conducted with these in mind. The review and in-depth analysis of related material aimed to increase the scope of knowledge on the chosen issue.

An extensive search of books, journals, and internet resources served as the foundation for the literature review for this project. It's arranged under the subsequent headings:

Section I: Review of Literature Related to Knowledge on Safety Measures regarding handling of chemotherapeutic Drugs.

Section II: Review of Literature Related to the Effect of Structured Teaching Programs on Safety Measures regarding Handling Chemotherapeutic Drugs.

SECTION I: Review of literature related to knowledge on safety measures regarding handling of chemotherapeutic drugs.

V. Uma, M. Subhasree, S. Subitha, S. Sudharsan (2024), a non-experimental descriptive research design study was conducted using a quantitative research approach. A self-structured, closed-ended questionnaire was employed to collect information about chemotherapy treatments and assess the knowledge and attitudes of 3rd and 4th year B.Sc. Nursing students. Regarding the safe handling of chemotherapy medications, 42 participants (42%) demonstrated inadequate knowledge, while the majority, 58 participants (58%), showed relatively adequate understanding. These findings clearly indicate that students lack essential knowledge about safely managing chemotherapy drugs. In terms of attitudes, most students (75%) exhibited a positive attitude toward the safe handling of chemotherapy medications, while only 25% had a negative view. Consequently, the majority held a favorable opinion on the responsible use of these drugs. The study's results, with an intra-class correlation coefficient of 0.98, reveal a negative correlation between the knowledge and attitude levels of B.Sc. Nursing students. Overall, the findings suggest that most third- and fourth-year B.Sc. Nursing students have a fair understanding of how to handle chemotherapy drugs. [24]

Kumar J, Khichi S M, Verma B, (2022), using an easy sampling method, 60 undergraduate nurses were chosen for a pre-experimental investigation. The participants' knowledge was evaluated using a standardized knowledge questionnaire that they self-administered. The post-test was administered one week later. Both descriptive and inferential statistics were employed to analyze the collected data. The results indicate that the structured instruction program effectively improved the student nurses' understanding of chemotherapy

administration, as evidenced by a mean post-test knowledge score of 29.45 (92.03%), which was significantly higher than the mean pre-test score of 16.52 (51.60%). The difference in knowledge scores before and after the intervention was found to be significant, with a mean difference of 12.93. [25]

Sargidy A., Yahia A., Ahmad M., Abdalla A. et., al. (2022), a study was carried out to evaluate the knowledge of oncology nurses at Khartoum   Oncology Hospital in Sudan regarding   safe handling, administration, and waste management of cytotoxic drugs. A group of specialists created a questionnaire to assess knowledge in three important areas related to oncology nursing practice: handling, administration, and disposal. The nurses received a mean score of 12.7 ± 3.9 out of 26 questions regarding their knowledge of cytotoxic drugs. The results indicated that while nurses scored well on administration (mean = 6.2 ± 1.7 out of 10), they had poor scores for waste disposal (mean = 4.4 ± 1.5 out of 8) and low scores for safe handling (mean = 2.0 ± 1.5 out of 8). Simple linear regression analysis revealed that nursing knowledge was significantly predicted by education level ($\beta = 3.715$, $p = .008$) and training ($\beta = 0.969$, $p = 0.004$).

Overall, the findings highlight a significant need for Sudanese oncology nurses to enhance their understanding and skills related to safe cytotoxic drugs handling, emphasizing the importance of implementing stringent regulations for cytotoxic waste management to reduce health risks and prevent hospital contamination.[26]

Shari B N., 2021, the knowledge of 76 under graduate nursing students about chemotherapy and workplace safety measures was evaluated by a cross-sectional study carried out at University Sains Malaysia (USM). Data were analyzed using version 26.0 of the SPSS program, employing Fisher's exact test for statistical analysis. The results revealed that 45 participants (59.2%) had good knowledge of chemotherapy, while 74 participants (97.4%) demonstrated strong knowledge of occupational safety measures. These findings indicate varying levels of knowledge across the two topics. In conclusion, there is a need to improve and enhance nursing students' knowledge to better equip them for caring for chemotherapy patients.[27]

Mishra R, Bhawana, Kushwaha A (2021), using a one -group pre-test post-test methodology, a pre-experimental study was carried out to. assess the knowledge of thirty nurses employed in the cancer care unit. To choose participants, non-probability convenience sampling was used. Data were gathered using a systematic knowledge questionnaire and an observational practice checklist. Descriptive and inferential statistics were employed to analyze the collected data. The average pre-test scores were 17.5 (±2.28) for knowledge and 9.13 (±1.52) for practice. In contrast, the post-test scores, reflecting improvements after a systematic instruction program, were 27.03 (±1.73) for knowledge and 13.8 (±1.09) for practice. The calculated t-test values were 26.78 for knowledge and 28.91 for practice, both of which were highly significant at the 0.05 level. The study concluded that the Structured Teaching Program effectively enhanced nurses' understanding and skills related to the safe handling of chemotherapy drugs. It is strongly recommended that nurses receive regular updates to their knowledge, supported by policies ensuring adherence to established guidelines.[28]

Kaur K, Kumari R, 2020, a pre-experimental design study was conducted with 40 3rd year B.Sc. Nursing students from Patiala, Punjab. Data were collected from the participants using a convenience sampling

technique. Students who took part in a structured teaching program completed a self-structured questionnaire to provide the necessary data. Following the pre-test, a systematic education program was implemented to enhance their understanding of the safe handling of chemotherapy medications. Both descriptive and inferential statistics were applied to analyze the data. The analysis revealed that the mean percentage of post-test scores for the 3rd B.Sc. Nursing students was significantly higher than their pre-test scores, which ranged from 8 to 25. The average pre-test knowledge score was 17.5, while the post-test knowledge scores ranged from 19 to 34, with a mean score of 27.2. These results indicate that the structured teaching program was an effective educational approach that significantly improved 3rd year B.Sc. Nursing students' knowledge of safety precautions for handling chemotherapy medications.[29]

Asfa S., Aga F., Dimegde NG., Demie TG., (2020), a cross-sectional study was conducted in a hospital setting with 77 oncology nurses working at tertiary teaching hospitals in Addis Ababa, Ethiopia. A purposeful sampling technique was used to select participants, and structured questionnaires were completed through self-administered interviews. The average knowledge score among nurses was 7.82 ± 2.22 out of 15, while the average practice score was 22.1 ± 5.50 out of 40. Approximately 69% of the nurses reported that their workplaces lacked a cytotoxic drug (CD) handling training program, and the use of personal protective equipment (PPE) was inadequate, with only partial PPE being worn. The analysis revealed that nurses who were unaware of CDs scored 0.33 points lower in knowledge compared to those who were aware ($p < 0.01$). Additionally, nurses with higher knowledge scores practiced safe CD handling 0.33 points more effectively than those with lower scores ($p < 0.05$). Interestingly, married nurses practiced safe CD handling an average of 0.27 points less than single nurses ($p < 0.05$). Overall, the findings indicate that nurses' knowledge and practices related to the safe handling of cytotoxic medicines are insufficient. It is recommended that chemotherapy safety protocols and guidelines be developed, along with providing oncology nurses with appropriate PPE and training for handling CDs.[30]

Koulounti M., Roupa Z., Charalambous C., Noula M. (2019), data for a cross-sectional study were collected using a self-completing questionnaire from 82 nurses working in the hematology and oncology departments at the Bank of Cyprus Oncology Center and Limassol General Hospital. To protect staff members from the harmful effects of chemotherapy exposure, it is essential to develop and implement educational programs that keep nurses informed about the latest safety measures and procedures.

The administration of the medical facility must ensure that the work environment complies with all safety and health regulations related to chemotherapy handling. Additionally, further research is needed to monitor the levels of knowledge and attitudes, as well as the adherence to safety and health regulations regarding the safe management and preparation of chemotherapy within healthcare organizations.[31]

Sarita D. Dr. Preksha (2019), a non-experimental descriptive cross-sectional survey was conducted with 60 participants at a tertiary care hospital in India using convenience sampling. Attitudes were measured using a Likert scale, while a knowledge questionnaire was employed to assess knowledge levels. Data analysis included

descriptive statistics, Pearson correlation, ANOVA, and t-tests. The findings revealed that the majority of nursing staff (55%) had inadequate knowledge regarding the safe handling of chemotherapy medications, while 46.7% displayed a somewhat favorable attitude. A statistically significant correlation was found between knowledge of safe handling and the education level and gender of the nursing staff. Additionally, there was a significant correlation between the attitudes of nursing staff regarding safe handling and their experience in oncology. Overall, the results indicate that nursing personnel at the tertiary care hospital in India exhibit insufficient knowledge and a mildly positive attitude toward the safe handling of chemotherapeutic drugs.[32]

Sylvia E. Nwagbo, Rose Ekama Ilesanmi1, Beatrice M. Ohaeri1, Abimbola O. Oluwatosin (2017), a cross-sectional descriptive analysis was conducted among 100 nurses in the cancer departments of University College Hospital in Ibadan. A validated questionnaire consisting of 54 items was used to collect data. The participants' ages ranged from 35.4 to 5.1 years, and over half had more than three years of experience working in the oncology unit, with a mean of 2.62 ± 1.1 years. The results showed that the cohort had a high level of knowledge regarding chemotherapy, with an average score of 13.9 ± 2.2. Notably, 70% of the nurses recognized that wearing gloves and gowns is essential for safety precautions. Only 57% of respondents knew, nevertheless, that patient apparel shouldn't be hand-washed or cleaned alongside other goods. In general, 79.2% of participants were conscious of safety protocols, whereas 4.7% were not aware of them, and 16.1% were unsure of the requirements for delivering chemotherapy. There was a considerable correlation ($P < 0.05$) between the respondents' degree of education and their understanding of chemotherapy, and there was also a strong correlation ($P < 0.05$) between their professional cadre and practice scores. It is advised that rigorous policies be put in place to guarantee adherence to safety procedures and that nurses update their knowledge on a regular basis.[33]

II. Review of Literature on the Effect of Structured Teaching Programs on Safety Measures regarding Handling Chemotherapeutic Drugs

Anbumani J, Sharma D, Vijayata (2023), 4th year B.Sc. nursing students at Bee Enn College of Nursing in Chak Bhalwal, Jammu, participated in a pre-experimental study. Purposive sampling was used in the study to collect data from 40 fourth-year B.Sc. (N) students using a pre-test and post-test approach. Knowledge was evaluated through the use of a uniform survey. SPSS 16 was used for data analysis. The t-test analysis revealed a significant difference in knowledge between before and after the structured teaching program on the safe handling of chemotherapy medications, with results indicating t=16.580 and p=0.000 at the 0.05 level of significance.[34]

Phule M., (2023), Using a one-group pre-test and post-test methodology, a study was carried out at Sasson General Hospital in Pune to assess the effect of a structured teaching program on staff nurses' knowledge and abilities about the administration of chemotherapy. Thirty individuals in all were chosen using purposive sampling. The results showed that after participating in the organized education program, knowledge and competency levels increased. A link between educational background and prior knowledge of intravenous

chemotherapy treatment was found using statistical analysis. Furthermore, a positive link was noted between the nurses' knowledge and competence levels before and after the test. Overall, the study showed that the organized instruction program improved the knowledge and abilities of nurses who prepare and administer intravenous chemotherapy in an effective manner. [35]

Prakash P., Chandra A., Chandra A. (2022), Thirty staff nurses from Ramaiah Medical College Hospital in India participated in a pre-experimental study that used a group pre-test and post-test design. Convenience sampling was used to choose the participants, and the identical structured knowledge questionnaire was used for both assessments. A organized 45-minute training schedule was then put into place. Both descriptive and inferential statistics were used in data analysis of the participants, 66.7% were female and 36.7% had more than ten years of professional experience. According to the pre-test data, 70% of the nurses lacked sufficient expertise. The pre-test mean knowledge scores were 15.33 ± 4.003 and the post-test mean knowledge scores were 24.67 ± 5.384. Between the pre- and post-tests, there was a statistically significant difference in knowledge scores about managing chemotherapeutic drug extravasation. All things considered, the results show that the structured education program improved nurses' comprehension of managing chemotherapy medicine extravasation.[36]

Kumar R. (2022), in a pre-experimental one-group pre-test and post-test design, thirty staff nurses from the Rajiv Gandhi Cancer Institute and Research Center in New Delhi participated in the study. Purposive sampling with non-probability was used to choose the participants. Data were gathered prior to and following a four-day instructional program, and then there was a "post-test. The results showed that the mean knowledge score before the test was 15.64 ± 4.5, and it increased to 20 ± 4.1 after the test. Regarding practice, the mean score before the exam was 14.86 ± 1.06, and the mean score after the test was 18.08 ± 0.94". Given that the computed 't' "value was higher than the 't' table value, the results showed a favorable association between knowledge and practice". Overall, the study found that the staff nurses' knowledge and abilities were much enhanced by the structured instruction program. [37]

Singh B., Tomar S., Singh S., (2021), using a one-group pre-test and post-test methodology, 60 staff nurses took part in a pre-experimental study to gauge their comprehension of safe handling of chemotherapy drugs. Data was collected before and after the instructional program using a standardized questionnaire, and participants were chosen using non-probability convenient sampling. The knowledge scores from the pre- and post-tests differed significantly, with mean post-test scores of 16.6 and mean pre-test scores of 12.95, according to the data. With a p-value of 0.00001, this change was statistically significant, demonstrating the organized training program's efficacy. Overall, the results show that the nurses' comprehension has significantly improved, proving that the program was successful in raising their awareness of preventive actions. [38]

Kale M. Sunagar M. Nagaraj, Thorat R. (2020), using a non-probability convenient sampling strategy, a quantitative research study with a one-group pre-test and post-test design was carried out among 60 nurses from chosen hospitals in the Sangli, Miraj, and Kupwad Corporation region. The expertise of the nurses was evaluated

using structured questionnaires. A test-retest methodology was used to determine the tool's reliability, proving its dependability. Regarding the safe handling of cytotoxic medications, the preliminary findings showed that 13.3% of nurses had very low knowledge, 46.7% had bad knowledge, 30% had good knowledge, 6.7% had very high knowledge, and 3.3% had excellent knowledge. In contrast, "post-test scores" revealed that 83.22% of nurses had received effective instruction on safe handling practices. The findings suggest that the instructional program was successful in enhancing the nurses' knowledge as intended.[39]

P Chithirai, Stella (October 2018), a study was carried out to evaluate the knowledge of 30 staff nurses on the safe administration and handling of chemotherapy medications using a pre-experimental pre-test and post-test design. The nurses' mean knowledge score on the first pre-test was 11.58, with a standard deviation of 1.22, suggesting that they didn't know enough. After implementing a structured instruction program, the post-test scores significantly improved, showing a mean of 21.2 and a standard deviation of 1.68. This resulted in a 39% increase in the mean percentage between pre- and post-test knowledge levels. The analysis utilized a paired "t" test to evaluate the differences, demonstrating the effectiveness of the teaching program in enhancing nurses' understanding of safe chemotherapy practices.[40]**Angel Rajakumari G. Soli T. K., (2017),** in a pre-experimental one-group pre-test-post-test study, 40 nursing students participated to evaluate the effectiveness of structured education on the safe handling and disposal of chemotherapy medications. Knowledge and attitudes were assessed using a modified three-point Likert scale, structured questionnaire, and checklist. The structured teaching sessions were conducted in groups of 17 students each. Results indicated that 36% of the students lacked adequate knowledge, while 46% held unfavorable attitudes toward the safe use and disposal of chemotherapy drugs. The study concluded that the structured teaching program effectively improved both knowledge and "attitudes among the students." Additionally, pharmacist-led interventions contributed to enhancing nursing students' understanding of cytotoxic drug handling. Further evaluation may be necessary to confirm the sustainability of these improvements.[41]

Pethe P. R., Rose A., Singh S., (2017), a non-experimental descriptive study was conducted with sixty nursing students from selected nursing colleges in the Vidarbha region to assess their knowledge of safe handling of chemotherapy drugs. Using non-probability convenience sampling, the study employed a structured knowledge questionnaire as the primary tool. Pre-test results indicated that 1.67% of participants scored exceptionally poorly, 26.67% poorly, 58.33% at an average level, 13.33% well, and none scored exceptionally well. The mean score was 9.95 ± 2.281, with scores ranging from 4 to 15. In contrast, post-test results showed that 45% of respondents reported having strong or excellent knowledge, 8.33% had average knowledge, and only 1.67% had weak understanding, with no participants in the extremely poor category. The mean post-test score was 16.05 ± 2.620, with a minimum of 5 and a maximum of 20. Statistical analysis confirmed that the post-test knowledge scores were significantly higher than the pre-test scores, demonstrating a marked improvement in the nursing students' knowledge after the structured teaching program. [42]

Summary

This chapter addresses two key aspects of the literature review. The first section focuses on knowledge related to the safe handling of chemotherapy medications, while the second section examines the effectiveness of structured teaching programs designed to enhance safety practices in handling these drugs.

CHAPTER-III

RESEARCH METHODOLOGY

Burns and Groove state that a research methodology outlines the overall strategy, the process for conducting an empirical inquiry, as well as the means of gathering accurate and trustworthy data regarding the issue under investigation. This chapter outlines the theoretical framework that encompasses a collection of practices and concepts relevant to the field of study. It typically includes various ideas such as stages and methods. The methodology serves as the theoretical basis for selecting the appropriate method or combination of methods to achieve specific results. The exact procedures and methods used to find, pick, handle, and evaluate data on a particular subject are included in research methodology. In order to achieve its goals, the research is carried out in accordance with the study kind and technique selected. This chapter describes the many steps the investigator took to carry out the investigation.[43]

Research, approach

The description of research methodology outlines a structured plan and process that moves from broad hypotheses to specific methods for collecting, analyzing, and interpreting data. [43]

Considering the nature of the problem and the study's objectives, a quantitative evaluative approach was found appropriate to assess the Effect of a Structured Teaching Programme on Knowledge on Safety Measures Regarding Handling Chemotherapeutic Drugs among 3rd Year B.Sc. Nursing Students in Guwahati, Assam. This approach is generally used when the researcher seeks to evaluate how effectively the objectives of a specific initiative have been met.[43]

Research design

It is a comprehensive plan outlining the methods and procedures for collecting and analyzing the necessary information in a research study.[43]

The design utilized for this study was a pre-experimental one-group pre-test and post-test design. This approach was implemented to evaluate the effect of a Structured Teaching Programme on Knowledge on Safety Measures Regarding the Handling of Chemotherapeutic Drugs among 3rd Year B.Sc. Nursing Students in Guwahati, Assam. In this design, the same dependent variable is measured in a single group of students before (pre-test) and after (post-test) the treatment is administered.
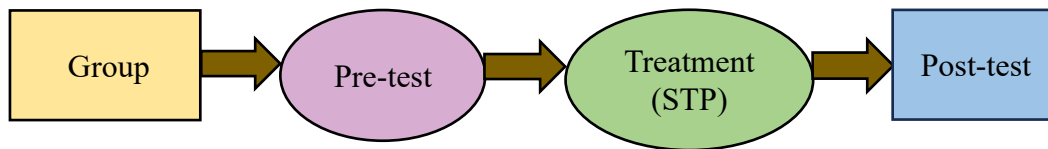
FIGURE 2.1

Schematic diagram of one group pre-test and post-test design

Research setting

The research setting refers to the physical, social, or experimental environment where the research is conducted.[43]

There are 18 B. Sc. Nursing Colleges in Guwahati, Assam, altogether; two of these were conveniently selected, namely Rahman Hospitals "College of Nursing" and Nemcare Institute "of Nursing" Sciences.

Population

The population refers to the entire group of individuals or items that capture the researcher's interest, to which the research findings aim to be applied.[43]

In this study, the population comprises all B.Sc. Nursing students.

Target population

The target population refers to the total number of cases exhibiting a specific phenomenon from which the researcher aims to draw general conclusions. [43]

In this study, the target population consists of 3rd year B.Sc. Nursing students in Guwahati, Assam.

Accessible Population

The totality of cases that meet predetermined inclusion and exclusion criteria and are available to serve as study participants is referred to as the accessible population..[43]

In this study, the accessible population comprises 3rd Year B.Sc. Nursing students from Guwahati, Assam, specifically from 1) Rahman Hospitals College of Nursing and 2) Nemcare Institute of Nursing Sciences. Participants were selected conveniently from these two colleges. The selection process involved Simple Random Sampling using the Lottery method, with participants chosen in proportionate numbers as illustrated in Table 1.

Sample and sample size

A sample refers to the subset of individuals or objects sharing common characteristics that are selected for a research study. It is often considered the universe of the study, representing the larger population from which it is drawn.[43]

In the present study, the sample consists of students from two conveniently selected 3rd Year B.Sc. Nursing Colleges in Guwahati, Assam. The sample size was determined using the Raosoft sample size calculator, based on a population size of 88 students, with a 5 percent margin of error, a 95 percent confidence level, and a population proportion of 50 percent.

TABLE 1

Selection of desired sample size from 2 selected Nursing colleges

College No.	Class	Total students	Proportionate number
1.	3rd year B.Sc. Nursing	55	43
2.	3rd year B.Sc. Nursing	58	45
Total		**113**	**88**

Sampling technique

Sampling technique refers to the method used to select a representative subset from the entire population in a study. This process ensures that the sample accurately reflects the characteristics of the broader population, enabling meaningful analysis and generalization of the findings.[43]

The researcher used the lottery method in conjunction with the probability sampling methodology to select the subjects for the current investigation. Rahman Hospitals College of Nursing and Nemcare Institute of Nursing Sciences are two conveniently located private nursing colleges that were chosen based on the subjects' availability. There are 113 students enrolled in the two selected nursing institutions, of whom 88 subjects were chosen by lottery method from the class attendance record using the Probability Simple Random Sampling approach.

Sampling criteria

Sampling criteria refer to the specific characteristics or qualifications that subjects or respondents must possess to be included in a study. These criteria may include factors such as the ability to read and write responses on

data collection instruments, age, educational background, and any other relevant attributes necessary for the research objectives.[43]

The following criteria was used in the present study to select the samples.

Inclusion Criteria

- Students who are willing to participate in the study.

Exclusion Criteria

- Students who are acutely sick during the time of data collection.

Variables

A person, thing, or situation's attributes, properties, and characteristics that fluctuate or change are called variables. In research, an individual, location, object, or phenomena that the investigator seeks to quantify is referred to as a variable.[43]

Independent variable

The independent variable is the treatment or experimental activity that the researcher modifies or manipulates in order to observe its effect on the dependent variable. In a study, it is the factor that is intentionally changed to see how it influences outcomes.[43]

In this study the independent variable refers to structured teaching programme on safety measures regarding handling of chemotherapeutic drugs.

Dependent variable

The dependent variable is the outcome that changes as a result of manipulating the "independent variable. It represents the desired result that the researcher measures, and its value depends on the effects of the independent variable.[43]

In this study, the dependent variable refers to the knowledge of safety measures regarding the handling of chemotherapeutic drugs. This knowledge is what the research aims to measure and evaluate after the implementation of the structured teaching program.

Demographic variables

In most research studies, researchers aim to analyze and present the characteristics of the sample, which are referred to as demographic variables.[43]

In this study, the demographic variables include age, gender, religion, type of family, and the source of information regarding safety measures for handling chemotherapeutic drugs. These factors can provide valuable context for understanding the knowledge levels among the participants.

Tools and technique

Development of the structured self-administered knowledge questionnaire

A research instrument is a piece of advice that a researcher uses to gauge the level of interest in a subject before gathering data.[43] To generate data, tools were built based on the study's objectives. The following procedures are taken in order to create the study's instruments.

- An extensives review of research and non-research literature

- Discussion and suggestions from guide and co-guide and discussion with experts.

- Content validity by the experts.

- Establishing the reliability of, the tool.

Description of tool

The data collection instrument was developed in alignment with the study's problem statement, objectives, and operational definitions. A standardized, self-administered knowledge questionnaire was utilized as the primary tool for gathering data. This questionnaire consisted of two sections: Section A and Section B, each designed to capture relevant information pertaining to the knowledge on safety measures regarding the handling of chemotherapeutic drugs.

Section A: Demographic variables such as ages, gender, religions, type of families and source of informations on safety measures regardings handling of chemotherapeutic drugs.

Section B: A structured self-Administered Knowledge Questionnaire was constructed on safety measures regarding handling of chemotherapeutic drugs. This section consists of 30 multiples choice question, with four options having only one corrects answer. The corrected answers will be rewarded one (1) mark and inc0rrect answer will be rewarded 0 marks. The maximum score is 30s and the minimum score is 0.

Area I: Knowledge related to introduction, meaning of Chemotherapeutic drugs.

Area II: Knowledge related to classification and modes of administering chemotherapeutic drugs.

Area III: Knowledge related to side effects and Safety measures of handling chemotherapeutic drugs.

Range

Range of the score is interpreted as:

I.(Mean + Standard Deviation) = Adequate knowledge i.e. (≥17)

II.(Mean ± Standard Deviation) = Moderate knowledge i.e. (11-16)

III.(Mean - Standard Deviation) = Inadequate knowledge i.e. (≤10)

The blueprint of structured self-administered knowledge questionnaire was prepared including 3 areas. Area I was introduction, meaning of chemotherapeutic drugs and there was total 7 questions. 5 questions were knowledge based i.e. Q1, Q2, Q5, Q6, Q7 and two questions were comprehension based i.e. Q3, Q4. Area II was classification and modes of administering chemotherapeutic drugs and there were 7 questions, 4 questions were knowledge based i.e. Q8, Q9, Q11, Q12 and 3 were comprehension based i.e. Q10, Q11, Q12. Area III was Side effects and Safety measures of handling chemotherapeutic drugs and there were 16 questions, 9 questions were knowledge based i.e. "Q15, Q16, Q17, Q18, Q19, Q20, Q21, Q22, Q23" and 4 questions were comprehension based i.e. Q24, Q25, Q26, Q27 and 3 questions were application based i.e. Q28, Q29, Q30.

Validity of the tool

Validity of a tool refers to the extent to which the instrument accurately measures the concept it is intended to assess. In the context of this study, it indicates how well the knowledge questionnaire evaluates the understanding of safety measures regarding the handling of chemotherapeutic drugs.[43]

Thus, the finalized items, with 100% agreement, were utilized in the study. To establish content validity, the developed tool was submitted to seven experts, including six from the Medical-Surgical Nursing Department and one consultant physician from the Medicine Department. These experts evaluated the tool based on its relevance, adequacy, and appropriateness concerning the study's objectives and problem statement. The tool comprised 30 questions, all of which received unanimous approval from the experts, indicating that no modifications were necessary.

Validity of Structured Teaching Program

Seven experts were consulted in order to verify the content validity of the structured teaching program on safety handling chemotherapeutic drugs, which included a statements of. the problem, objective, hypothesis, and operationale definitions. 6 of them were employed by the Medical Surgical Nursing Department, and one of them was a consultant physician from the Department of Medicine. The experts were asked to verify the item for appropriateness, sufficiency, and applicability and to offer their judgment based on their knowledge and interest in the subject. Lastly, the approved structured teaching program was employed in the study with their full consent.

Reliability of tool

Reliability refers to the degree of consistency with which an instrument measures an attribute or variable. It indicates the extent to which the results obtained from the instrument can be replicated over time and across different conditions.[43]

The organized, self-administered knowledge questionnaire with 20 items about safe handling of for chemotherapeutic drugs is reliable. 3rd year B.Sc. nursing students who fulfill the necessary population characteristics from a few selected nursing institutes in Guwahati, Assam, were asked to test the tool's reliability. The Split Half approach developed by Karl Pearson has been used to assess the tool's reliability. Through grouping in odd number questions and even number questions, the tool's thirty elements were divided into two equal sections. By using the splited half approache, the reliability of the complete test is estimated using a value of "r" of 0.76, which is deemed significant. This indicates that the instrument can be relied upon to conduct the study.

Pilot study

A pilot study is a small-scale preliminary test of the methodology intended for use in a larger study. It provides researchers the opportunity to test procedures, methods, and data collection tools, allowing them to identify and address potential issues before conducting the full-scale research. This step helps ensure the study runs smoothly and enhances the reliability and validity of the results.[43]

The purpose of the pilot study was to:

- Evaluate the developed tool/instrument for effectiveness and clarity.

- Assess the feasibility of conducting the final study, including logistics and participant engagement.

- Determine the appropriate method of statistical analysis to be used in the main study.

The pilot study was conducted at Apollo Nursing College in Guwahati, Assam, with official approval from the relevant authority. Data were collected from twenty 3rd year B.Sc. nursing students between January 24, 2024, and February 2, 2024. To maintain confidentiality and anonymity, participants were assigned numerical codes, and informed verbal consent was obtained after explaining the research process. A probability simple random sampling technique and specific inclusion criteria were utilized during sample selection.

The Structured Self-Administered Knowledge Questionnaire was used to assess participants' pre-test knowledge regarding the safe handling of chemotherapy drugs. A post-test was administered one week later to evaluate the impact of the structured teaching program. Descriptive and inferential statistics were employed to analyze the collected data.

Results showed that in the post-test, 20% of participants had adequate knowledge, while 75% demonstrated moderate knowledge and 15% had inadequate knowledge. The knowledge gain score was significant at the 0.05 level, with a computed paired "t" test value of 12.1, exceeding the tabular value of 2.09. The structured teaching program effectively facilitated data collection, and there were no issues in participants understanding the instrument. Both participants and the relevant authority were cooperative throughout the process, leading to the conclusion that no changes were needed following the pilot study.

Ethical consideration

In nursing research, ethics involves the moral principles that researchers must follow to safeguard the rights and welfare of subjects, participants, and the community. The following ethical procedures were considered in this study.

- Ethical approval for the research study was obtained from the Institutional Ethical Committee of PEWS Group of Institutions, Guwahati-26 (Annexure II).

- Permission to conduct the study was granted by the principals of Apollo College of Nursing, Rahman Hospitals College of Nursing, and Nemcare Institute of Nursing Sciences (Annexure III to V).

- Informed verbal consent was secured from the 3rd Year B.Sc. Nursing students.

- Participants were assured that their data would be kept confidential.

- Anonymity was preserved by using coded numbers in place of their names.

Data Collection Procedure

Data collection is the precise and systematic process of gathering information that is relevant to the specific objectives, questions, or hypotheses of a study.

Prior to data collection, written approval was obtained from the principal of Nemcare Institute of Nursing Sciences and Rahman Hospitals College of Nursing. The study was conducted from April 29 to May 27, 2024. Data were collected from 88 students using a Probability Simple Random Sampling method. Student roll numbers were selected by lottery from the attendance register. Verbal informed consent was obtained from each participant. The pre-test aimed to assess participants' understanding of safe handling procedures for chemotherapy medications, while the post-test evaluated the impact of the structured teaching program after seven days. Participants' privacy and confidentiality were maintained throughout the study. Data were gathered and analyzed using a structured, self-administered knowledge questionnaire.

Plan for data analysis

In alignment with the study's objectives and hypotheses, the data collected from 3rd-year B.Sc. Nursing students were categorized and analyzed. The gathered data were coded and compiled into a master sheet for statistical analysis. The analyzed data were presented in tables, graphs, and figures to facilitate interpretation.

The following plans for the analysis were developed with the expert's opinion.

- Descriptive statistics, including frequency and percentage distribution, were used to analyze the demographic variables. The mean, standard deviation, and mean percentage were employed to assess the knowledge levels.

- A paired "t-test" was utilized to evaluate the effectiveness of the structured teaching program.

- The association between knowledge levels and specific demographic variables such as age, gender, religion, type of family, and sources of information regarding safety measures for handling chemotherapeutic drugs was analyzed using the Chi-square test.
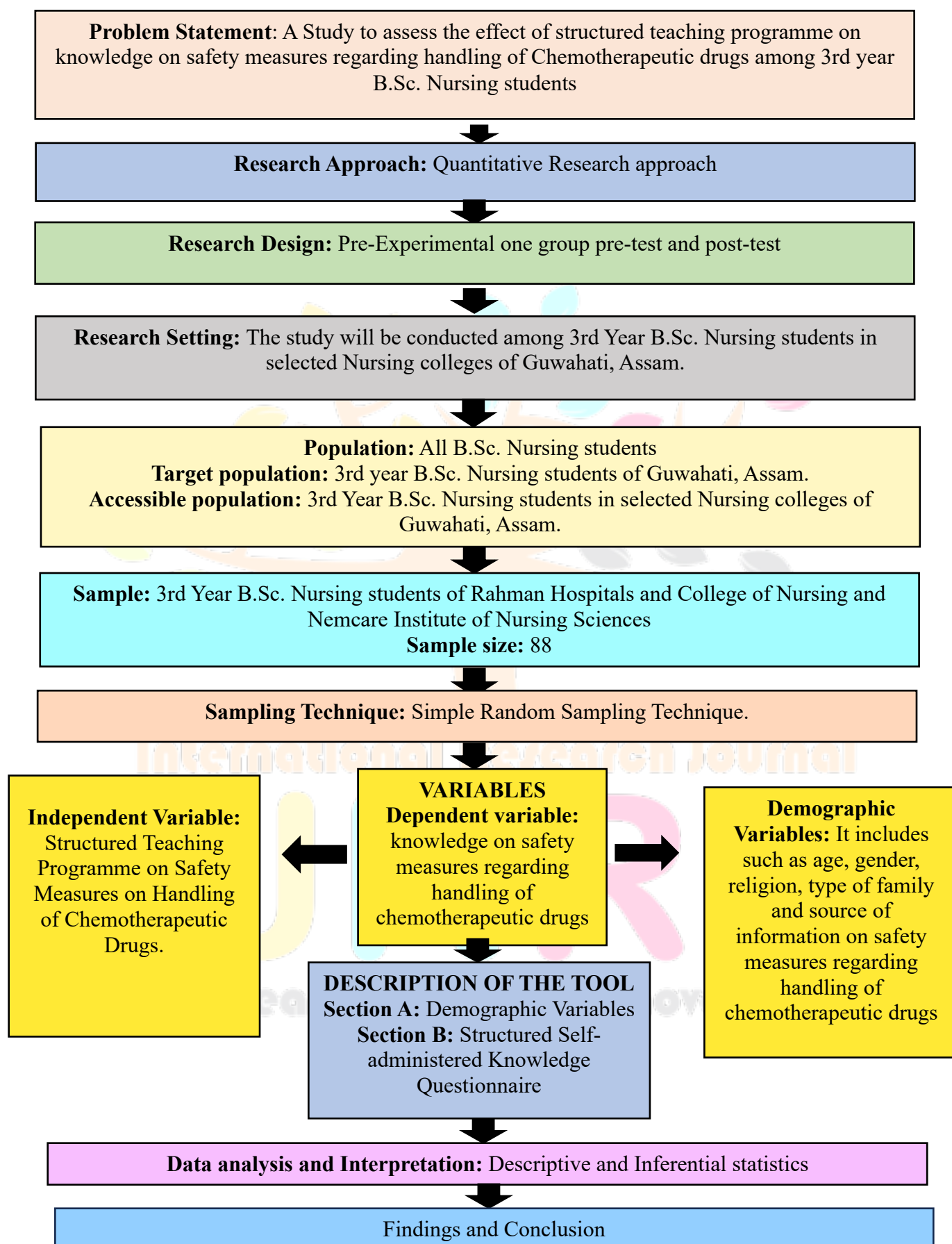
Problem Statement: A Study to assess the effect of structured teaching programme on knowledge on safety measures regarding handling of Chemotherapeutic drugs among 3rd year B.Sc. Nursing students

Research Approach: Quantitative Research approach

Research Design: Pre-Experimental one group pre-test and post-test

Research Setting: The study will be conducted among 3rd Year B.Sc. Nursing students in selected Nursing colleges of Guwahati, Assam.

Population: All B.Sc. Nursing students
Target population: 3rd year B.Sc. Nursing students of Guwahati, Assam.
Accessible population: 3rd Year B.Sc. Nursing students in selected Nursing colleges of Guwahati, Assam.

Sample: 3rd Year B.Sc. Nursing students of Rahman Hospitals and College of Nursing and Nemcare Institute of Nursing Sciences
Sample size: 88

Sampling Technique: Simple Random Sampling Technique.

Independent Variable: Structured Teaching Programme on Safety Measures on Handling of Chemotherapeutic Drugs.

VARIABLES
Dependent variable: knowledge on safety measures regarding handling of chemotherapeutic drugs

Demographic Variables: It includes such as age, gender, religion, type of family and source of information on safety measures regarding handling of chemotherapeutic drugs

DESCRIPTION OF THE TOOL
Section A: Demographic Variables
Section B: Structured Self-administered Knowledge Questionnaire

Data analysis and Interpretation: Descriptive and Inferential statistics

Findings and Conclusion

Figure 2.2: Schematic Representation of Research Methodology

Summary

This chapter covered a number of the study methodology's components, such as the design, population, sample size and composition, sampling process, and inclusion and exclusion criteria. It also covered the variables at play, the methods and instruments employed, the instruments' validity and reliability, the pilot study, ethical issues, the process of gathering data, and the strategy for analyzing it. A schematic depiction of the research technique was also included.

CHAPTER-IV

ANALYSIS AND INTERPRETATION OF DATA

Data analysis involves organizing and synthesizing information to address research questions and evaluate hypotheses. Interpretation, often regarded as the most challenging and structured phase, requires the researcher's creativity. In this study, data were collected using a self-structured knowledge questionnaire, which formed the foundation for the subsequent "analysis and interpretation of the findings.

Polit and Hungler (1999) defined analysis as the systematic organization and synthesis of research hypotheses using relevant data.[43]

The aim of the analysis in this study was to organize and integrate the data to effectively address the research questions and validate the hypotheses. The data were tabulated, analyzed, and interpreted using both descriptive and inferential statistics. SPSS 24 was employed for the analysis in line with the study's objectives.

Objectives of the study

1. To assess the pre-test level of Knowledge on Safety Measures regarding Handling of Chemotherapeutic Drugs among 3rd year B.Sc. Nursing students in selected Nursing Colleges of Guwahati, Assam.

2. To assess the post-test level of Knowledge on Safety Measures regarding Handling of chemotherapeutic drugs among 3rd year B.Sc. Nursing students in selected Nursing Colleges of Guwahati, Assam.

3. To evaluate the effect of Structured Teaching Program on Knowledge on Safety Measures regarding Handling of Chemotherapeutic Drugs among 3rd year B.Sc. Nursing students in selected Nursing Colleges of Guwahati, Assam.

4. To find out the association between pre-test level of Knowledge on Safety Measures regarding Handling of Chemotherapeutic Drugs with selected demographic variables.

Hypotheses

H₁: There is significant difference between pre-test and post-test knowledge on Safety Measures regarding Handling of Chemotherapeutic Drugs among 3rd Year B.Sc. Nursing students of Guwahati, Assam as measured by Structured self-administered knowledge questionnaire at 0.05 level of significance.

H₂: There is significant association between pre-test knowledge on Safety Measures regarding Handling of Chemotherapeutic Drugs among 3rd Year B.Sc. Nursing students with selected demographic variables as measured by structured self-administered knowledge questionnaire at o.o5 level of significance.

Organization and Interpretation of Data

The collected data were examined, tabulated, and analyzed using both descriptive and inferential statistics. The data analysis is organized and presented in the following sections:

Section I: Frequency and percentage distribution of demographic variables of 3rd year B.Sc. Nursing students.

Section II: Assessment of pre-test and post-test levels of knowledge, and the effectiveness of the structured teaching program on safety measures regarding the handling of chemotherapeutic drugs among 3rd year B.Sc. Nursing students, before and after the program.

Section III: Effect of the structured teaching program on knowledge on safety measures regarding the handling of chemotherapeutic drugs among 3rd year B.Sc. Nursing students.

Section IV: Association between the pre-test level of knowledge on safety measures regarding the handling of chemotherapeutic drugs and selected demographic variables among 3rd year B.Sc. Nursing students.

Section I: Frequency and percentage distribution of demographic variables of 3rd year B.Sc. Nursing students.

In this section, the frequency and percentage distribution of 88 third-year B.Sc. Nursing students are detailed according to various demographic variables, including age, gender, religion, family type, and sources of information regarding safety precautions for handling chemotherapy medications. Tables 2.1 to 2.5 and Figures 3.1 to 3.5 present the frequency and percentage data, effectively summarizing the sample characteristics.

TABLE 2.1

Frequency and Percentage Distribution of 3rd Year B.Sc. Nursing Students According to Age

n=88

Age in years	Frequency (f)	Percentage (%)
18-20	22	25
21-22	55	62.5
23 and above	11	12.5
Total	**88**	**100**

The data presented in Table 2.1 indicates that out of 88 students, the majority, 55 (62.5%), fall within the age group of 21-22 years. This is followed by 22 students (25%) who are between 18-20 years old, while 11 students (12.5%) are 23 years or older.

n=88
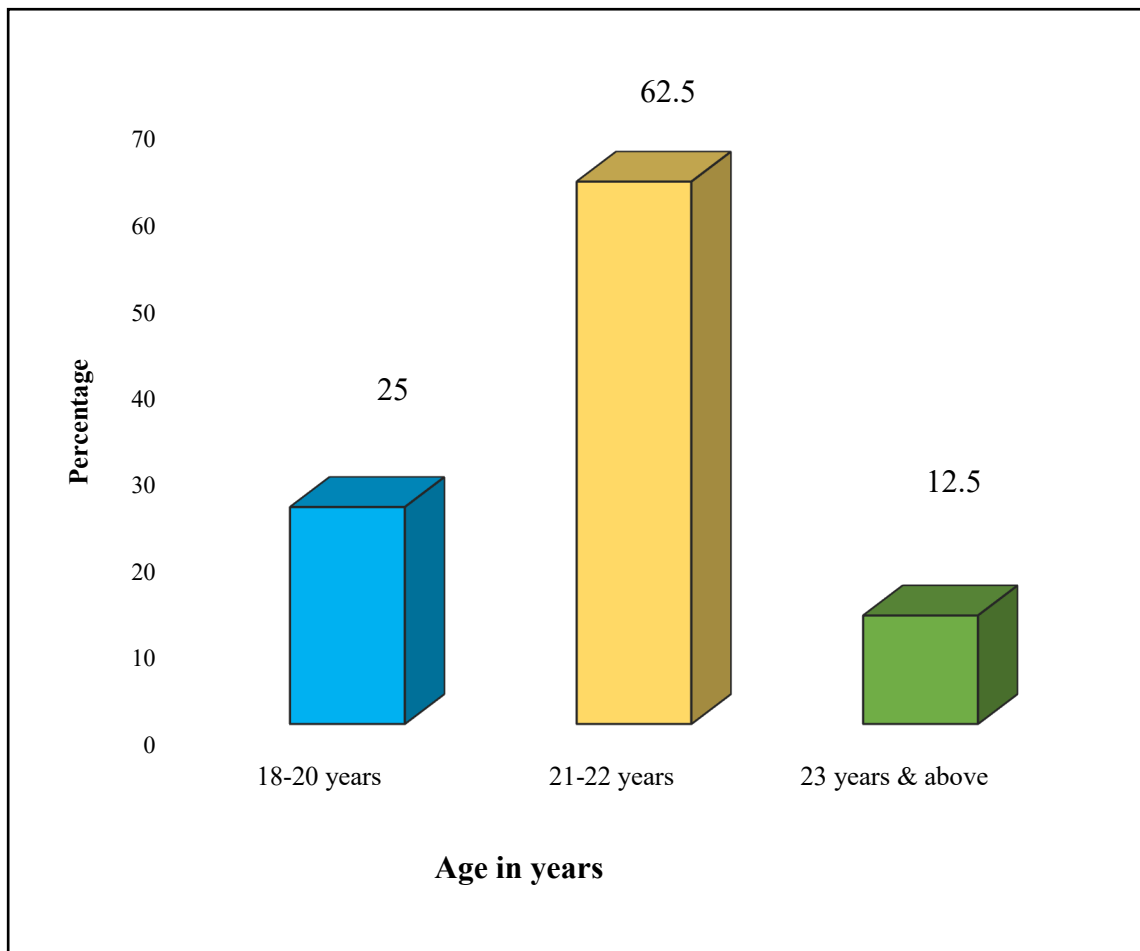
FIGURE 3.1

Percentage distribution 3rd year B. Sc. Nursing students according to their age.

TABLE 2.2

Frequency and Percentage Distribution of 3rd Year B.Sc. Nursing Students According to Gender

n=88

Gender	Frequency (f)	Percentage (%)
Female	83	94.3
Male	5	5.7
Others	0	0
Total	**88**	**100**

The data presented in Table 2.2 reveals that, out of 88 students, the vast majority, 83 (94.3%), were female. This is followed by 5 students (5.7%) who were male, with no students identified in other gender categories.

n=88
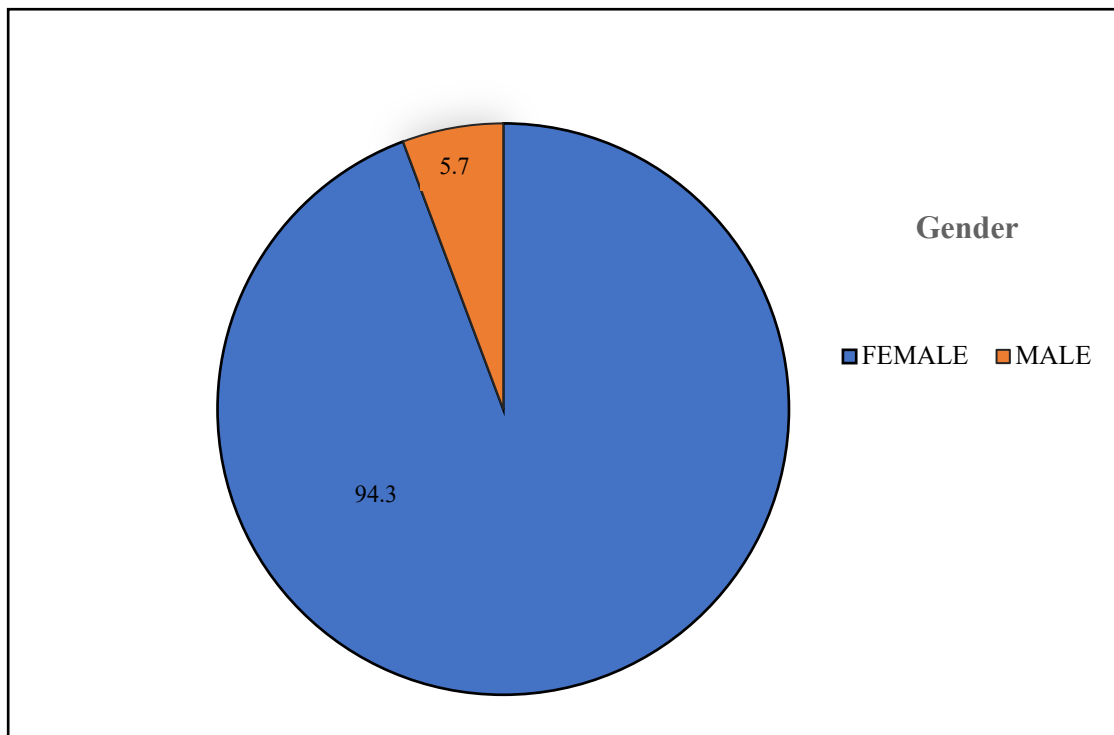
FIGURE 3.2

Percentage distribution of 3ʳᵈ year B. Sc. Nursing students according to their gender

TABLE 2.3

Frequency and Percentage Distribution of 3rd Year B.Sc. Nursing Students According to Religion

n=88

Religion	Frequency (f)	Percentage (%)
Hinduism	31	35.2
Christianity	10	11.4
Islam	47	53.4
Others	0	0
Total	**88**	**100**

The data presented in Table 2.3" indicates that, out of 88 students, the majority, 47 (53.4%), identified as Muslims, followed by 31 students (35.2%) who identified as Hindus. Additionally, 10 students (11.4%) belonged to Christianity, with no students represented from other religions.

n=88
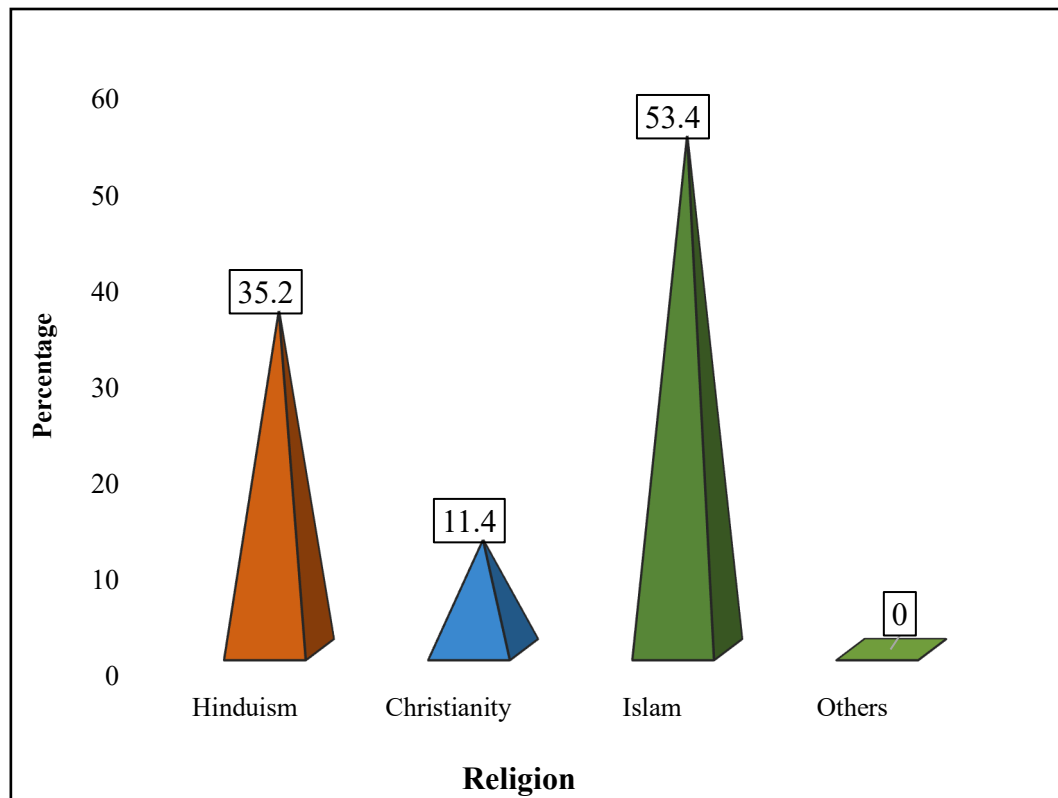
FIGURE 3.3

Percentage distribution of 3rd year B. Sc. Nursing students according to their religion

TABLE 2.4

Frequency and Percentage Distribution of 3rd Year B.Sc. Nursing Students According to Type of Family

n=88

Type of family	Frequency (f)	Percentage (%)
Nuclear	73	83
Joint	15	17
Extended	0	0
Total	**88**	**100**

According to the information in Table 2.4, out of the 88 students, the majority, 73 (83%), belonged to nuclear families, while 15 students (17%) were part of joint families. Notably, none of the students had relatives living abroad.

n=88
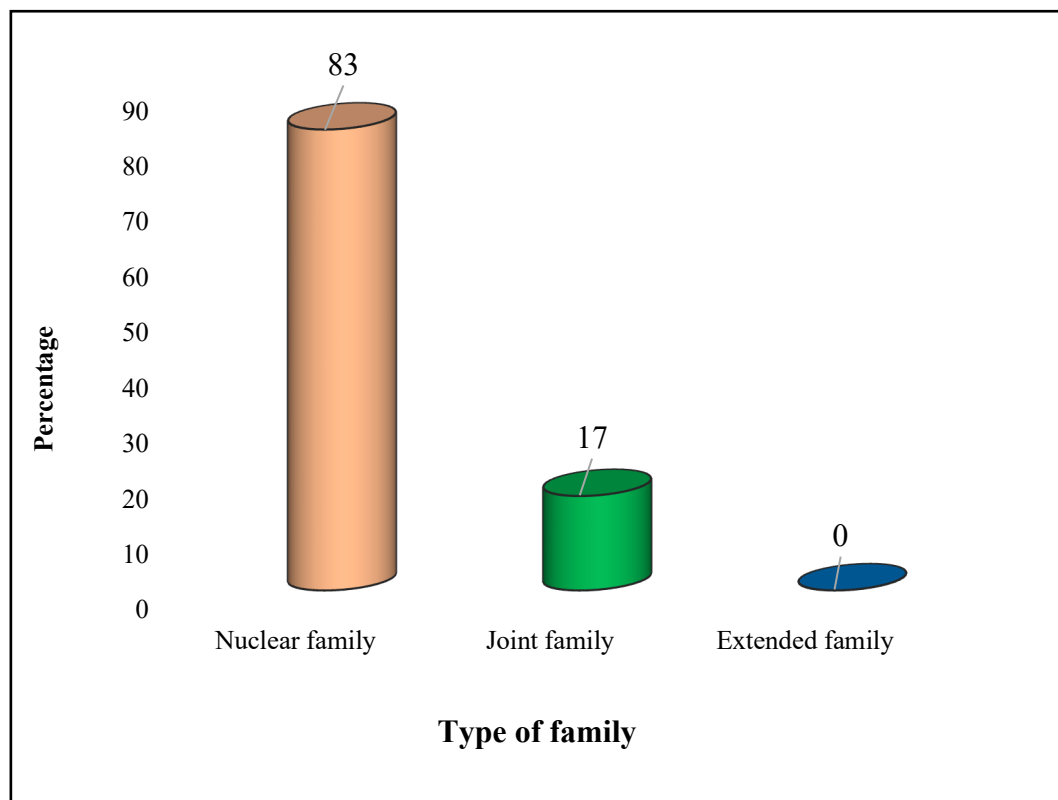
FIGURE 3.4

Percentage distribution of 3ʳᵈ year B. Sc. Nursing students according to their type of family

TABLE 2.5

Frequency and Percentage Distribution of Sources of Information on Safety Measures Regarding Handling of Chemotherapeutic Drugs Among 3rd Year B.Sc. Nursing Students

n=88

Source of information	Frequency (f)	Percentage (%)
Workshop	18	20.5
In-service education	9	10.2
Mass media education	23	26.1
Others	38	43.2
Total	**88**	**100**

Table 2.5 shows that out of the 88 students, the majority, 38 (43.2%), obtained information about safety precautions for handling chemotherapy drugs from other sources. This was followed by 23 students (26.1%) who received information through mass-media education, 18 students (20.5%) who learned from workshops, and 9 students (10.1%) who had the least exposure from in-service education.

n=88
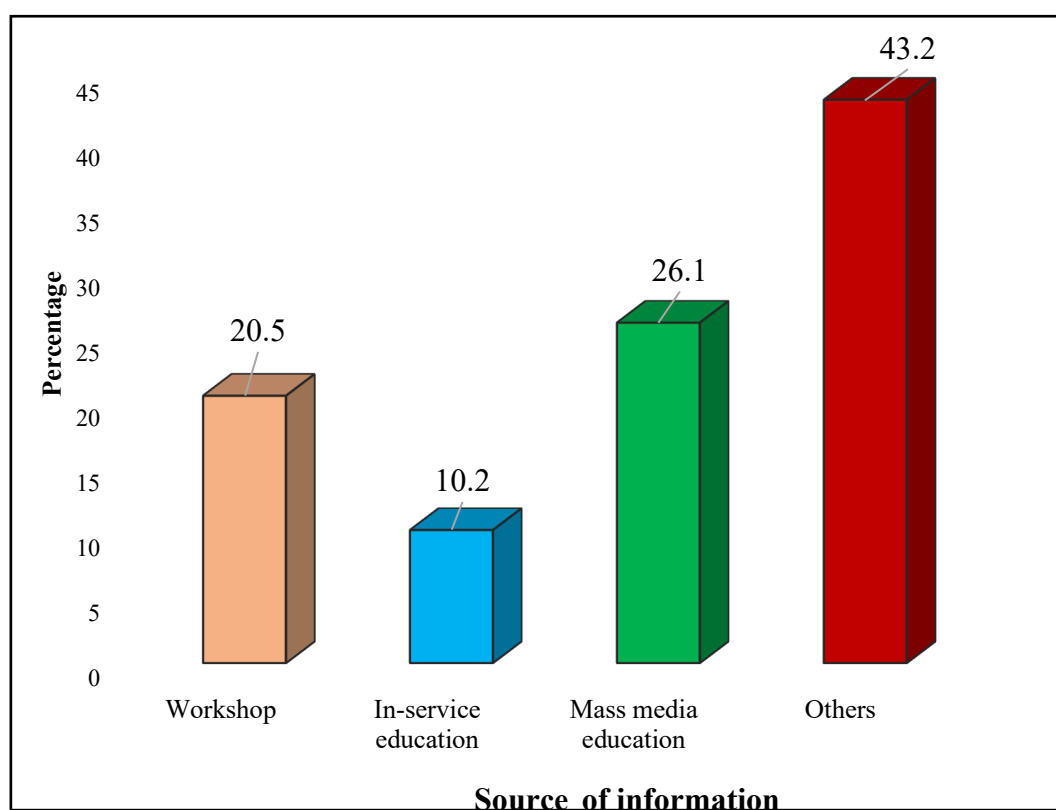
FIGURE 3.5

Percentage distribution of source of information on safety measures regarding handling of chemotherapeutic drugs among 3rd year B. Sc. Nursing students.

SECTION II: Assessment of Pre-Test and Post-Test Levels of Knowledge and Effect of Structured Teaching Programme on Knowledge of Safety Measures Regarding Handling of Chemotherapeutic Drugs

This section provides information on the pre- and post-test knowledge levels as well as the impact of a structured education program on students' understanding of safety precautions to take when handling chemotherapy medications. The formula Mean±SD was utilized to categorize the knowledge level in this study into three levels: inadequate, moderate, and adequate. Table 3.1 displays the frequency and percentage distribution of the knowledge level data from the pre- and post-test.

Additionally, table 3.2 and figures 4.1 and 4.2 in this section provide the mean, median, and standard deviation of the pre- and post-test knowledge scores.

The area-specific mean percentage of the knowledge scores from the pre- and post-tests, as well as the actual and modified gain scores, are also shown in table 3.3 of this section.
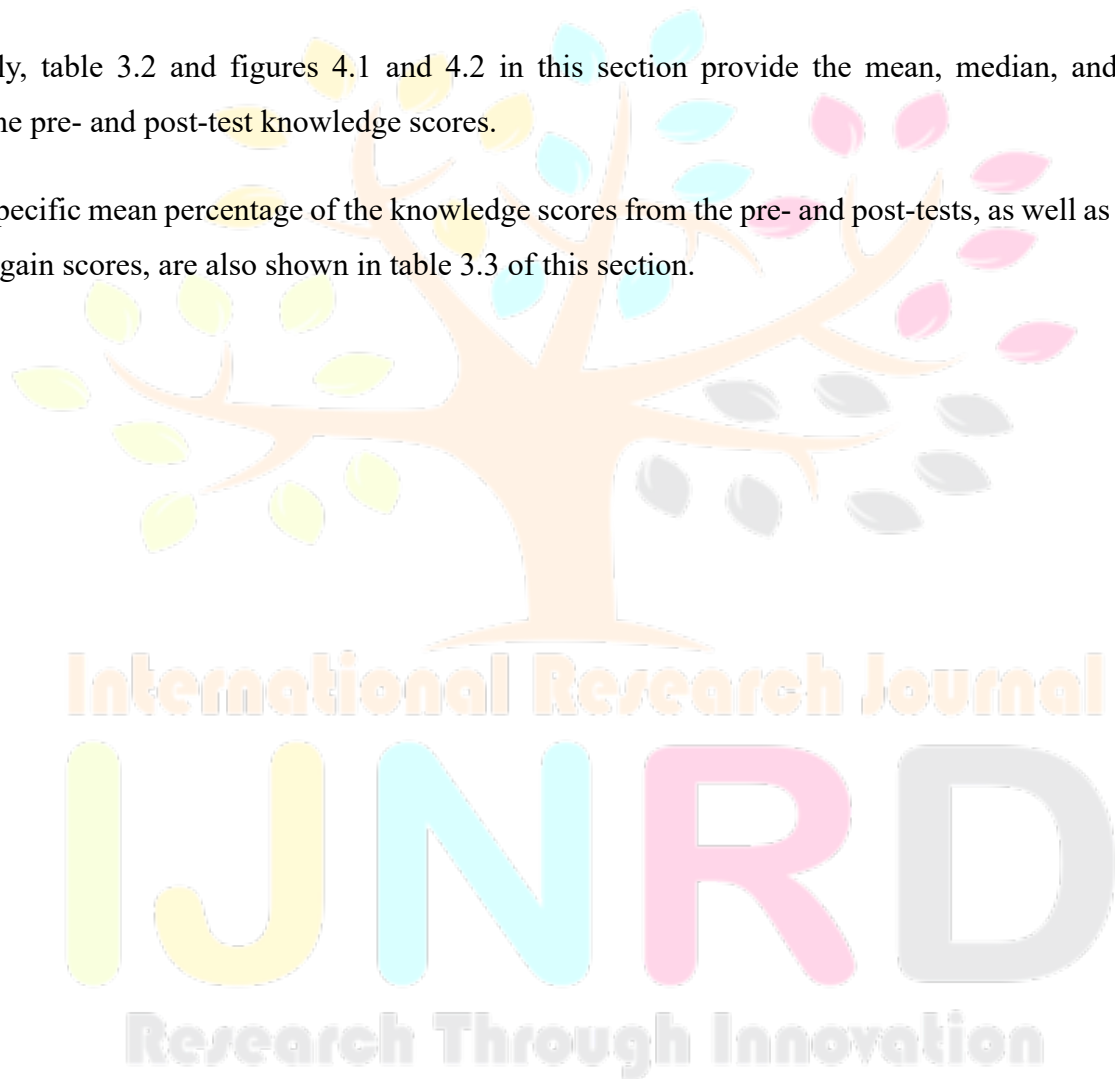
TABLE 3.1

Assessment of pre-test and post-test knowledge levels regarding safety measures regarding handling chemotherapeutic drugs among 3rd year B.Sc. Nursing students.

n=88

Level of knowledge	Pre-test		Post-test	
	Frequency (f)	%	Frequency (f)	%
Inadequate knowledge (≤ 10)	10	11.4	0	0
Moderate knowledge (11-16)	70	79.5	1	1.1
Adequate knowledge (≥ 17)	8	9.1	87	98.9
Total	**88**	**100**	**88**	**100**

The data presented in Table 3.1 indicates that during the pre-test, most students, 70 (79.5%), had moderate knowledge regarding safety measures for handling chemotherapy drugs. In contrast, 10 (11.4%) exhibited inadequate knowledge, and 8 (9.1%) had adequate knowledge. After the structured teaching program, the post-test results showed a significant improvement, with 87 (98.9%) of students demonstrating adequate knowledge, while only 1 (1.1%) retained moderate knowledge.

TABLE 3.2

Mean, median and standard deviation of pre-test and post-test knowledge score

n=88

Knowledge Score	Mean	Median	Standard Deviation
Pre-test	13.76	23.59	2.324
Post-test	14	24	2.317

According to the information in Table 3.2, the knowledge score on the pre-test was 13.76 on average, 23.59 on median, and 2.324 on standard deviation. On the post-test, the knowledge score was 14 on average, 24 on median, and 2.317 on standard deviation.

n=88
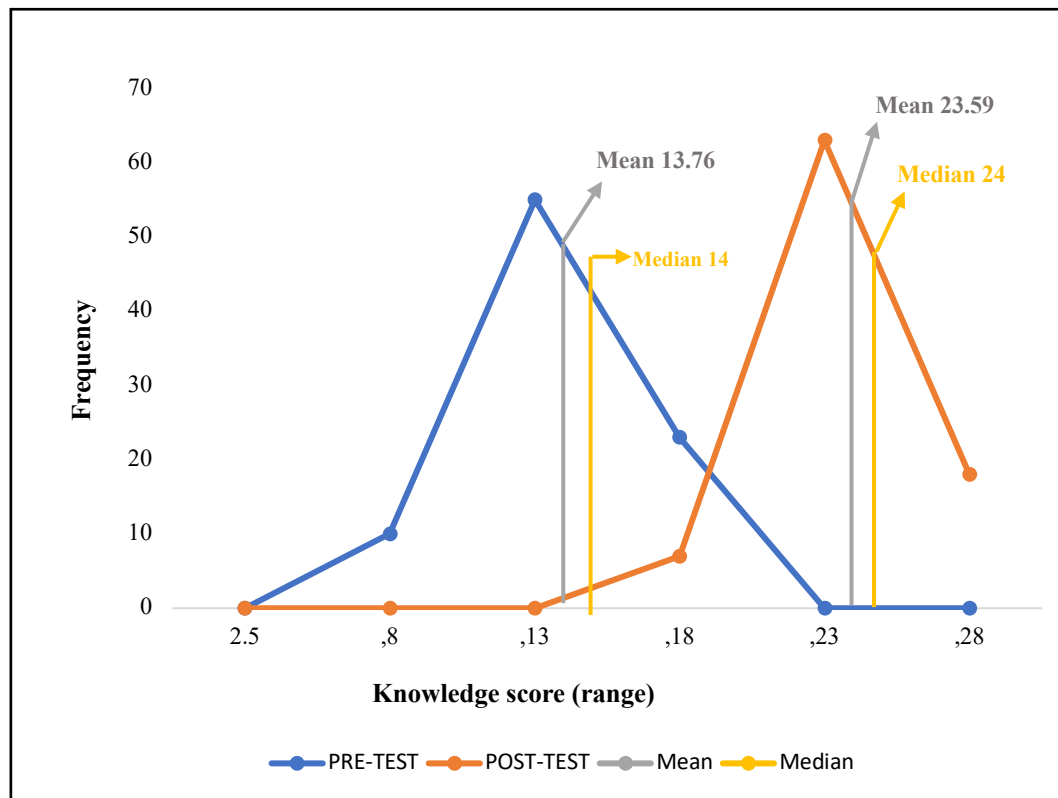
FIGURE 4.1

Frequency polygon showing pre-test and post-test knowledge score.

Figure 4.1 presents the frequency polygon for the pre- and post-test knowledge scores of the 88 subjects. The mean and median are closely aligned in both the pre-test and post-test frequency polygons. Notably, the frequency curve for the pre-test scores shows a mean positioned to the right of the median, indicating a negative skew (-0.24). Conversely, the post-test curve is shifted to the right of the pre-test curve, reflecting a broader range of higher scores in the post-test. The post-test frequency curve also displays a mean that is right of the median, again indicating a negative skew (-0.41). This suggests a significant increase in the knowledge scores of 3rd year B.Sc. Nursing students regarding safety measures for handling chemotherapeutic drugs.
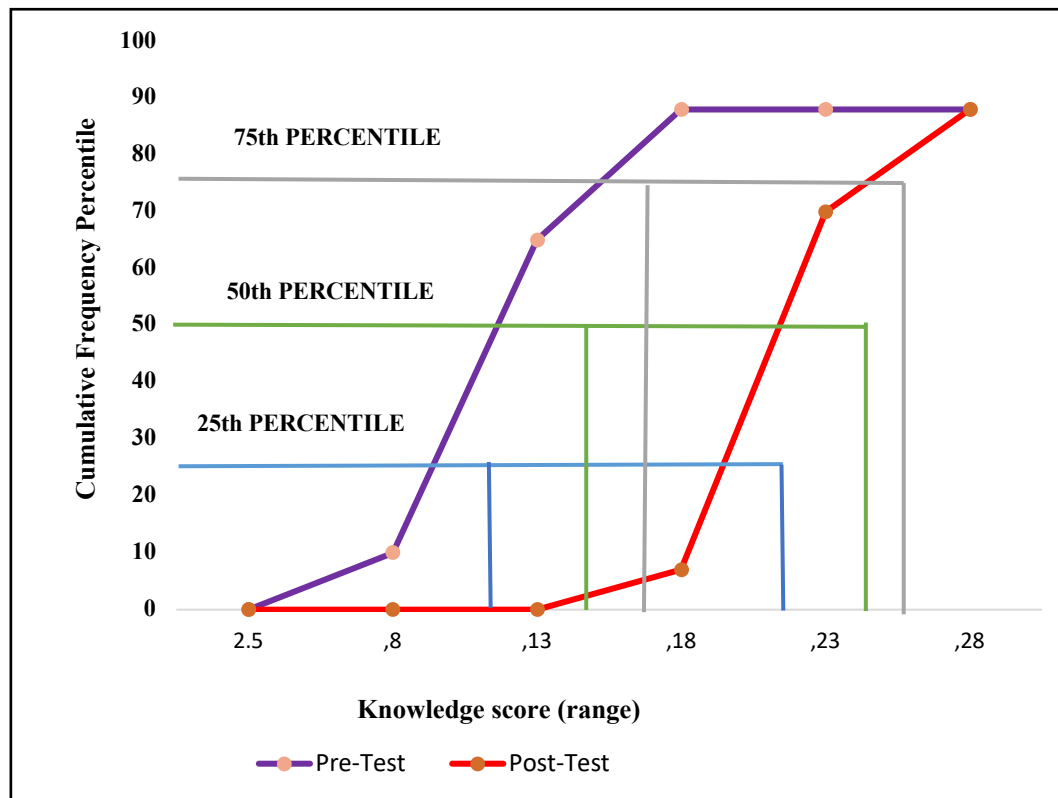
n=88

FIGURE 4.2

Ogive showing the pre-test and post-test knowledge score

Figure 4.2 illustrates that the post-test knowledge scores consistently surpassed the pre-test scores, with the post-test ogive directly overlaying the pre-test ogive throughout the entire range. This significant difference in scores indicates that the 3rd year B.Sc. Nursing students gained a better understanding of safety precautions for handling chemotherapy medications after participating in the structured teaching program. Specifically, the knowledge scores at various percentiles revealed an increase: at the 25th percentile (Q1), the scores were 12 (pre-test) and 22 (post-test); at the 50th percentile (Q2), they were 14 and 24; and at the 75th percentile (Q3), they were 16 and 25. These results clearly demonstrate that the post-test scores were higher than the pre-test scores across all percentiles.

TABLE 3.3

Area wise mean percentage of pre-test and post-test knowledges score, actual gain, possible gain and modified gain score

n=88

Area	Pre-test	Post-test	Gain in Score		
			Actual Score	Possible Score	Modified Score
Area-I	38.96%	81.49%	42.53	61.04	*0.69
Area-II	39.61%	74.67%	35.06	60.39	**0.58
Area-III	51.70%	80.82%	29.12	48.3	0.60

*Areas of maximum modified gain

**Areas of minimum modified gain

According to the information in Table 3.3, the largest gain score (0.69) was found in Area I, which dealt with the introduction and definition of chemotherapy medications, while the lowest modified gain score (0.58) was found in Area III, which dealt with the classification and delivery methods of chemotherapeutic agents. It is possible to conclude that there was knowledge growth across all domains because the modified gains in each area were greater than 0.05.

SECTION – III: Effect of structured teaching programme on knowledge on safety measures regarding handling of chemotherapeutic drugs among 3rd year B. Sc. Nursing students

This section details the findings related to the impact of the structured teaching program on knowledge regarding safety measures for handling chemotherapeutic drugs among third-year B.Sc. Nursing students.

To test the research hypothesis H1, the null hypothesis H01 was formulated as follows:

H$_{01}$: There is no significant difference between the mean pre-test and mean post-test knowledge scores concerning safety measures for handling chemotherapeutic drugs among 3rd year B.Sc. Nursing students.

To evaluate the effectiveness of the structured teaching program, a paired 't' test was conducted. The findings are summarized in Table 4.1.

Additionally, this section includes an analysis of the pre-test and post-test mean scores, standard deviations, mean differences, and 't' values for the students' knowledge regarding safety measures when handling chemotherapeutic drugs. These findings are presented in Table 4.2.
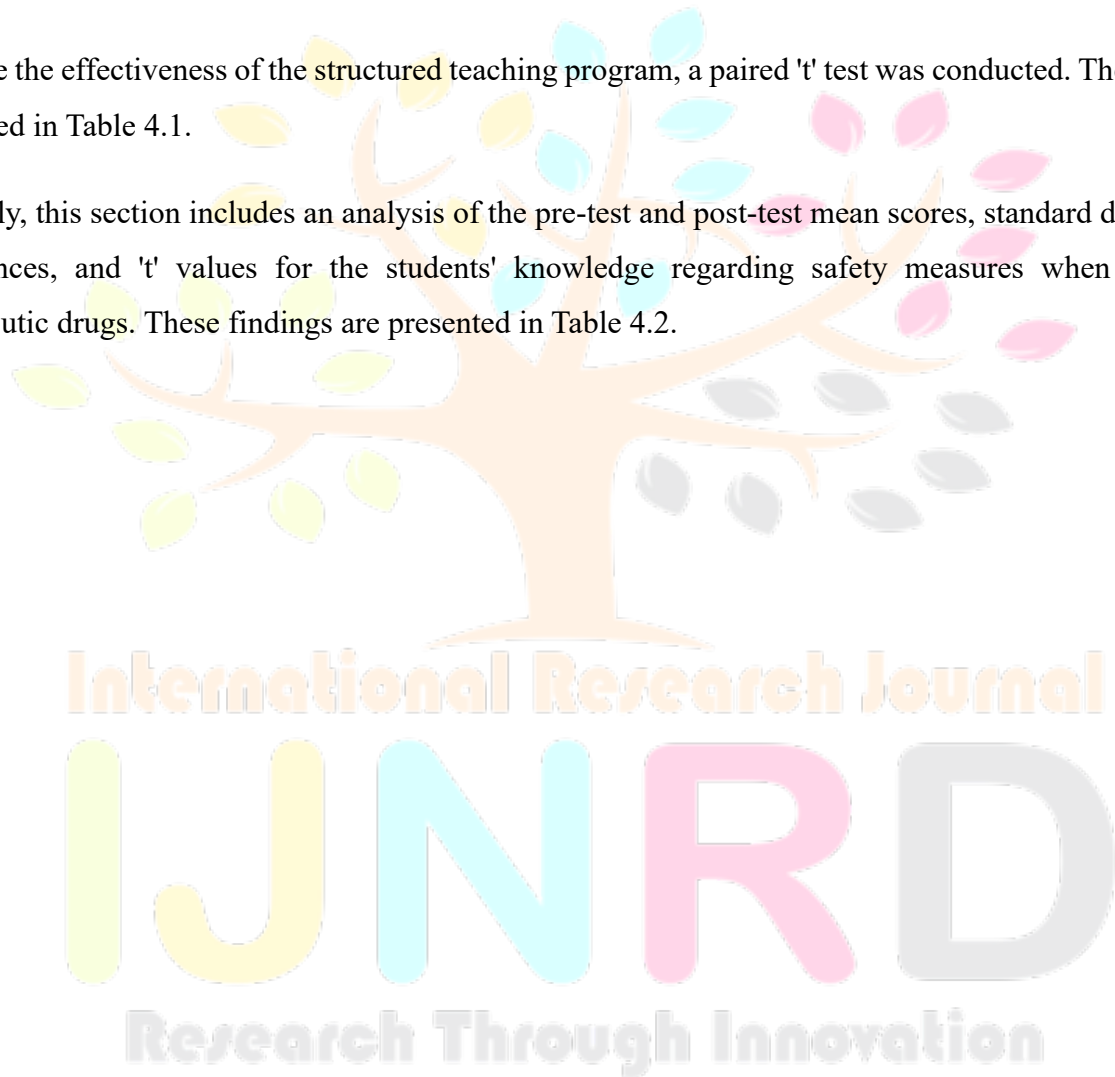
TABLE 4.1

Mean, median, standard deviation, mean difference, and 't' value for pre-test and post-test knowledge regarding safety measures for handling chemotherapeutic drugs among third-year B.Sc. Nursing students.

n=88

Level of knowledge	Mean	SD	Mean Difference	t-test Value	df	p-Value	Inference
Pre-test	13.76	2.324	9.82	28.59	87	0.001	*S
Post-test	23.59	2.317					

NS= Non-Significant   *S= Significant

The data in Table 4.1 indicate that the mean knowledge score in the post-test was 23.59±2.317, compared to a mean score of 13.76±2.324 in the pre-test, resulting in a mean difference of 9.82. A paired t-test was conducted to assess the significance of this difference, yielding a t-value of 28.59 with 87 degrees of freedom (df), and a p-value of 0.001, which is statistically significant at the $p<0.05$ level.

TABLE 4.2

Mean, standard deviation, mean difference, and t-value for pre-test and post-test knowledge on safety measures for handling chemotherapeutic drugs among 3rd year B. Sc. Nursing students, categorized by area.

n=88

Area	Level of knowledge	Mean	SD	Mean D	't' Value	df	'p' Value	Inference
Area-I	Pre-test	3.038	3.376	2.663	5.106	174	<0.0001	*S
	Post-test	5.701	3.541					
Area-II	Pre-test	2.769	3.423	2.454	5.041	174	<0.0001	*S
	Post-test	5.223	3.022					
Area-III	Pre-test	8.249	7.883	7.398	4.531	174	<0.0001	*S
	Post-test	12.89	5.492					

NS= Non-Significant   *S = Significant

Table 4.2 indicates that the mean post-test knowledge score in Area I was 5.701±3.541, which exceeded the pre-test mean score of 3.038±3.376, resulting in a mean difference of 2.663. The calculated t-value of 5.106 (df=174, p=0.0001) was statistically significant at the 0.05 level. In Area II, the mean post-test knowledge score was 5.223±3.022, higher than the pre-test mean score of 2.769±3.423, yielding a mean difference of 2.454. The estimated t-value of 5.041 (df=174, p=0.0001) also indicated statistical significance at the 0.05 level. Furthermore, in Area III, the mean post-test knowledge score reached 12.89±5.492, surpassing the pre-test mean score of 8.249±7.883, with a mean difference of 7.398. The t-value calculated was 4.531 (df=174, p=0.0001), which was statistically significant at the 0.05 level.

These findings suggest that the structured teaching program effectively enhanced knowledge regarding the safe handling of chemotherapeutic drugs" among the students.

SECTION- IV: Association between the pre-test level of knowledge on safety measures regarding the handling of chemotherapeutic drugs and selected demographic variables among 3rd year B.Sc. Nursing students.

This section explores the relationship between the pre-test knowledge of safety measures regarding the handling of chemotherapeutic drugs among 3rd year B.Sc. Nursing students and various demographic variables, including age, gender, type of family, religion, and source of information. To examine this relationship, research hypothesis H2 is evaluated against the null hypothesis

H_{02}: There is no significant association between the pre-test knowledge score on safety measures regarding handling of chemotherapeutic drugs among 3rd year B.Sc. Nursing students and the selected demographic variables.

A chi-square test was conducted to determine any significant associations between pre-test knowledge and the selected demographic variables. The findings are detailed in Tables 5.1 to 5.5.

TABLE 5.1

Association between pre-test knowledge levels on safety measures for handling chemotherapeutic drugs and age among 3rd year B.Sc. Nursing students.

n=88

Age in Years	Pre-test knowledge			χ^2 Value	Tabulated value	df	*p* value	Inference
	Inadequate	Moderate	Adequate					
18-20	4	17	1					
21-22	6	44	5	3.683	9.49	4	0.451	NS
23 & above	0	9	2					
Total	**10**	**70**	**8**					

NS=Non-Significant   *S=Significant

The data presented in Table 5.1 reveals that the calculated chi-square (χ^2) value of 3.683 with 4 degrees of freedom was less than the tabulated value of 9.49, corresponding to a p-value of 0.451. This indicates that, at the 0.05 level of significance, the demographic variable of age was statistically non-significant.

TABLE 5.2

Association between pre-test knowledge levels on safety measures for handling chemotherapeutic drugs and gender among 3rd year B.Sc. Nursing students.

n=88

Gender	Pre-test knowledge			$\chi2$ value	Tabulated value	df	*p* value	Inference
	Inadequate	Moderate	Adequate					
Female	10	67	6					
Male	0	3	2	6.483	5.99	4	0.166	*S
Others	0	0	0					
Total	**10**	**70**	**8**					

NS=Non-Significant   *S= Significant

In Table 5.2, the calculated chi-square (χ^2) value of 6.483 with 4 degrees of freedom exceeded the tabulated value of 5.99, yielding a p-value of 0.166. These results indicate that gender was a statistically significant demographic variable at the "0.05 level of significance.

TABLE 5.3

Association between pre-test knowledge levels on safety measures for handling chemotherapeutic drugs and religion among 3rd year B.Sc. Nursing students

n=88

Religion	Pre-test knowledge			χ^2 value	Tabulated value	df	*P* value	Inference
	Inadequate	Moderate	Adequate					
Hinduism	5	24	2					
Christianity	0	10	0	4.218	9.49	6	0.647	**NS**
Islam	5	36	6					
Others	0	0	0					
Total	**10**	**70**	**8**					

NS= Non-Significant   S=Significant

The data presented in Table 5.3 indicates that the calculated chi-square (χ^2) value of 4.218 with 6 degrees of freedom was less than the tabulated value of 9.49, resulting in a p-value of 0.647. This indicates that, at the 0.05 level of significance, the demographic variable of religion was statistically non-significant.

TABLE 5.4

Association between pre-test knowledge levels on safety measures for handling chemotherapeutic drugs and family type among 3rd year B.Sc. Nursing students.

n=88

Type of family	Pre-test knowledge			$\chi 2$ value	Tabulated value	df	p value	Inference
	Inadequate	Moderate	Adequate					
Nuclear	10	59	4					
Joint	0	11	4	8.287	5.99	4	0.081	*S
Extended	0	0	0					
Total	**10**	**70**	**8**					

NS= Non-Significant   *S=Significant

Table 5.4 presents a chi-square (χ^2) value of 8.287 with 4 degrees of freedom, which exceeds the tabulated value of 5.99. The corresponding p-value is 0.081. Consequently, the results indicate that the demographic variable of family type is "statistically significant at the 0.05 level.

TABLE 5.5

Association between pre-test knowledge levels on safety measures for handling chemotherapeutic drugs and sources of information among 3rd year B.Sc. Nursing students.

n=88

Source of Information	Pre-test knowledge			χ^2 value	Tabulated value	df	p value	Inference
	Inadequate	Moderate	Adequate					
workshop	3	14	1					
In-service Education	1	7	1	2.381	12.59	6	0.882	NS
Mass Media	2	20	1					
Others	4	29	1					
Total	**10**	**70**	**8**					

NS= Non-Significant   S=Significant

Table 5.5 reveals that the calculated chi-square (χ^2) value is 2.381 with 6 degrees of freedom, which is lower than the tabulated value of 12.59. The corresponding p-value is 0.882. As a result, the findings indicate that the demographic variable of information sources is "statistically non-significant at the 0.05 level.

The overall statistical analysis presented in Tables 5.1 and 5.5 indicates a significant correlation between the pre-test knowledge level of 3rd year B.Sc. Nursing students regarding safety measures for handling chemotherapeutic drugs and certain demographic variables, such as gender (χ^2 value = 6.483, p = 0.166) and family type (χ^2 value = 8.287, p = 0.081). Conversely, no significant correlation was found with demographic variables like age, religion, and sources of information. Thus, the study accepts hypothesis H2, which identifies a substantial correlation with gender and family type, while the null hypothesis H02 is not supported for the other demographic factors.

Summary

This chapter focused on the classification, organization, and presentation of data across various sections. It includes the analysis and interpretation of organized data, along with tables and figures illustrating demographic information, the impact of the structured teaching program, and the association between knowledge of safety measures for handling chemotherapeutic drugs and selected demographic variables.

CHAPTER-V

SUMMARY, FINDINGS, DISCUSSION, CONCLUSION

AND RECOMMENDATION

An overview of the study is given in this chapter, along with an explanation of the major conclusions and their implications for nursing practice, research, education, and administration." Additionally, it discusses the study's shortcomings and makes suggestions for further research on particular subjects.

Summary of the Study

The current study sought to assess 3rd year B.Sc. Nursing students from particular colleges in Guwahati, Assam, regarding their understanding of safety precautions for the appropriate handling of chemotherapy medications. A pre-experimental one-group pre-test post-test design was employed. At first, tools were created using data from a quantitative investigation. The feasibility of the research was evaluated by a pilot study, the findings of which guided the necessary modifications. The split-half approach was used to assess the tool's reliability.

Objectives of the study

1. To assess the pre-test level of Knowledge on Safety Measures regarding Handling of Chemotherapeutic Drugs among 3rd year B.Sc. Nursing students in selected Nursing Colleges of Guwahati, Assam.

2. To assess the post-test level of Knowledge on Safety Measures regarding Handling of chemotherapeutic drugs among 3rd year B.Sc. Nursing students in selected Nursing Colleges of Guwahati, Assam.

3. To evaluate the effect of Structured Teaching Program on Knowledge on Safety Measures regarding Handling of Chemotherapeutic Drugs among 3rd year B.Sc. Nursing students in selected Nursing Colleges of Guwahati, Assam.

4. To find out the association between pre-test level of Knowledge on Safety Measures regarding Handling of Chemotherapeutic Drugs with selected demographic variables.

The conceptual framework for this study is based on Ludwig von Bertalanffy's General System Theory. A comprehensive literature review was conducted on topics related to awareness of safety measures for handling chemotherapy drugs and the effectiveness of structured teaching program in this context. This thorough review enabled the researcher to develop a conceptual framework, create the necessary tools, analyze and interpret the data, and conduct a detailed investigation of the chosen problem.

In order to effectively meet the goals of the study, a pre-experimental one-group pre-test-post-test design was used in a quantitative research technique. Simple random sampling was used to choose 88 3rd year B.Sc. nursing students who were enrolled throughout the data collection period. Formal agreement was acquired from the

principals of Rahman Hospitals College of Nursing and Nemcare Institute of Nursing Sciences, two conveniently located nursing institutes in Guwahati, Assam. In May of 2024, data was gathered.

A structured knowledge questionnaire was used to gather demographic data, such as the age, gender, religion, family structure, and sources of information about safety precautions for handling chemotherapy medications for students. Both descriptive and inferential statistics were used in data analysis. The demographic data were analyzed using percentage distributions and descriptive frequencies. The degree of knowledge was tested using mean, standard deviation, and mean percentage calculations. To assess the efficacy of the structured training program, a paired "t-test" was employed, and a chi-square test with a significance level of 0.05 was utilized to investigate relationships between knowledge levels and particular demographic characteristics. Expert assessment of the items' relevance was used to determine the content validity of a 30-item self-structured knowledge questionnaire.

Major findings of the study

The following is a summary of the study's main findings:

Demographic Variables

- The majority of students, 55 (62.5%), were in the age group of 21-22 years.

- A significant portion, 83 (94.3%), were female.

- Most students, 47 (53.4%), identified as belonging to the Islamic religion.

- A majority, 73 (83%), came from nuclear families.

- Additionally, 38 students (43.2%) reported obtaining their information from various sources.

Level of knowledge on Safety measures regarding handling of chemotherapeutic drugs.

Eight students (9.1%) had adequate knowledge, 10 (11.4%) had inadequate knowledge, and 70 (79.5%) had moderate knowledge at the time of the study. On the other hand, during the post-test, 87 students, or 98.9%, had adequate knowledge and 1 student, or 1.1%, had moderate understanding regarding safety precautions when handling chemotherapy medications.

Effect of Structured teaching programme on knowledge on safety measures regar- ding handling of chem0therapeutik drugs.

With a mean difference of 9.82, the study discovered that the mean knowledge score at the post-test, which was 23.59+2.317, was greater than the mean knowledge score at the pre-test, which was 13.76+2.32. The mean difference in the knowledge scores from the pre- and post-test was investigated using a paired "t" test. At the

p<0.01 level, the resulting value (t = 28.59) at df = 87 was statistically significant. The study thus demonstrates the "effectiveness of the structured teaching programme"

Association between pre-test level of knowledge with selected demographic variable

The current study used the chi-square test to investigate the association between the selected demographic factors and the pre-test knowledge of 3rd year B. Sc. Nursing students regarding safety procedures when handling chemotherapy drugs. 3rd year B.Sc. Nursing students' pre-test awareness of safety precautions for handling chemotherapy medications was found to be significantly correlated with their gender and family type. It was discovered that other demographic factors, such as age, religion, and the source of information about these safety precautions, had no discernible impact.

Discussion

The current study set out to evaluate the impact of a structured teaching program on the comprehension of safe handling techniques for chemotherapy drugs among 3rd year B. Sc. nursing students at specific colleges in "Guwahati, Assam. An investigation was conducted using a quantitative technique. The goals and theories have been compared with the study's findings.

The study's main conclusions are contrasted and compared with those of related studies. The following headings have been used to discuss the study's conclusions:

Discussion on basis of demographic variables of research study.

The participants in this study were 88 students from two specially selected nursing institutes in Guwahati, Assam.

- The majority of students, or 55 (62.5%), were in the 21–22 age range.

- The majority of pupils, or 83 (94.3%), were female.

- The majority of students, or 47 (53.4%), identify as Muslims.

- The majority of students, or 73 (83%) of them, come from nuclear families.

- The majority of students, or 38 (43.2%), get their information about safe handling practices for chemotherapy drugs from external sources.

Level of knowledge on safety measures regarding handling of chemotherapeutic drugs among 3rd year B. Sc. Nursing students of Guwahati, Assam.

The objective of this study was to assess the level of knowledge among third-year B. Sc. Nursing students about safety precautions when handling chemotherapy drugs. Out of the 88 students who took the pre-test, 70 (79.5%)

had moderately knowledge, 10 (11.4%) had inadequate knowledge, and 8 (9.1%) had adequate knowledge. In contrast, 87 (98.9%) students had adequate knowledge and 1 (1.1%) had moderately knowledge regarding safety measures regarding handling chemotherapy drugs in the post-test.

The results of the current study were corroborated by those of a prior investigation carried out in SIMS Hospitals, Chennai, by Jain S., an M. Sc. Nursing II Year student with roll number 30162652 (2018). This study employed a pre-experimental pre-test and post-test research design. Thirty samples were selected by means of purposeful sampling. A pre-test structured interview schedule was used to ask questions of staff nurses in order to find out more about their understanding of the safe administration and handling of chemotherapy drugs. Examining the staff nurses' pre-test knowledge, it was found that their mean score was 11.58 and their standard deviation was 1.22, indicating low knowledge. The staff nurses' knowledge level considerably increased following a systematic instruction program, as evidenced by the post-test knowledge level mean of 21.2 and standard deviation of 1.68. The study appears to have been beneficial to the staff nurses' understanding of the safe administration and management of chemotherapy medications, as evidenced by the 39% "difference in the mean" percentage of knowledge levels prior to and following the exam. [45]

Effect of Structured teaching programme on knowledge on safety measures regarding handling of chemotherapeutic drugs

The study's findings about the effectiveness of a structured teaching program on third-year B. Sc. nursing students' knowledge of safety precautions when handling chemotherapy drugs show that, with a mean difference of 9.82, the post-test mean knowledge score was higher than the pre-test mean knowledge score of 13.76±2.32. The mean difference between the pre- and post-test knowledge scores was calculated using a paired "t" test. At the $p < 0.01$ level, the resulting value ($t = 28.59$) at df=87 was statistically significant. According to the study's findings, the structured teaching approach proved effective.

Applying a quantitative research approach, the pre-experimental study design (one group pre-test post-test only) was used. 60 staff nurses from Puducherry's Mahatma Gandhi Medical College Research Institute participated in this study. To choose the samples, a simple sampling strategy was employed. A standardized questionnaire was used to give the pre-test, and staff nurses were trained on how to handle cancer medications appropriately. Seven days have passed since the pre-test when the post-test was administered. 36 samples (60%) out of 60 had insufficient knowledge during the pre-test, 22 samples (36.7%) had slightly acceptable knowledge, and 2 samples (3.3%) had adequate knowledge. In the post-test, 55 (91.7%) had relevant knowledge and five (8.3%) had reasonably excellent knowledge. The post-test knowledge score was greater than the pre-test, with a mean score of 16.53 over the 8.62 on the pre-test. The standard deviation of the knowledge score prior to the test was 2.969, whereas the knowledge score following the exam had a standard deviation of 1.443. At the $p < 0.001$ level, the resulting paired value was 20.684, indicating substantial significance. According to the present study's findings, most staff nurses were not aware of the proper ways to manage cancer medications both before and

after the test. It shows how effective the educational program was in increasing the degree of knowledge held by "staff nurses. [46]

Association between pre-test level of knowledge with selected demographic variable

The current study used the chi-square test to investigate the association between the selected demographic factors and the pre-test knowledge of third-year B. Sc. Nursing students on safety measures for handling chemotherapy drugs. It was discovered that among third-year B.Sc. Nursing students, there was a significant correlation between the gender and family type characteristics and pro-test levels of knowledge regarding safety precautions when handling chemotherapy medications. Other demographic factors, such as age, religion, and information source, were discovered to have no discernible impact.

The results of the current study were supported by Dongare V. G.'s (2021) study, which included 60 staff nurses and collected data through a structured knowledge survey. The knowledge of safe handling of chemotherapy medications by staff nurses was found to be statistically correlated with certain demographic traits, including age, gender, and information source. Ultimately, the study found a substantial correlation between a variety of factors and staff nurses' knowledge of safely handling chemotherapy drugs.[47]

Limitations

1. Sample size were only 88, it could have been larger in number.

2. The findings cannot be generalized as it was conducted only in two selected Nursing colleges" of Guwahati, Assam.

3. The things that happened in between the pre- and post-test were outside the investigator's control.

Conclusion

The results of this study indicate that a systematic teaching program on safety precautions for handling chemotherapeutic medications to 3rd year B. Sc. Nursing students was successful in raising the students' level of knowledge. In order to prevent the potentially harmful effects of handling chemotherapy medications on student nurses, it is imperative that health professionals take the initiative to educate students on safe handling practices. The prevalence and burden of dangerous side effects brought on by cytotoxic medications, such as chemotherapy treatments, can be decreased with the use of structured training programs that provide students with accurate information, increase awareness, and encourage good health behaviors.

Nursing implication

The following study results were derived by the investigator, and they are extremely important for the fields of nursing practice, administration, education, and research.

Nursing practice

In the subject of nursing practice, research has a broad scope. When it comes to patient care, nurses are essential. Understanding the precautions to take when handling chemotherapeutic medications will help identify and stop the negative side effects of cytotoxic medications early on. This research will assist nursing students in maintaining awareness when handling chemotherapy medications. It is equally necessary to implement health education and training programs on the safe handling of chemotherapy medications. The present study's conclusions can be used by nursing staff to refresh and enhance their understanding of safety measures regarding handling chemotherapy drugs.

Nursing administration

To achieve the goals, one area that requires ongoing research is nursing administration. To help nurses advance their knowledge and abilities, nurse administrators might plan conferences, workshops, seminars, demonstrations, and health education.

Nursing education

The application of methods and evidence-based practice in nursing education is crucial in both hospital and community settings to improve the health of nurses. Nurse as an educator has got lots of opportunity in nursing profession to educate and create awareness among the nurses, students. She can teach the nursing students how to create awareness about the adverse effects of cytotoxic drugs on health professionals itself. Conference, workshop. seminar can be conducted on various aspects of health programmes among the students and nursing personnel for improvement in knowledge.

Nursing Research

Nursing is a changing profession, thus research is important to add to the body of information already known. To enhance the quality of life for both staff nurses and nursing students, research and clinical studies must be given priority. By applying the study's findings to a larger sample, it is possible to generalize the results, and aspiring researchers can make good use of these findings as valuable references.

Recommendations

The study's conclusions lead to the following recommendations for additional research:

- A similar study can be conducted on a larger sample with different demographic variables.

- An exploratory study can be conducted to identify the knowledge and practice of students regarding prevention of harmful side effects of cytotoxic drugs like chemotherapeutic drugs.

- A follow-up study of STP can be carried out to find the effectiveness in terms of retention of knowledge.

- A similar study can be conducted along with health practices among staffs nurses regarding save handling of chemotherapeutics drugs.

- A similar study can be conducted using other strategies like SIM, booklets and pamphlets.

- Workshops can be conducted to spread more awareness about safe handling of chemotherapeutic drugs.

Summary

This chapter provided a detailed explanation of the current study's summary, findings, comparison of the study with related studies from the literature review, limitations, conclusion, nursing implications, and suggestions for additional research.

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ANNEXURE XI

TOOLS USED FOR THE STUDY (ENGLISH VERSION)

SECTION-A

DEMOGRAPHIC PROFILE

INSTRUCTION:

Please read the following questions carefully and answer each question by placing a tick mark (√) in the option. The information collected from participates will be used only for the purpose of the research study and kept in confidential.

1. Age:

2. Gender:

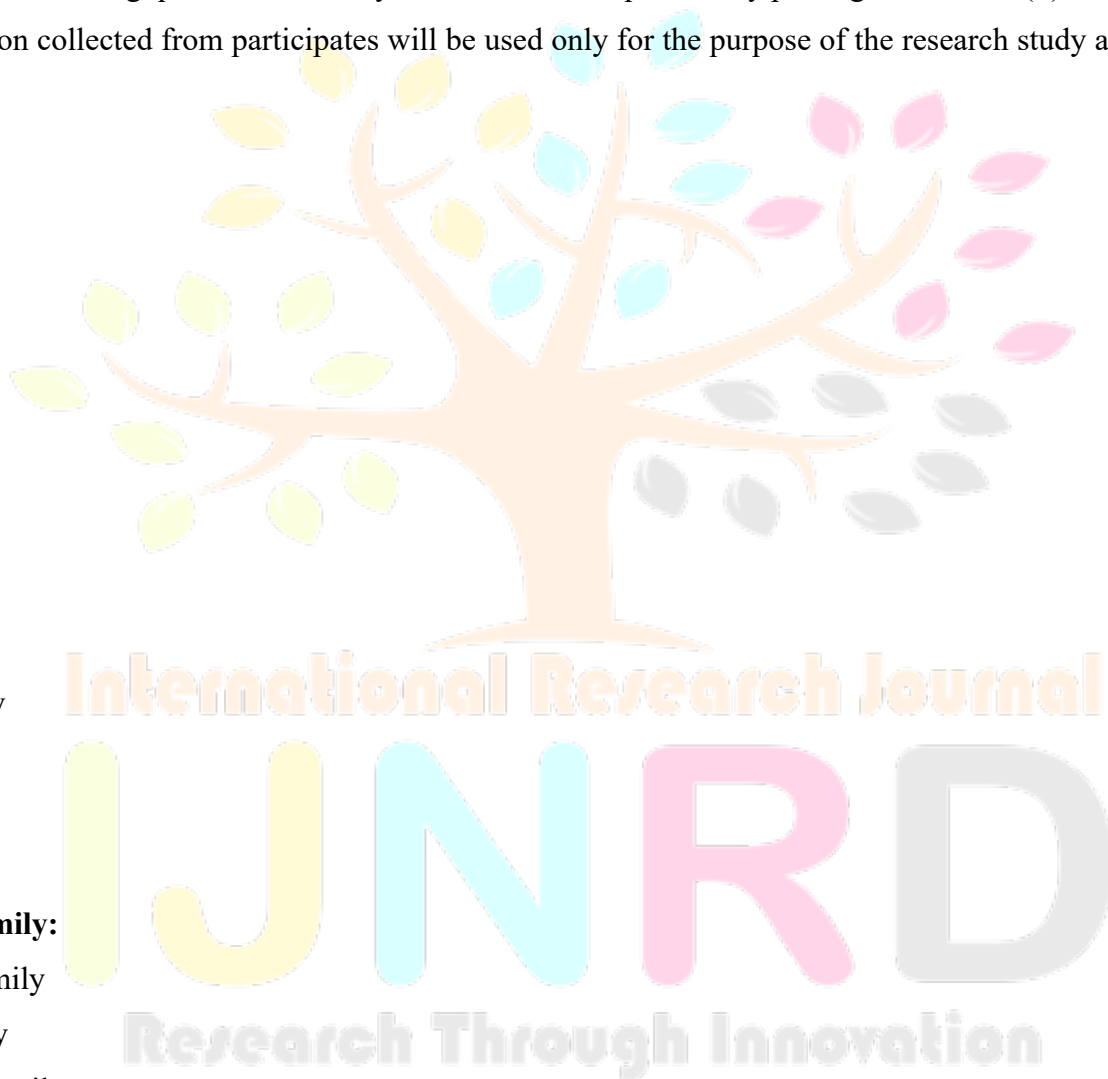a) Female

b) Male

c) Others

3. Religion:

a) Hinduism

b) Christianity

c) Islam

d) Others

4. Type of family:

a) Nuclear family

b) Joint family

c) Extended family

5. Source of information on safety measures regarding handling chemotherapeutic drugs?

a) Workshop

b) In-service education

c) Mass-media education

d) Other

SECTION- B

STRUCTURED SELF-ADMINISTERED KNOWLEDGE QUESTIONNAIRE ABOUT SAFETY MEASURES REGARDING HANDLING OF CHEMOTHERAPEUTIC DRUGS

1. **What is the full form of NIOSH?**

a) National Institute of Occupational Safety and Health

b) National Institute of Overall Safety and Health

c) National Institute of Occupational Security and Health

d) None of the above

2. **As defined by NIOSH, how many numbers of characteristics does hazardous drugs have in humans and animals?**
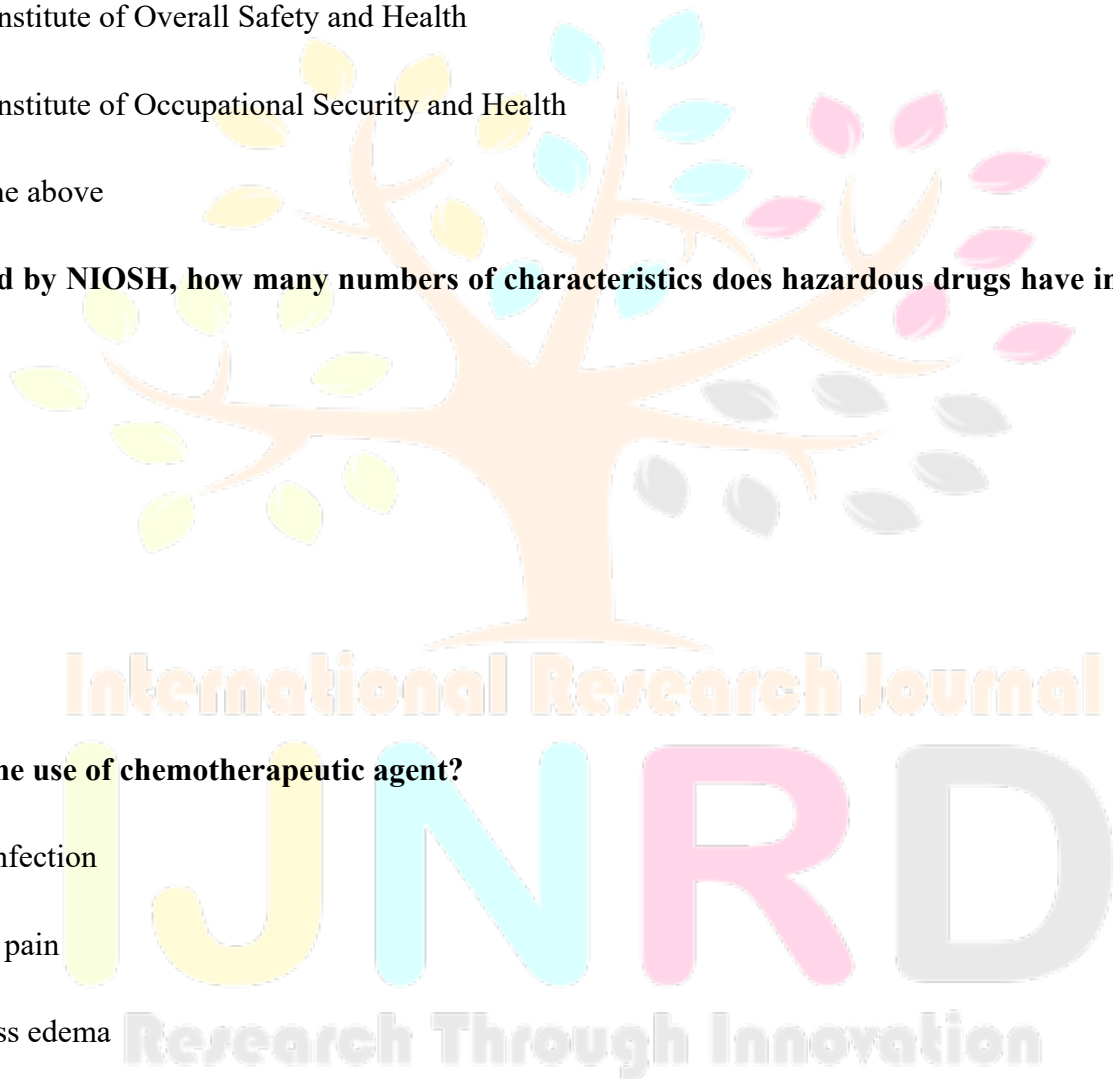
a) Seven

b) Five

c) Six

d) Eight

3. **What is the use of chemotherapeutic agent?**

a) Treating infection

b) To relieve pain

c) To suppress edema

d) Treating malignancies

4. **What is the nature of chemotherapeutic drugs?**

a) Analgesics

b) Life-threatening

c) Anti-neoplastic agents

d) Anxiolytic

5. **Currently how many different types of chemotherapy drugs are available?**

a) Below 50

b) More than 100

c) Only 60

d) Less than 100

6. **What is the function of Anti-tumor antibodies drugs?**

a) Destroys tumor cells only

b) Prevents cells from reproducing

c) Cannot reproduce eventually

d) None of the above

7. **What is Chemotherapy?**

a) Drug that controls tumor growth

b) Drug that improves immunity

c) Drug that increases the size of the cells

d) Drug that reduces blood pressure level

8. **Alkylating agents comes under which classification of chemotherapeutic drugs?**

a) Activity of cell

b) Chemical agents

c) Cell cycle phase specific

d) Cell cycle phase non-specific

9. **Which chemotherapeutic drugs are the ones that blocks certain enzymes that cell needs to produce?**

a) Mitotic inhibitors

b) Topoisomerase inhibitors

c) Antimetabolites

d) Alkylating agents

10. What is the meaning of Neo-adjuvant chemotherapy?

a) Make a tumor smaller before surgery

b) Destroys the tumor after surgery

c) Use chemotherapy with radiotherapy

d) None of the above

11. Which type of chemotherapy is prescribed with the intention of curing highly sensitive tumor?

a) Immunosuppressive

b) Palliative

c) Adjuvant

d) Primary

12. What is the meaning of Concurrent chemotherapy?

a) Treatment given before surgery to shrink tumor

b) Treatment given after surgery to "mop up" microscopic residual

c) Treatment given simultaneously to increase sensitivity of cancer cells to radiation

d) Treatment given at a particular interval of time.

13. What are the routes of administering chemotherapeutic drugs?

a) Intravenous routes

b) Intra-peritoneal

c) Intra-arterial routes

d) All the above

14. Dosage of chemotherapeutic drugs depends upon which of the following factors?

a) Body mass index

b) Body weight in kilograms
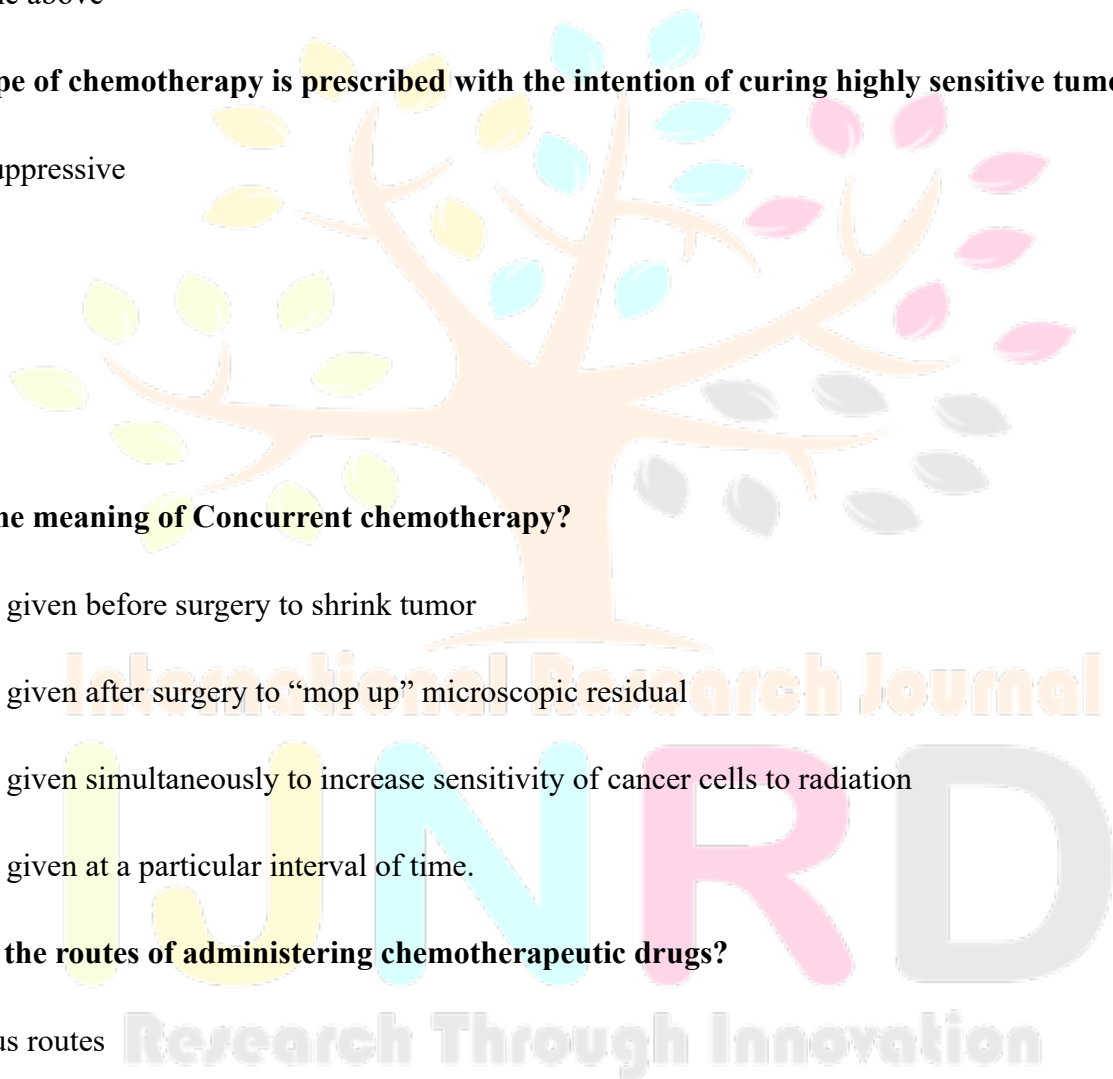
c) Body surface area

d) Both (b) and (c)

15. Which of the following are the side effects of chemotherapy?

a) Nausea, vomiting and hair loss

b) Nausea, blood in sputum and night sweats

c) Hair loss, loss of appetite and vision impairment

d) Muscle problems, fatigue and constipation

16. How to mix the chemotherapeutic drugs in order to prevent unwanted exposure?

a) Above the eye level

b) Below the eye level

c) At the eye level

d) All of the above

17. How many persons needs to counter check the chemotherapeutic drugs before administering to the patient?

a) One nurse

b) Two nurses

c) One nurse and two physicians

d) Two nurses and one physician

18. What must a nurse ensure to patients prior to administration of chemotherapeutic drugs?

a) Signed consent

b) Had appropriate education on effects/side effects and precautions to take

c) Has appropriate venous access with established blood back flow.

d) All the above

19. How will the nurse ensure the patency of IV before the administration of chemotherapeutic drugs?
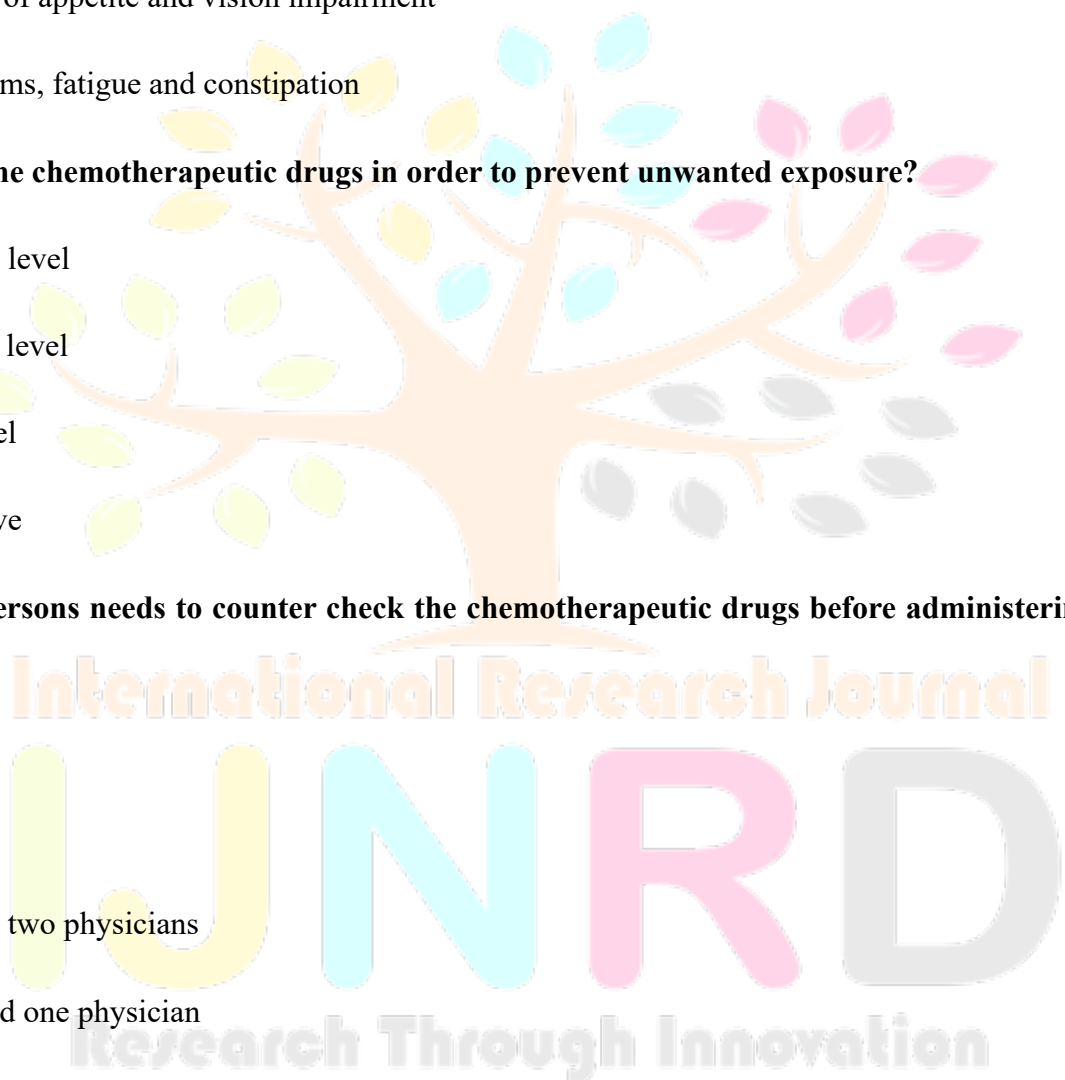
a) Flushing the line with heparin

b) Watch for the backflow and show the attendant

c) Presence of blood in the IV line

d) Watch for the signs of phlebitis

20. PPE should be removed in which order?

a) Gown, goggles or face-shields, mask or respirators, gloves

b) Goggles or face-shields, gloves, gowns, mask or respirators

c) Gloves, gown, goggles or face-shields, mask or respirators

d) Mask or respirators, goggles or face-shields, gloves, gown

21. How the cytotoxic waste is generated?

a) From antiemetic drugs

b) From antineoplastic drugs

c) From anti-inflammatory drugs

d) From antispasmodic drugs

22. What is the ideal bin to dispose chemotherapeutic drugs?

a) Waterproof metal bin

b) Blue and red colored bin

c) Puncture proof bin

d) Yellow colored bin

23. Who should handle the cytotoxic drugs?

a) Specially trained nurse

b) Registered nurse

c) Only in-charge nurse

d) Only doctors.

24. What are the routes of exposure to chemotherapeutic drugs?

a) Ingestion

b) Injection through needle prick

c) Absorption through mucous membrane

d) All the above

25. Which of the following method is considered safest in preparing chemotherapeutic drugs?

a) Wearing PPE

b) Mixing in preparation room

c) Mixing under Laminar hood cabinets

d) Mixing at the patient's bedside

26. What kind of light is present in the laminar hood for chemotherapeutic drugs?

a) Laser light

b) UV light

c) Normal light

d) LED light

27. What personal protective equipment does the nurse is to wear when administering chemotherapeutic drugs?

a) Plastic apron and non-sterile gloves

b) Long sleeved impermeable gown, purple nitrile gloves, optional to wear goggles and mask.

c) Plastic apron, purple nitrile gloves, goggles and mask.

d) None at all

28. In case of unavailability of BSCs or laminar hood cabinets, the recommended location for chemotherapeutic drug preparation is?

a) Quiet and low-traffic room

b) Ordinary room

c) Opened room

d) Patient's room.

29. What should be the nurses' first response, if the patient complaints of breathing difficulty, hot flush and chest pain immediately after administration of chemotherapeutic drugs?

a) Inform the doctor

b) Keep the crash cart nearby

c) Document the allergic reaction

d) Stop the medicine, check vitals and inform physician.

30. When administering chemotherapeutic drugs if the nurse finds that the IV tubing is leaking, what measures to be taken immediately?

a) Stop the drug and apply plaster in the leaking area.

b) Inform patient that it is only small amount nothing to worry

c) Stop the drug, clamp the line and change the IV tubing after wearing PPE

d) Consult doctor.

ANNEXURE II

ANSWER KEYS OF THE SELF-STRUCTURED QUESTIONNAIRE

Question	Answer	Score
1	a	1
2	c	1
3.	d	1
4.	c	1
5	b	1
6.	b	1
7.	a	1
8.	b	1
9.	b	1
10.	a	1
11.	d	1
12.	c	1
13.	d	1
14.	d	1
15.	A	1
16.	b	1
17.	b	1
18.	d	1
19.	b	1

20.	c	1
21.	b	1
22.	d	1
23.	a	1
24.	d	1
25.	c	1
26.	b	1
27.	c	1
28.	a	1
29.	d	1
30.	c	1

PHOTOGRAPHS