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Safe Handling of Cytotoxic Drugs Practices for Nurses Working with Oncology Patients in Middle Euphrates Oncology Teaching Hospitals

Thesis

Submitted to The Council of Nursing College, University of Babylon .

By

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Supervised By

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بِسْمِ اللهِ الرَّحْمَنِ الرَّحِيمِ

﴿ يَأَيُّهَا النَّاسُ قَدْ جَاءَتْكُمْ مَوْعِظَةٌ مِنْ رَبِّكُمْ وَشِفَاءٌ لِمَا فِي الصُّدُورِ وَهُدًى وَرَحْمَةٌ لِلْمُؤْمِنِينَ ﴾

صدق الله العلي العظيم

سورة يونس أية (57)

Supervisor Certification

I certify that this thesis, which entitled " **Safe Handling of Cytotoxic Drugs Practices for Nurses Working with Oncology Patients in Middle Euphrates Oncology Teaching Hospitals** ", was prepared under my supervision at the College of Nursing- University of Babylon in partial fulfillment of the requirements for the master degree Science in Nursing.

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Dedication

With great love and respect I dedicate this work to:

- Beloved parents ,who have been a source of inspiration,

who continually provide me with moral, spiritual, emotional and financial support.

- Beloved wife for her support when I thought of giving up.

-Dear sisters, brothers and friends who shared with me their advice and encouragement to finish this study.

Researcher

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Abstract

Background: All oncology centers are responsible for the safe management of cytotoxic medications, and a number of different approaches must be followed. In terms of cytotoxic reconstitution and administration, the products and devices chosen will have a significant impact on daily practices.

Objectives: To assess the practices of nurses regarding safe handling of cytotoxic drugs.

Methodology: A descriptive observational research design was conducted between the 11th of October, 2021, and the 1st of April, 2022. The research was carried out at Middle Euphrates oncology Teaching Hospitals. A non-probability (purposive) sampling of (125) nurses working in the oncology center are selected related to special criteria. In order to assess safe handling of cytotoxic drugs practices for nurses , a special checklist is prepared which is divided into three parts ;the first part consists of demographical characteristics ;the second part includes general information ; while the third one consists (6) domains related to the safe handling of cytotoxic drugs practices for nurses .The validity is obtained by (9) experts, and inter-observer reliability (r: 0.98), that is statistically acceptable was obtained.

Results: The findings indicated that the majority of the study sample, 105 (84 percent), was between the ages of 20 and 30, 87 (69.6%) was female, and the majority of the research sample, 52 (41.6 percent), was Diploma degree, 63 (50.4%) were married . No significant relationships was found between the

nurses practices with respect to safe handling of cytotoxic drugs and their demographical characteristics at $P \leq 0.05$.

Conclusion: The statistical findings concluded a reasonable degree of experience among nurses when it comes to the proper handling of cytotoxic drug during their everyday care in oncology centers.

Recommendation: A special manual focused on the policy, practices of safe handling of cytotoxic drugs can be prepared and distributed to the oncology departments which provide direct care to the patients to improve the nurses competence related to safety measures.

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List of Acronyms

Title	Page No.
ASCO	American Society of clinical oncology
ASHP	American Society of Health-System Pharmacists
CVD	Cardio Vascular Disease
DNA	Deoxyribonucleic Acid
DHFR	Dihydrofolate reductase,
FDA	Food and Drug Administration
HER2	Human Epidermal growth factor Receptor
HF	Heart failure
HDs	Hazard drugs
IV	Intravenous
IA	Intra-arterial
IM	Intramuscular
IP	Itra-peritoneal
ISOPP	International Society of Oncology Pharmacy Practitioners
IRAC	International Agency For Research on Cancer
NCI	National Cancer Institute
MTX	Methotrexate
NIOSH	National Institute for Occupational Safety & Health
OSHA	Occupational Safety and Health Administration
ONS	Oncology Nursing Society
PPE	Personal protective equipment
RNA	Ribonucleic acid
RT	Radiotherapy
SPSS	Statistical Package for the Social Sciences
TS	Thymidylate synthase
UTI	Urinary tract infection
WHO	World Health Organization

List of appendices

List of Statistical symbols

Items	Meaning
F	Frequency
%	Percentage
SD	Standard Deviation
MS	Mean Score

Chapter one:
Introduction

Chapter One

Introduction

1.1. Introduction

Cancer is a primary reason for distress and mortality rate worldwide. The numbers of cancer cases enhanced evidently with aged and gender, life-style, ethnicity, infection, irritation, and genetics that have a vital effect on its occurrence. According to the World Health Organization(WHO),there is about (17) million death occurs because of cancer and (75) million persons having a cancer annually , WHO ,reports estimated that about (27) million case of cancer are expected for 2030,report revealed that the greatest effect of this disease will be increased in middle-income and developing countries like iraq(National Cancer control 2016).

Most types of cancers can be treated with exclusive techniques such as chemotherapy , radiotherapy and surgery. Surgery and radiotherapy are used as a local treatment to kill or remove small tumors, or to lessen the size of big tumors .While chemotherapy or cytotoxic drugs is a type of therapy which used to kill or slow the growth of cancer cells (Bruce,2016).

Because of their usefulness in the cancer treatment and other disorders, cytotoxic treatments have been routinely employed in clinical settings for a decade. These systemic therapies may have both short and long effects across the body, depending on the dosages and combination of medications administered. Nausea, vomiting, stomatitis, diarrhea, anorexia, bone marrow ,depression, alopecia, risk of infertility, lethargy, renal toxicity, and heart toxicity are some of the most prevalent adverse effects. (American Society of Clinical Oncology,2017).

Routes in which the cytotoxic drugs administered are intravenous, oral, intramuscular ,subcutaneous, or may be injected locally into the fluid around the spine or into body cavity such as bladder. Chemotherapy creams may be used for some skin cancers (Cancer Council Victoria, 2014).

Occupational dangers such as abortion, infertility, preterm labor, behavioral and developmental disorders among workers' children were caused by cytotoxic medications, which were widely used in the therapy of cancer (Karima et al,. 2010).

The risk of occupational exposure for employees who handle cytotoxic medications varies based on a variety of circumstances, including the frequency and length of use. Inhalation of aerosolized cytotoxic medications, skin absorption, and needle injuries are the most common modes of cytotoxic drug exposures. Despite the fact that various recommendations have been published, safe procedures are rarely routinely followed. (Yaakub ,2014).

The expanding use of chemotherapy medications has resulted in an increase of chemotherapeutics exposures amongst nurses who work in oncology departments. Chemotherapy drugs agents may have toxicological consequences in humans, such as carcinogenic effects, teratogenic effects, and mutagenicity (Sarita Devi,2019).

Chemotherapeutic drug exposure can occur by inhalation, ingestion, skin contact, or injection. Improper hygiene practices, such as eating, or smoking while preparing or in the preparation area, as well as the administration and disposal of chemotherapy drugs, enhance the chance of being exposed (Sarita Devi,2019).

The oncology nurse's primary job in this form of care is to help the patient by resolving his or her worries. In a collaborative learning,

the oncology nurses is also responsible for patient management education, particularly while in therapy. In order to maximize the patient's safety and increase his life quality, the oncologist nurse must be aware with current regimens, their related toxicity profile, and the techniques utilized in symptom management (Hollywood & Semple, 2017).

There is evidence that nurses who prepare and deliver cytotoxic medications and contact with contaminated bodily fluids are at danger, hence all precautions should be taken to reduce the risk of exposure. Experts propose that rather than seeking occupational exposure monitoring, efforts should be focused on improving medication handling and staff education, as well as compliance with good practice standards. Local effects induced by direct attach with the skin, eye, and mucous membrane, such as dermatitis, inflammation of mucous membrane, blistering, and allergic responses, and systemic changes caused by inhalation, swallowing, or injecting cytotoxic chemicals during delivery (Landry, 2017).

Using suitable protective gloves; changing gloves as industries advise, hand washing extensively after all material handling, changing out of protective gear used when handling drugs, not eating during drug administration, storing or discarding all equipment used, and ensure efficient cleaning of the surrounding environment are all ways to reduce the risk. (Mills, 2017).

1.2.Importance of the study:

Cancer is the uncontrolled growth and proliferation of cells in the body that may damage nearly any tissue. Global estimates from the year 2000 signalized that 564,000 patients with cancer were recorded per year. Including 398,000 men and 166,000 women. Hepatic cancer

continued as the 5th commonest cancer in males and the 8th in females ,where the males are usually 2-4 times higher than females (Bosch et al.,2004).

The most prevalent malignancies in men are lung and stomach cancers, whereas the most common cancers in women are breast and cervical cancer. Cancer kills 7.6 million people globally, accounting for 13percent of all fatalities. Stopping at the pharmacy's door isn't an option. Any method used in the pharmacy during the manufacturing of cytotoxic medications that might lead to contamination outside the pharmacy must be prohibited. (WHO ,2007).

In Thailand ,cancer was the master reason for death .The prevalent kind that occupied the top place within Bangkok's men was lung cancer and cervical cancer within women(PiamKjariyakul et al.,2010).

In Jordan, outright 58788 patients were listed with cancer in the duration from 2000 to 2013.Of these ,men 48.6% and women were 51.4%.

In 2018, Globocan recorded 25,320 new cancer cases in Iraq, with 14,020 (55.37 percent) of females and 11,300 (44.62 percent) of males being diagnosed. With the high number of cancer-related deaths, it's not surprise that cancer is currently the second leading cause of death worldwide. It's worth noting that Iraq's cancer death rate is comparable to that of many impoverished nations, with 57.36 percent of new patients dying as a result of their illness in 2018.

In Iraq, specifically the Middle Euphrates,(18587) new cases of cancer were recorded in 2020 in Najaf Governorate and (24,444) in 2021 (Najaf Health Department statistics).(610) cases of various cancers were recorded for the year 2020 in Al-Diwaniyah Governorate, and

(730) cases were recorded for the year 2021(Statistics of the Diwaniyah Health Department).

In the holy governorate of Karbala, (3400) cases of cancer were recorded for the three past years 2019, 2020 and 2021 (Statistics of the Holy Karbala Health Department).

All units in the hospital are responsible for the safe management of cytotoxic medications, and a multi - disciplinary approach must be followed. In terms of cytotoxic reconstituted and administration, the goods and equipment used will have a significant influence on everyday practice. The use of a particular containment container for preparation, for example, may have ramifications for how nurses must provide the treatment to patients. The pharmacy plays a critical role in the selection of these items and/or technologies (ISOPP,2007). as Generally, it is apparent that safe handling procedures do not end at the pharmacy's door. Any method used in the pharmacy during the manufacturing of cytotoxic medications that might lead to contamination outside the pharmacy must be prohibited.

Nurses may be subjected to a diluted product of a commercial cytotoxic substance. Nurses will come into touch with the pure concentrated cytotoxic medicine if bags or syringes made in the pharmacy are contaminated on the exterior surfaces. When nurses break tablets or open capsule, the same thing happens. Nurses potentially come into touch with diluted drugs produced in the pharmacy while connecting or disconnecting the bag or syringe from the administration equipment. The disconnecting operation poses a risk to nursing workers, hence it's best to employ a containment container for administration. An IV bag holding a cytotoxic medication must not have tubing removed. Disconnect tubing from other parts of the system until it has been

completely cleansed with a non-toxic solution. If at all feasible, keep the IV bag and tubing intact. Before leave the medication administration location, hand wash your hands with water and soap should be performed (ISOPP ,2007).

Oncologist nurse who work in ambulatory settings with chemotherapy frequently learn to safeguard their patients from undue exposure early on. When giving chemotherapy in an outpatient environment, however, many oncology nurses may not completely comprehend or appreciate their own health risks. (Salpaka, 2000).

1.3.Statement of the study*:*

Safe Handling of Cytotoxic Drugs Practices for Nurses Working with Oncology Patients in Middle Euphrates Oncology Teaching Hospitals.

1.4.Study questions :

1.4.a. Are the nurses handling cytotoxic drugs by using standard safety measures in the oncology setting?

1.4.b. Are the demographical characteristics affect the nurses practices when handling cytotoxic drugs ?

1.4.c. Are the nurses on need to improve their practices when handling cytotoxic drugs ?

1.5.Objectives of the study:

The objectives of the study are directed to:

1.5.1. Assessing nurses practices for safe handling of cytotoxic drugs in the oncology teaching hospitals.

1.5.2. Identify demographical characteristics of study sample.

1.5.3. Finding the relation between the practices of safe handling cytotoxic drugs and the nurses demographical and employment characteristics such as (age, gender, educational status, marital status and years of experience).

1.6. Definitions of terms*:*

1.6.1. Safe handling

1.6.1.a.Theoretical:

Practices to reduce risk by controlling of recognized hazards in order to achieve an acceptable level of protection from harm. (Mohsen, 2013).

1.6.1.b.Operational:

Basic practices which performed in clinical setting to minimize risk when working with hazardous chemical substance.

1.6.2. Cytotoxic drugs

1.6.2.a.Theoretical:

Antineoplastic drugs worldwide used as a management model to treat cancer ,its known as chemotherapeutics ar anticancer drugs,which interrupting cell cycle and killing cancer cell.(Muna and Samir2016).

1.6.2.b.Operational:

Agents, that are utilized in the treatment of cancer patients ,they can produce side effects both to the patients and others who become exposed.

1.6.3. Practices

1.6.3.a.Theoretical:

Defined as an actual performance of doing something in systematic way, which can be considered as a standard (kirat,2005).

1.6.3.b.Operational:

Repeated performance carried out by nurses working in the oncology centers ,who directly handling cytotoxic drugs.

1.6.4. Nurse

1.6.4.a. Theoretical:

A person who is prepared by special educational program to provide holistic care to the patients, family and community by independent ,dependent or through collaborative practices to restore or maintain their health and wellbeing (Dunphy,2011) .

1.6.4.b. Operational:

A professional person trained to provide care and cover human needs for patients ,is undergoing chemotherapy in oncology centers.

1.6.5. Patient

1.6.5.a. Theoretical:

A person who suffers from disease or injury which may effect his\her body systems or mental states ,seeking for health consultation ,waiting for care or may already receive it (Segen,2012).

1.6.5.b. Operational:

A person who is diagnosed with cancer and scheduled for receiving cytotoxic drugs .

1.6.6. Oncology

1.6.5.a Theoretical:

A medical branch that focuses on diagnosis and the treatment of cancer.(kalia,2015).

1.6.5.b. Operational:

Specialized health agency that provide comprehensive health care for patients with cancer.

Chapter Two:
Review of Literature

Chapter Two

Review of Literatures

2.1. Historical review of chemotherapy:

At the starting of 1900, Agerman chemist ,Paul Ehrlich,created the chemotherapy term and he described its usage as a chemical materials to control disease. Additionally ,he is the first one who recorded the advantage of using animals as a model to examine the effects of the chemical materials action related to disease process by using rabbit to examine the treatment of syphilis at the year of 1908 (Ibrahim and Ali,2012).

In the second Warld War ,people who had been exposed to mustard gas, suffered from decrease of the white blood cells this result encouraged researchers to study if the mustard gas effective to reduce or prevent rapid malignant growth of cells (Mandal,2014).

At the early of twentieth century , Goodman and Gilman's discovery that nitrogen mustards have anticancer properties, as well as parallel studies carried out on antifolates which contributed to the first successful cancer drug therapies, the first successful chemotherapy protocol for breast cancer (Bedard, et al., 2010).

In 1940, the United States of America department of protection worked on a project to study the potential medical application of chemical war agents ,Louis S.Goodman and Giliman work as pharmacologists from Yale Medicine College join the project (Verrill, 2009).

Experimental trail carried out in rats with lymphoid mass transplantation who received nitrogen mustard ,they observed that there was a degeneration inside the mass, after that they requested a thoracic specialist physician Gustaf lindskog to use the same agent on a person with non–

Hodgkin's lymphoma and acute airway obstruction a clear degeneration was founded, this experiment carried out in 1943.The outcome to guide the synthesis and checking out of many related agents to alkylating compounds ,by oral usage such as chlorambucil and cyclophosphamide.

In 1946 Nitrogen mustard application distributed rapidly in United States of America for lumphoma treatment(Vincent, et al;200).Later, observations of uracil on normal mouse mucosa recorded ,follow by evaluation of five-fluorouracil, then cyclophosphamide- methotrexate five-fluorouracil developed which than used as successful treatment routine for breast cancer (Verrill, 2009).

This development in the essential information of cancer has helped the development of 2 new anticancer techniques (Baguley, 2002).

2.2. Chemotherapy:

The term (Chemo) typically means the cytotoxic agents, and these agents are used in the treatment of malignant illness to lowering the cell growth. It works by breaking down fast cells division. These divisions of malignant cells are affected with these drugs (Abbas, 2013).

2.3.Mechanism of chemotherapy action:

To understand the chemotherapy action, it is important to understand the normal life cycle because of the all chemotherapy can target cancer cells at different phases in the process of forming new cancer cells (Turkcan, et al., 2012).

The cell cycle governs the production both of normal and cancerous cells. The time it takes for one cell to divide and create two identical daughter cells is referred to as the cell cycle time. Any body's cell cycle is

divided into four stages, each of which serves a critical purpose (Levine, 201).

2.3.1. G1 phase—RNA and protein synthesis occur

2.3.2. S phase—DNA synthesis occurs

2.3.3. G2 phase—premitotic phase; DNA synthesis is complete, mitotic spindle forms

2.3.4. Mitosis—cell division occurs."

Following mitosis and throughout the G1 phase, cells can enter the G0 phase, which is their resting or inactive state. Within the G0 phase are those dangerous cells that are not actively dividing but have the potential for replicating. Protocols (standardized regimens) for administration of certain chemotherapeutic agents (as well as some other forms of therapy) are developed and coordinated with an understanding of the cell cycle.

2.4.The purpose of chemotherapy:

Chemotherapy was a powerful tool for the treatment of cancer and to protect the patients from a recurrence. in this case, there are many goals for this treatment which includes (Ozols, 2005).:

2.4.1.Cure:

Chemotherapy drugs are used to cure the cancer, if that is possible, it means that the cancer cells disappear and do not return again. In any case, physicians only use the word cure in the context of a possibility or an aim. They may choose to utilize therapy with curative purpose when offering treatment that has a probability of curing cancer. Furthermore, there are no assurances, and while cure is a desirable outcome, it is not always achieved. It might often take a long time to find out if a patient's cancer has been cured. (Brighton and Wood, 2005).

2.4.2.Control:

If the cure is not possible, the goal of chemotherapy may be to control the deviation of cancer cells to shrink any cancerous tumors and to stop the cancer from growing, multiplying and spreading. This can improve someone's condition and possibly life expectancy. In many cases, the cancer does not completely cure but is only controlled **(Wilkes and Barton, 2014).**

2.4.3.Palliation:

Chemotherapy treatment which is given to relieve the symptoms of cancer, but not meant to cure cancer or to extend life to a significant degree. (Eldridge, 2018).

2.5. Chemotherapy medications:

Chemotherapy is the process of using cytotoxic (cell-killing) drugs to destroy or make cancer cells less active. It functions by killing cells that are quickly dividing. Since cancer cells divide at a faster rate than most cells, they are more vulnerable to these medicines (Abbas, 2018 and Tao et al., 2015).

Chemotherapy involves the administration of anti-cancer medications either intravenously or orally. The medications pass through the circulation to enter cancer cells in the body. Chemotherapy can be directly injected into the spinal fluid on rare occasions. Chemotherapy medications change cellular function during one or more stages of the cell cycle, affecting both cancerous and normal cells (Mohammed and Ameen, 2013).

2.5.1. Classification of chemotherapy agents:

The cytotoxic drug can be classified with their association to the specific cell cycle phase as (Polovich, et al., 2005).

2.5.1.a. Specific to cell-cycle agents:

These agents are positive to cell cycle. Most of these agents lead to cell damage at (S) phase by interfering with the (DNA) & (RNA) synthesis, while others cause damage at (M) phase that stops mitotic axis formation such as (plant alkaloid or vinca).

2.5.1.b. Non-specific to cell-cycle:

The cytotoxic agents that are independent of the cell cycle, which produces continual damage to cell and leading to death. While other agents act dependently on the specific and nonspecific to cell cycle to raise the susceptibility of the killing of tumor cells throughout therapy period.

2.6. Targeted therapy for cancer:

This is a new generation of cancer treatment that integrates with specific proteins that are essential for the malignant cell growth and development. These involved (cell cycle protein, G.F-receptors, apoptosis modulator, molecule signal, and other molecule that included in the spreading and development of new blood vessels that are necessary in the progression and homeostasis in healthy tissue. Cancer cells can achieve function as a result of over-expression or genetic modifications (Widakowich et al., 2007).

The targeted treatment can be used with chemotherapy or radiation and also can be used in combination with vaccine or immune therapy (Han-Chung, et al; 2006).

NCI,2014, reported that the targeted drugs vary from typical chemotherapeutic agents in many ways such as:

2.6.a. The targeted drugs work on particular targets molecule are related to cancer cells, while the typical chemotherapeutic agents affect all cells (healthy and malignant) that dividing rapidly.

2.6.b. The targeted agents were identified purposefully to have an effect on their targets, while the typical chemotherapeutic agents were recognized because of their cell killing properties.

2.6.c. The targeted agents usually stop tumor cells proliferation (cytostatic), while the typical chemotherapeutic agents damage the malignant tumor cells (cytotoxic)(NCI,2014).

2.7.Types of chemotherapeutic agents:

2.7.1.Cisplatin

Cisplatin is a DNA-intercalating agent that interferes with RNA transcription and DNA replication by forming cross-links in DNA. DNAdamage-induced cell-cycle arrest and apoptosis are initiated if the DNA lesion are not healed. Several mechanism, such as changes in the drug's accumulation in cells, can cause cells to become resistant to cisplatin. Only 20 genes are differentially expressed in breast cancer subtypes when it comes to cisplatin-associated gene. (Hill, et al; 2019).

2.7.2.Doxorubicin

Doxorubicin is used to treat a variety of cancers, such as breast, lung, stomach, thyroid, ovarian, non-Hodgkin's and Hodgkin's lymphoma, sarcoma, multiple myeloma, and pediatric cancers, by intercalation into DNA and disruption of topoisomerase-II-mediated DNA repair and (ii) generation of free radicals and their damage to cellular membranes (Thorn, et al;2011).

2.7.3.Methotrexate

Methotrexate is a foliate derivative that binds to the enzyme dihydrofolate reductase (DHFR) in a reversible manner. Dihydrofolate reductase catalyzes the conversion of dihydrofolate to tetrahydrofolate, which is required for thymidylate, hypoxantine, and glycine synthesis. The

inhibition of DHFR by MTX prevents DNA synthesis and cell development. Methotrexate is a chemotherapeutic drug used to cure breast cancer, but resistance has limited its clinical application. Functional genomic analysis using microarrays was conducted in breast cancer cell lines susceptible and immune to MTX to gain a better understanding of the mechanisms of MTX tolerance. (De Almagro, et al;2011).

2.7.4.Fluorouracil

Fluorouracil (5-FU) is a chemotheraputic agent that is believed to prevent DNA synthesis and cell growth by misincorporating into DNA and RNA, as well as preventing the nucleotide synthase enzyme thymidylate synthase (TS) (Jahani et al., 2017). Anal, colorectal, breast, esophageal pancreatic, stomach, and skin tumors have also been treated with fluorouracil (especially neck and head cancers). Actinic keratosis, skin tumors, and Bowen's disease have also been treated with it topically(Alhussein and Hameed, 2016).

2.7.5.Cyclophosphamide

Cyclophosphamide is a chemotherapy drug used to cure cancers including breast cancer and cervical cancer. It is converted to cytotoxic metabolites like 4-hydroxycyclophosphamide, phosphoramide mustard, and acrolein by cytochrome P450 proteins in the liver, which cause cell apoptosis by binding covalently to DNA, leading to DNA fragmentation and irregular DNA synthesis. (Hung et al., 2017).

2.7.6.Docetaxol

Docetaxel is a semi-synthetic taxol alkaloid molecule that has been authorised by the FDA. It's being used as first-line chemotherapeutic drugs in the treatment of metastatic breast cancer. By stabilizing and blocking depolymerization of microtubules, it causes cell cycle arrest and apoptosis in

cancer cells. Docetaxel resistance, on the other hand, is a significant health issue in a variety of tumors, particularly breast cancer patients. (Dey,et al; 2017; Zhang et al., 2016).

2.7.7.Trastuzumab

Trastuzumab (Herceptin) is a humanized monoclonal antibody that binds to the HER2 receptor and inhibits its activity. It is the only FDAapproved therapeutic antibody for HER2-positive breast cancer currently on the market. Trastuzumab binds to the HER2 extracellular segment's domain .As a result of this process, dimerization is prevented, resulting in cell arrest during the G1 phase. Any of the medicinal effect may be attributed to HER2 downregulation. These mechanism allow receptor dimerization to be disrupted, reducing signaling channels and causing cell-cycle arrest. (Gemmete and Mukherji, 2011).

2.7.8.vincristine

Vincristine is a plant alkaloid derivative that inhibits microtubule activity and hence has anticancer properties (Boyette-Davis, et al; 2013). Vincristine is an anticancer drug that targets the cell cycle. Vincristine's cytotoxic function is linked to its actions including the inhibition of microtubules and the modification of tubulin polymerization equilibrium, resulting in cell division arrest in metaphase (Zeng et al., 2015; Chen et al.,2012).Vinblastine has proved effective in Hodgkin's disease, and other lymphomas, and a number of beneficial results have been acquired in carcinoma of the breast and bronchus (Al-hussein and Hameed, 2016).

2.7.9.Gemcitabine

Deoxycytidine kinases phosphorylate gemcitabine, which then incorporates into DNA to suppress synthesis and cell proliferation while encouraging cancer cell apoptosis (Zheng, et al; 2014). Gemcitabine is used

to treat a variety of solid tumors, including non-small cell lung cancer, pancreatic cancer, breast cancer, and ovarian cancer. One of the most challenging aspects of cancer treatment is that tumors develop resistance over time (Moysan, et al; 2013).

2.8.Route of chemotherapy administration:

Using of anti-neoplastic agents considered as a complex process filled with the possible to hurt the patient. Chemotherapeutic agents may be given in the hospital, outpatient center, or through home setting (Jacobson, et al; 2009,numerate the following routes:

2.8.1.Intramuscular (IM) & Subcutaneous (SC):

Chemotherapeutic drugs are given through the shot into the thigh, arm, and hip muscle or subcutaneously in leg, belly, or arm fatty tissue.

2.8.2.Intra-arterial injection (IA):

Chemotherapeutic agents are given directly into the vein that nourishing the cancer cells.

2.8.3.Intra-peritoneal (IP):

Chemotherapeutic agent can be administered by peritoneal cavity that is surrounded by the organs of (ovary, stomach, intestine and liver.(

2.8.4.Intravenous injection (IV):

Chemotherapeutic agents are administered directly into the vein.

2.8.5.Locally :

Chemotherapy agents are applied as cream or ointment locally on the skin.

2.8.6.Orally:

chemotherapeutic agents are administered via orally as capsule, pills or liquid for swallow (NCI, 2010).

The administration route of chemotherapeutic agents relies on many things: the type and recommended dose and the site, kind and extent of a malignant disease that required therapy (Smeltzer, et al; 2010).

Before administration of chemotherapeutic agents, should understand many issues involving an appropriate medical diagnosis and the progress of disease, physical examination, health history and patient should understand the therapeutic strategies (Gullatte, 2013).

2.9.Dosage of chemotherapy:

The chemotherapeutic dosage will be ineffectual against the neoplasm if it is too low. Whereas, if it is increases, the adverse consequences will be insullerable to those receiving it. The standard way of calculating the dosage relies on calculating the person's weight and height by an arithmetic formula or a graph to calculate a body surface area(Helderman, et al; 2019).

2.10.Treatment strategies of chemotherapy:

There are specific programs in administrating the CT agents .Today Induction chemotherapy (neoadjuvant chemotherapy) is the headmost line in treating cancer with chemotherapeutic agents. This kind of chemotherapy is utilizing for curative intent (Ferrari ,et al; 2020).Combined chemotherapy utilizes chemotherapeutic agents with other cancer curatives, like combined chemotherapy with radiation therapy or surgery (Li, et al;2020).

2.10.1.Consolidation chemotherapy:

Is utilized after remission to prolong the overall illness-free time and improving overall survival. The remedy that is given is the same as the remedy that achieved (Zhong, et al; 2020).

2.10.2.Intensification chemotherapy:

Is similar to consolidation Chemotherapy. But, a different remedy than induction Chemotherapy is utilized (Patel, et al; 2020).

2.10.3. Salvage chemotherapy or palliative chemotherapy:

Is utilized without a curing purpose but only to minimize neoplasm's overburden and increase liſe expectancy (Arigami ,et al;2018).

2.11.Efficiency of chemotherapy:

The human body tissue includes cells that can be developed and duplicated to exchange the damage or by breaking down cells through processes called cycle of the cell. The duplication of malignant and normal cells depend on the cell cycle way. The time needed for each cell to divide into two new cells is referred (cell cycle time).The cell cycle involved four different stages, each stage has its important function,it can be numerated according to Smeltzer, et al; 2008 as following:

G1 Stage : synthesis of protein & RNA that occurs in this stage, this stage take time approximately eight or more hours

S Stage: synthesis of DNA that occurs in this stage. , this stage takes approximately six to eight hours.

G2 Stage: this stage it also referred to pre-mitotic stage, in this stage the DNA synthesis is done. The G2 stage takes time about 2 to 5 hrs.

Mitosis: Cell division occurs in this stage.

The stage of G0, the dormant stage or resting of the cells can occur after mitosis and during the G1 stage. At some stage in G0 , the serious cells which might have the capability to copying and not act to divided. The administration of certain chemotherapeutic agents (in addition to a few other forms of therapy) is coordination within the cycle of the cell . The effectiveness of chemotherapy relies upon the type of cancer and its stage.

The overall efficiency ranges from being a treatment for several kinds, like leukemia, to being inefficient, like in some of the brain's neoplasms, to being unneeded in others, as almost all nonmelanoma skin cancers (De Santis, et al; 2014)

2.12.Side effect of cytotoxic drugs:

Anticancer medicines are systemic therapy that can have a wide range of long and short-term negative effects across the body. Depending on the dosages and combination of medications provided, these impacts will vary. Nausea and vomiting, stomatitis, diarrhea, anorexia, bone marrow depression, fertility risk, hair loss, exhaustion, renal toxicity, heart toxicity, extravasation, and CNS toxicity are all typical adverse effects. Relevant health care personnel must have a thorough understanding of the potential adverse effects of the chemotherapeutic being administered in order to ensure that the patients is properly informed. (American Society of Clinical Oncology, 2017).

2.13.Short complications related to chemotherapeutic drugs:

2.13.1.Neurological System complications:

Chemotherapy more commonly causes peripheral neuropathy, the defect in the nerve that leads to tingling, pins and needles, burning sensations, weakness, and numbness in the upper and lower extremities. Often, nerve damage is temporary; it will usually get better, but it can take time. In addition to that, the patient may suffer from headache, lack of physical activity and the ability to concentrate (Staff et al., 2017). Respiratory System complications: Some patients may experience repeated infections of the tonsils, pharynx, and recurrent chest infections. Patients may experience coughing frequent sputum and respiratory allergic reactions suffering from cough (Bou-Assaly and Mukherji, 2010).

2.13.2.Gastrointestinal System complications:

Inflammation and/or ulcers in the gastrointestinal tract, as a result of chemotherapy and radiotherapy ,are known as gastrointestinal mucositis. Oral mucositis is another common side effect of cancer treatments. Diarrhoea, stomach pain, bleeding, weakness, fatigue, exhaustion, electrolyte imbalance, and infection are all symptoms of gastrointestinal mucositis, and may lead to death. Furthermore, gastrointestinal mucositis can cause dosing delays and reductions, resulting in ineffective treatment. (Touchefeu et al., 2014; Peterson et al., 2011). The patient also may suffer from appetite loss that may lead to lose weight and not getting the nutrition you need, may also lose muscle mass and strength. Chemotherapy can cause constipation. Patient can have stomach paiKn or cramps. Changes may occur in diet and in the taste (Hufnagel et al., 2021).

2.13.3.Musculoskeletal System complications:

It's difficult to guess how chemotherapy affects skeletal muscle directly in patient, but a study shows that patients who receive neoadjuvant chemotherapy lose a lot of muscle mass (Daly et al., 2018) . Muscle fatigue, in addition to muscle destruction, is a significant side effect of disease and cancer treatment (radiation, chemotherapy, and hormone deprivation) in cancer patient. Loss of muscle tone was shown to be independent of loss of muscle mass in breast cancer patients who had their functional capability assessed. Patient may suffer from tired feeling and joint and back pain (Sturgeon ,et al; 2019).

2.13.4.Cardiovascular System complications :

The occurrence of left ventricular dysfunction (LVD) and apparent heart failure is among the most frequent manifestations of cardiotoxicity linked with anticancer therapy exposure (HF). Patients can experience

Cardiovascular (CV) symptoms like myocardial ischemia, LVD, and hypertension as a result of widely utilized anticancer agents and radiotherapy (RT). Other complications such as palpitation ,pain over the chest and radiate to the neck, shoulders and arm (Curigliano, et al; 2012).

2.13.5.Hematologic System complications:

Chemotherapy drugs destroy tumor cells but also harm healthy cells, especially immune cells WBC and neutrophils (neutropenia), disrupting the antitumor immune response (Aldarouish et al., 2019). Chemotherapy and therapeutic targets, for example, will increase susceptibility to bruising and bleeding. These therapies can cause a decrease in platelet count in the blood as well as small purple or red patches of skin (NCI, 2018). Women may suffer from fatigue and dyspnea as a result of chemotherapy effect on RBC that cause low RBC's ability to supply oxygen to the tissues. Chemotherapy drugs cause anemia by affecting hematopoiesis directly. They also cause anemia by lowering erythropoietin output in the kidneys, which increases production of RBCs in the bone marrow. (Rodgers, et al; 2012).

2.13.6.Urinary System complications:

Any forms of chemotherapy and immunotherapy can also harm or hurt cells in the urinary system due to discomfort or a burning sensation when you urinate, hematuria, difficulty beginning to urinate, urinary retention, sensation like there is a need to urinate immediately or regularly, bleeding a little urine as you sneeze or cough, cloudy or red urine, fever and backache from urinary tract infection (UTI) and can occur bladder spasms were a complications of chemotherapy (NCI, 2020).

2.13.7.Reproductive System complications :

Clinically, patients subject to chemotherapy initially avoid menses as a result of the reduction of developing follicles. The mechanism by which chemotherapy causes damage to the fertility capacity, remains Chapter Two: Literature Review 39 uncertain. The level of harm is linked to age, chemotherapeutic regimen, and dosage of pelvic radiation obtained (Meirow, et al; 2010).

2.13.8.Skin complications :

Some forms of chemotherapy may cause the skin to become itchy, dry, red , dark, or peel. Patient can develop a mild rash or sunburn easily; these are termed photosensitivity. Some may also experience skin pigmentation change. It's possible that nails are dark and cracked, that acne and cuticles possibly being a hurt. If the patient had radiation treatment in the past, the region of skin where you received radiation can turn red, blister, peel, or hurts. This is referred to as radiation recall. Signs of an allergic reaction to chemotherapy can involve a sudden or intense rash or itching or a burning feeling. In addition to hair loss and changing the hair strength (NCI, 2019).

2.13.9.Vision complications :

The word dry eye is a misnomer since people with dry eyes may get a lot of water in their eyes. Dry eye syndrome is diagnosed primarily according to the occurrence of subjective signs of pain, including a gritty feeling, and it happens most commonly in post-menopausal women who coincidently are the ones most likely to develop Breast Cancer. Patient may also experience other symptoms like: dryness, burning, watery eyes, redness and itching (Eisner and Luoh, 2011; Friedman, 2010).

2.13.10.Endocrine System problems:

Patient undergoes chemotherapeutic agent may experience face lunar and obesity behind the neck, abdomen and shoulders in some cases. In less common cases, it may lead to elevated blood sugar (The American Society of Health-System Pharmacists, 2012).

2.14. Safe Handling :

The proper management of cytotoxic medications is a shared duty of all healthcare organisations, and a multi - disciplinary approach is recommended. In terms of cytotoxic reconstituted and administration, the goods and equipment used will have a significant influence on everyday practice. The use of a particular containment container for preparation, for example, may have ramifications for how nurses must provide the medicine to the patient. The pharmacy plays a critical role in the selection of these items and/or technologies (Durif-Bruckert, C., et al:2015).

2.14.1.Historical overview safe handling:

Professional societies of health professionals and government public health authorities in the U.S. And other countries have produced recommendations for the proper management of hazardous chemotherapeutic medications since the early 1980s, when the dangers were first recognized. Indeed, in 1990 , ASHP was the first engineering support Bulletin which use the phrase hazardous medicine to refer to drugs that posed a risk to employees but were not utilized in cancer treatment. They developed a system in which a drug's intrinsic toxicity may be used to qualitatively classify it as dangerous. These features are typically related to carcinogenic effects, genotoxicity, or reproductive risks. Antineoplastic/cytotoxic agents account for somewhat upwards of half of the dangerous pharmaceuticals discovered, with hormonal agents, immune

suppressants, antiviral treatments, and other drugs accounting for the rest (NIOSH 2012).

Despite the fact that safe handling standards were established in the mid-1980s, studies revealed that worksite contamination and worker exposure were still occurring in settings where anticancer medications were manufactured and delivered (Wick et al. 2003).

As a result, the National Institute for OcKcupational Safety and Health (NIOSH) addressing safe handling problems for all hazardous chemotherapeutic medications in order to refresh and strengthen current professional society standards on the matter (NIOSH 2004). Despite this advise, research in and outside the U.s continue to record continued exposure ,in part due to voluntary and inconsistent adherence to the rules (Schierl et al.2009).

Professional associations, such as the American Society of Health-System Pharmacists, have modified its safe handling recommendations in recent years. (ASHP 2006) and the Oncology Nursing Society (Polovich 2011).

2.14.2.Administration of hazardous chemotherapy drugs:

Several of the proper safety considerations for hazardous medication delivery are the same regardless of the route of administration. In any case, certain standard precaution must be followed by care providers (Polovich and others 2009).

1- Before touching the hazardous drugs hand washing should perform.

2-Have a spill kit on hand.

3-Before removing the hazardous drugs from the shipping container, personal protective equipment should wearn.

4-Before touching the shipping container, inspect it and its contents.

5-Wear two sets of gloves that have been tested for chemotherapy (NIOSH 2004).

6- Dress in a chemo gown.

7- protective mask used in case of splashing of hazardous drugs.

8-respiratory protection may use when any aerosols of hazardous drugs may present.

2.15.Occupational exposure :

Chemotherapeutics toxicity has been recognized since the 1940s, when they were initially used to treat cancer. Evidence emerged in the 1970s showing that health-care personnel may be at risk for chemotherapeutic medication side effects as a result of occupational exposure. Several countries assigned drug contamination as work hazardous in their reports.

Falck and his colleagues produced the first evidence demonstrating workers' exposure in healthcare setting (Kumari Sunita et al;2009).

Nurses who prepared and dispensed chemotherapy medications had greater indications of mutagenic chemicals in their urine. Chemotherapeutic drug side effects (such as nausea, immune suppression, and loss of hair) are caused by damage to these cells. The inherent toxicity of these medications is the foundation for their possible negative effects from occupational exposure. Even therapeutic doses given to patients might have the same consequences if nursing personnel are subjected to these medications. A link was discovered between chemotherapeutics exposure and acute adverse effects such as urine mutagenicity, skin problems, fetal loss in the first trimester of pregnancy, spontaneous abortion, deformities, and genotoxicity, according to previous investigations (Hanafi, et al.,2015).

Exposure to numerous anticancer drugs, such as alkylating compounds and antimetabolites, has also been linked to carcinogenic and teratogenic effects in experimental animals (Susan Martin,2005).

Moreover, due to the extensive use of chemotherapeutic medications, exposure to these chemicals among staff nurses in oncology departments has increased. Chemotherapy drugs agents may have toxicological consequences in humans, such as carcinogenicity, teratogenicity, and mutagenicity. Chemotherapeutic drug exposure can happen by skin contact, inhalation, ingestion, or injections. Improper hygiene habits, such as drinking, eating, or smoking while preparing or in the preparation area, as well as the administration and disposal of chemotherapy drugs, enhance the risk of being exposed (Karima ,et al.,2010).

At several phases of handling, there is a risk of unintentional exposure to chemotherapeutic drugs (i.e., transport, storage, administration, unpacking, handling, and disposal). Personal protective equipment is strongly recommended since skin or mucous membranes contact is the most prevalent route of exposure. Although nurses who use the necessary gear might be exposed to chemotherapy if they contact contaminated surfaces with their bare hands accidently. Counters, drug storage spaces, floors, garbage bins, and drug vials are common examples of these surfaces (Ver Strate andCheryl A.,2015).

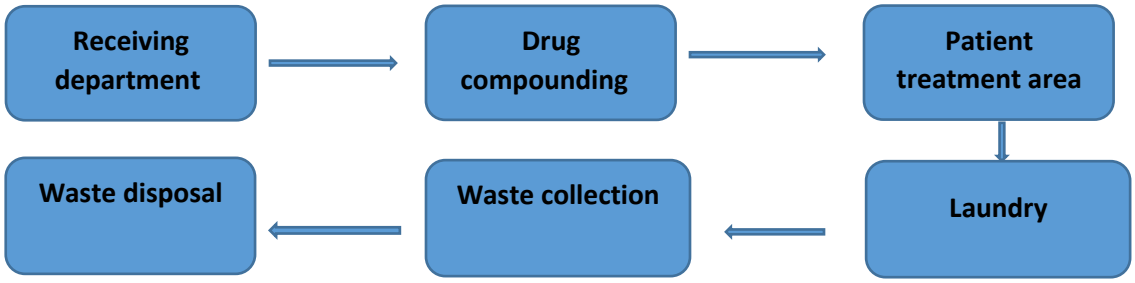


Figure (1): A flow of potentially dangerous medications through a hospital or clinic adopted from Polovich, M., & Olsen, M. M. 2003.

2.16.Prevention of exposure to chemotherapeutic drugs:

Proper safety guidance for chemotherapy agents have been recommended by many organizations such as the "National Institute for Occupational Safety and Health (NIOSH), the American Society of Hospital Pharmacists (ASHP), the Oncology Nursing Society, the American Society of Clinical Oncology (ASCO), and the Occupational Safety and Health Administration (OSHA)". These guidelines recommend the application of hierarchy of control technologies to lessen workplace hazards, which include engineering controls, administrative controls, work practice controls, and personal protective equipment (PPE) in order of decreasing effectiveness. All healthcare workers who work with chemotherapeutic drugs have been advised to adhere to this safety guidelines (Orujlu S, et al.,2016).

According to these guidelines, each institution should execute a complete teaching program and evaluate nursing skills at specific periods.

The Oncology Nursing Society (ONS) also advises personal protective equipment (PPE), which is known to protect healthcare workers from chemotherapeutics exposures. For maintaining safety, follow these guidelines:

• Wearing two pairs of gloves that have been tested against chemotherapy agents during all chemotherapeutic medication preparation, delivery, and disposal.

• Using a disposable gown composed of a low-permeable fabric.

The gown must have a back closure.

• Wearing eye and face protection when handling chemotherapy medications to avoid spillage (Al-Attar WMA,2015).

2.16.1.Gloves:

Nitrile, polyurethane, neoprene, or latex Gloves are recommended during handling with chemotherapeutic drugs. Allergy causing tendency of Latex should be kept into consideration during glove selection. Vinyl gloves should not be used because they don't resist chemotherapeutic agents.

Depending on the degree of exposure at each stage in the medicine circuit, the frequency of gloves replacements can be modified. Workers must replace gloves promptly if they get ripped, punctured, or clearly contaminated with such a chemotherapeutics when dispensing reconstituted drugs, for example, and follow Routine Practices. To avoid contaminating the skin, gloves should be removed with extreme caution. Nurses must wear two pairs of gloves, one under the gown's cuff and the other on the gown's cuff (CDC, 2019).

2.16.2.Gown:

Disposable gown used to handle chemotherapy medications must be constructed of lint-free, low-permeability fabric, have long sleeve with tight-fitting cuffs, and clasp in the back. In the case of contamination, spills, or tears, as well as at the conclusion of the process, gowns must be replaced (Health Protection Scotland, 2015).

2.14.3.Facial Protection:

When handling and preparing pharmaceuticals in a biological safety cabinet, surgical or procedural masks are necessary; in this case, they are worn to avoid microbial contamination of the sterile field. When there is a chance of splashing, full-face protection should be used (for example, during certain procedure of administration of drugs). It is preferable to wear a complete face protection. Goggles must be used in combination with a fluid-resistant mask if goggles are utilized (HSE, 2005).

2.16.4.Respiratory Protection Apparatus:

Whenever there is a possibility of an aerosol powder or spray being created, fit-tested respirator mask such as those certified N95 or N100 by the US National Institute for Occupational Health and Safety must be worn(Eisenberg, 2009).

2.16.5.Cap:

Caps are only necessary in the sterile preparation room and are worn to protect the sterile field from microbiological contamination (NIOSH, 2008).

to protect the sterile field from microbiological contamination (NIOSH, 2008).

2.16.6.Shoe Covers:

Disposable shoe coverings should be used in the sterile preparation room or in the case of a spill to avoid contamination of the healthcare personnel' shoes. To prevent contamination of other places, shoe coverings must be removed promptly before exiting the sterile prep room. (Al-Attar WMA,2015).

2.17. Guidelines on safe handling of cytotoxic drugs for ISOPP

2.17.1. Receiving and storage:

While administering cytotoxic medications, certain protocols should be implemented to guarantee the safety of shop employees. As a precaution, anybody involved in the packaging or handling of cytotoxic medications should wear two sets of gloves. Store employees should also wash their hands after handling vials containing cytotoxic medications, according to the instructions. The exterior surfaces of medicine vials have been found to be contaminated in several investigations. As a result, proper precautions should be used when handling them. To avoid hazardous contamination and exposure to workers, cytotoxic medications must have warning labels and be kept in a dedicated location (Mason H, et al.,2003).

2.17.2.Storage of hazardous drugs:

Hazardous medication vials are widely recognized for being sent from manufacturers with trace quantities of drug on the exterior surface. Contamination happens when liquid or powder chemotherapy is poured into the vials. As a result, it is critical that all people handling HDs wear adequate PPE, as exposed skin must not come into touch with the drug residue. All individuals involved in the retrieval, storage, or inventorying of HDs must adhere to the following recommendations which suggested by (Connor et al. 2005).

1 - Employees should be taught about the risks presented by HDs and trained in the use of personal protective equipment (PPE), such as a mask for use in the event of a leak or breaking.

2 - In the HD storage area, spill kits should be reaKdily available, and all workers must be trained to mop up spills.

3 - There must be adequate airflow in the HD storage room. To decrease drug residue in breathing air, storage facilities should have negative air pressure in comparison to adjacent regions, with at least 12 air changes each hour.

4- Workers must wear one or two sets of gloves that were examined and authorized for usage with high-definition televisions.

5 - Before using, personnel must clean each HD vial or ampoule with a wiper dampened with alcohol or similar suitable solution. Spraying the HD container directly causes contamination to spread to the air and other surfaces. After usage, the wiper must be enclosed and disposed.

6 - Storage compartments should be cleaned with a detergent solution at least once every 30 days. If the container is resistant to bleach harm, a diluted bleach solution can also be utilized.

2.17.3.Preparation:

Compounding of cytotoxic medications must be done in a designated area inside the wards or clinic, ideally in a biological safety cabinet. Gowns, overshoes, gloves, a head cover, mask, and eye protection must all be used. In the event of apparent contamination, gloves must be replaced regularly and quickly. After concluding work, all work surfaces must be cleaned and disinfected (KNH,2014).

2.15.4 .Cleaning:

When decontaminating the cytotoxic preparation area, all cleaning employees should follow strict protocols. When cleaning, Ppe must be worn at all times, and hands must be cleansed thoroughly with soap and water after removing gloves. Because the unaltered medication may be excreted by the patient up to 7 days following administration of cytotoxics, the recommendations advocate adopting measures while handling patient

excreta. If there is a chance that body fluids can splatter, it is also suggested that you wear a gloves, gown, and goggles. (American Society of Hospital Pharmacists guidelines,2006).

2.17.5.Cytotoxic drug spill:

The protocols to follow in the case of a spill should be taught to all healthcare staff. If there is a spill within the safety cabinet, it must be cleaned up right away. Small spills should be cleaned up using absorbent gauze, while major spills should be cleaned up with a spill cushion. After that, the surface should be cleaned with water and soap, then wiped with 70% sterile isopropyl alcohol (ASHP, 2006). The cleaning protocol for a cytotoxic drug spill, according to ISOPP rules, begins with warning other workers in the vicinity of the possible hazard. A warning sign should be placed in a conspicuous spot to restrict access to the area. The mask, goggles or face shield, head cover, and gloves are then taken from the spill kit and placed on in the following order: mask, head cover, goggles or face shield, and gloves. Cleaning the spill location should begin on the outside and work its way within. After that, the spilled area must be carefully cleaned with detergent water (ISOPP, 2007).

2.17.6.Disposal:

When needles, syringes, glove, single-use gowns, mask, and items used to mop up cytotoxic spills come into contact with anticancer drugs, they should be considered hazardous waste. Contaminated materials must be labeled, sealed, and covered with disposal containers, and only trained employees should handle them. During transportation, waste must be collected in designated containers with an identifiable color and symbol (ISOPP, 2007).

2.17.7.Handling hazardous drug waste:

The hospital or clinic must decide how to handle hazardous medication waste created during compounded and administering, as well as waste (bulk) items, in the event of a leak (Smith 2002). Each case will be unique, based in part on local garbage disposal and air and water quality restrictions. To guarantee compliance, it is critical to know state and municipal rules. Because HDs are hazardous, waste treatment measures should aim to reduce the risk of their polluting the local water supply and/or soil. Although only particular incinerators are efficient in eliminating some of the HD residue, incineration is the chosen disposal technique for most HD trash. HD trash must never be disposed of in a landfill or into wastewater (sink or toilet). Contaminated materials must be labeled, sealed, and covered with disposal containers, and only trained employees should handle them. During transportation, waste should be collected in specialized containers with a recognized color and emblem (American Society of Hospital Pharmacists) (ASHP,2006).

2.17.8.Challenges associated with handling of cytotoxic drugs:

Regardless of the fact that nurses are aware of the dangers of cytotoxic drug exposure, they seldom follow safety precautions when handling these medications. High workload, restricted time, and the lack of availability and comfortability of PPE are just a few of the issues workers have mentioned. (Favier B, et al:2005).

2.17.9.Need of safe handling of chemotherapeutic drugs:

Cancer is one of the most prevalent diseases around the world. According to recent reports by World Health Organization (WHO), the incidence of cancer will increase in future decades. In fact, this condition is expected to be the most common cause of mortality (Kermani,A et al. 2015).

Chemotherapeutics exposure in the workplace is a serious occupational hazard for nurses. During everyday actions connected to patient care, nurses and other health care personnel are frequently exposed to chemotherapeutic medicines. Chemotherapeutic medication exposure is linked to a higher risk of negative health effects. Nurses' workplace exposure to chemotherapy medicines can be reduced by wearing personal protective equipment (Polovich, et al ; 2010).

In all situations, knowledge is necessary for safe nursing practices, but it is more critical when a nurse's knowledge deficiency risks personal safety or the safety of the patient. Chemotherapeutic may have unintentionally harmed the oncology work environment for more than thirty years, according to previous study (Esmail.D,2016).

The major job of nurses in cancer is chemotherapeutic preparation and administration, which is a delicate area in oncology nursing where even little errors can result in serious health consequences for patients, employees, and the environment. Due to a lack of expertise and training among the personnel, tragic incidents like as overdosing on chemotherapy, incorrect medication calculations, and transfusion errors occur, occasionally resulting in patient death. (Najma Khan et al; 2012).

Nurses are the major sttaf among health professional that are at more risk of exposed to chemotherapeutic drugs in patient care settings. Although the potential therapeutic benefits of chemotherapeutic drugs outweigh the risks of side effects for ill patients, but nurses who provide direct nursing care to cancer patients by administering chemotherapeutic drugs risk these same side-effect with no therapeutic advantage (Waheida S, et al; 2015).

As nurse is the key person to care for cancer patient and nurses with specialized knowledge and skills play a major role in ensuring safe and competent administration of chemotherapeutic drugs and care of people receiving chemotherapeutic drugs (Shrestha et al; 2015).

Little negligence or mistake may lead to adverse unpleasant effects for patients, staff and environment. There's a need to give specific information to nurses who provide care to cancer patients undergoing chemotherapy about the proper handling of chemotherapy medications in order to ensure patient safety as well as their own job safety. Medication mistakes have resulted in the dismissal of several nurses. Nurses need additional chemotherapy instruction in nursing program and in-service education while on the job. (Mohmed NMA,2015).

2.18.Management of chemotherapeutic drug spillages:

Chemotherapeutics spillage kits should be accessible, and all personnel working in locations where chemotherapy medicine is delivered should know where to find them and how to use them.

Restricted access to the spilled region has been proposed by Sarita Devi and Preksha Shama,2019.

1. Notify other members of the ward's staff, as well as a senior member of staff.
2. Direct engagement of new and pregnant mothers in the management of a chemotherapeutics spill must be avoided.
3. Turn off all of the fans.
4. Get a spill kit out.
5. If protective gear becomes contaminated during the spill, remove the contaminated items and replace them with fresh protective clothes from the

spillage kit. Put all infected objects in the chemotherapeutic trash container. Follow the spill's instructions to the letter.

2.19.Previous studies:

2.19.1.First study:

A study conducted by (Sheik, 2014) aimed to assess the knowledge ,practice and challenges on safe handling of cytotoxic drugs a many health care workers at KNH .the study carried out on (109) health workers,the results clearly recorded that the participants have sufficient knowledge ,toward safe handling of these drugs but they do not practice well and did not follow protective measures during handling.

2.19.2.Second study:

A study conducted by (Mahdy,et al;2017) aimed to assess the influence of cytotoxic drug safe-handling guidelines on knowledge, handling behaviors, and attitude of oncology nurses in Ain Shams University Hospitals, Egypt, was evaluated using a quasi experimental research design. The research involved 65 nurses who work at a cancer hospital and deal with cytotoxic medicines. The findings had a favorable impact on nurses' understanding in this area (safe handling measures of cytotoxic drugs). The guideline had a positive impact on the oncology nurses' practice (drug preparation, administration, transportation, discontinuation, waste disposal and spillage management, and safety cabinet care) as well as the nurses' attitude in the cancer center affiliated with Ain Shams University Hospital.

2.19.3.Third study:

A study conducted by(Mahdy, et al 2018) aimed to assess nurses' performance regarding chemotherapy administration in the clinic through: Assess the nurses 'level of knowledge regarding chemotherapy

administration in the clinic, assess the nurses 'level of practice carried out in chemotherapy clinic at El-Fayoum University Hospital. The Study carried out on (30) nurses who works in chemotherapy clinic ,the results had unsatisfactory level of knowledge and majority (83.3%) of studied nurses had unsatisfactory level of practice regarding chemotherapy administration. Approximately three quarters (73.3%) of the studied nurses had negative attitude regarding chemotherapy administration.

2.19.4.Fourth study :

A study conducted by(Gehan. And Gamal,2019) aimed to measure safe practice in chemotherapy handling. The research was carried out at the Oncology Center in Minya City, Egypt, as well as the University Hospital's Chemotherapy Clinic. The study involved (50) nurses who worked in a chemotherapy clinic, and the results revealed a poor level of knowledge, with the majority of the nurses (83.3%) having an unacceptable level of practice when it came to chemotherapy management. Almost three-quarters (74%) of the nurses polled had negative attitudes concerning chemotherapy.

2.19.5.Fifth study:

A study conducted by (Asefa ,et al:2021) aimed to examine their knowledge and practice on safe handling of cytotoxic medications.

The results of the study, which included (77) nurses, clearly indicated that the nurses' knowledge and practice of safe handling of cytotoxic drugs are insufficient. Provision of proper PPE and training regarding the handling of CDs for Oncology Nurses is recommended, as is the establishment of chemotherapy safety protocol as well as guidance.

Chapter Three:

Methods and Procedures

Chapter Three

Methods

In these pages, we present all methods and principles which selected systematically to reach the specific objective of the current study.

3.1. Design of the study:

Descriptive – observational study design is choice to specific phenomena of interest related to assessing safe handling practices of cytotoxic drugs for nurses who working in oncology units , from the period between 11 Oct.2021 to 1 Apr. 2022.

3.2. Administrative arrangements:

To achieve the study objectives the following administrative steps performed:

- The Council of the college of nursing – University of Babylon award its primary acceptance after a brief presentation of the interested phenomena in formal seminar session.

- After getting the validity of the study checklist, the objective and the checklist submitted to gain the approval of the ethical committee .(college of nursing (appendix1).

- Official letter issued and submitted to the Health director. proven to get formal agreement to data collection from the teaching hospitals in Middle Euphrates Oncology Teaching Hospitals (appendix 2) .

3.3. Setting of the study :

The study was conducted in oncology centers in the following teaching hospitals in Middle Euphrates Oncology Teaching Hospitals

3.3.1. Al-Imam Al-Sadiq teaching hospital :

This hospital was established to receive Babylonian citizen in 2017, the total capacity of this hospital is (503) beds. The oncology unit consists of (6) beds.

3.3.2. Al-Diwanya teaching hospital :

This hospital established in 1982. The total capacity of this hospital is (503) beds. The oncology unit consists of (44) beds, there are four units within 1 or 2 beds in a room designated for new patients who did not take chemotherapy previously .

3.3.3. Middle Euphrates cancer center in Al-Najaf AL-Ashraf city:

This center established in (2015)as a specialized center for patients with cancer for the Middle Euphrates governorates. The total capacity of the center is about (120) beds.

3.3.4. Marjan Medical city:

This hospital established on (1957) and considered as the first general teaching hospital in Al-Hilla city, it specialized to receive the medical cases, the total capacity of the hospital is (316) beds. The oncology center established on (2013) includes (75) beds.

3.3.5.Al-Hussane teaching hospital :

This hospital was established to provide its health services in Karbala city since (47) years.The total capacity of this hospital is (680) bed. The oncology center established (2015) consists of (80) beds.

3.4. Sample of the study:

Purposive sample of (125) nurses who work in the oncology unit were selected to participate in the study.

3.5: Inclusion criteria

The following criteria taken under consideration when selecting the sample of the study:

1.Nurses who works in the oncology center.

2.Performing direct contact with patients.

3. Who administer cytotoxic drugs.

4. Who agree to participate in the study.

5. Have at least 6 months of experience

The distribution of the study sample related to the oncology hospitals presented in

Table (3.1) Distribution of the study sample according to selected setting.

No	Hospital name	Frequency	Percentage
1.	Al-Diwanya oncology center	11	8.8%
2.	Al-Hilla oncology center	22	17.6%
3.	Middle Euphrates Cancer Center	52	41.6%
4.	Imam Sadiq Hospital	15	12%
5.	Oncology center at Al-Husseini Hospital in Karbala	25	20%
6.	Total	125	100 %

3.5. Data collection checklist:

In order to assess the practices of safe handling for cytotoxic drugs for nurses who work in the oncology center, comprehensive review of

literature, a unique checklist was prepared. Depending on cytotoxic drugs Bader, K. (2012). with slight modification to few items to make it more a proper and relevant for our oncology center context. This checklist divided to three parts as the following:

Part I:

This part covers the following sociodemographic aspects of the study samples: (5) Items: (age, gender, educational status, residency, marital status).

Part II:

This part includes general information related to (experience years, experience years in oncology center, training course related to cytotoxic drug handling).

Part III:

This part consists of checklist divided into (4) domains to assess the practices for safe handling of cytotoxic drugs practices including the following:

1. **First domain** : Nursing practices related to the preparation of chemotherapy (cytotoxic drugs) included (13 items).
2. **Second domain**: Nurses' practices related to chemotherapy administration included (19 items) distributed as:

A. Intravenous infusion : included (11 items).
B. Intramuscular injection: included (5 items).
C. Oral drugs: included (3 items).

3. **Third domain** : Chemical waste management included (8 items)
4. **Fourth domain** :Spilled liquid handling included (8 item).

3.6. Rating and Scoring:

Three points Likert scale level used as a pattern of rating (always,sometimes

and never) in order to assess the level of the nurses practices related to safe handling of cytotoxic drugs in the oncology unites. The adopted scoring system which used is :(always =3,sometimes =2 and for never=1).

3.7. Validity:

Content validity obtained for the checklist which prepared to assess practices of safe handling for cytotoxic drug for nurses who work in the oncology center through the expert panel to determine the checklist validity and competence in order to clarify this phenomena.

A preliminary Arabic and English version of the checklist distributed among (9) experts (appendix 3), who have not less than (10) years of experience in their field. After reviewing the experts opinions and suggestions which focused on the translation. Modifications performed to achieve proper language matching between Arabic and English version.

3.8. Pilot study:

A pilot study conducted between 15th to 20th of Jan 2022, to determine the reliability of the checklist. After gaining their consent to take part in this research, ten nurses who work at Al.Diwanya cancer facility were each exposed to three observations from three observers at the same time. Those (10)nurses alienated from the original sample. The following points can be inserted to crystalize the benefits of the pilot study:

1. To determine the reliability of the study checklist.
2. To find out whether the contents of the checklist clear, understandable and easy in practice.
3. To estimate the average time which may needed for complete the individual checklist.

3.9.Reliability of the checklist:

The inter-observer or inter-rater approach is used to assess the stability of a research instrument by determining how much homogeneity or consistency exists in the scores provided by different judges. The researcher enlisted the help of two nursing college graduates to complete this step. Each participant in the pilot study was exposed to 3 observers at the same time with each practice, giving each participant 3 observation. The reliability of the checklist calculated by special equation, the statistical results recorded (r: 0.98), which is statistically accepted.

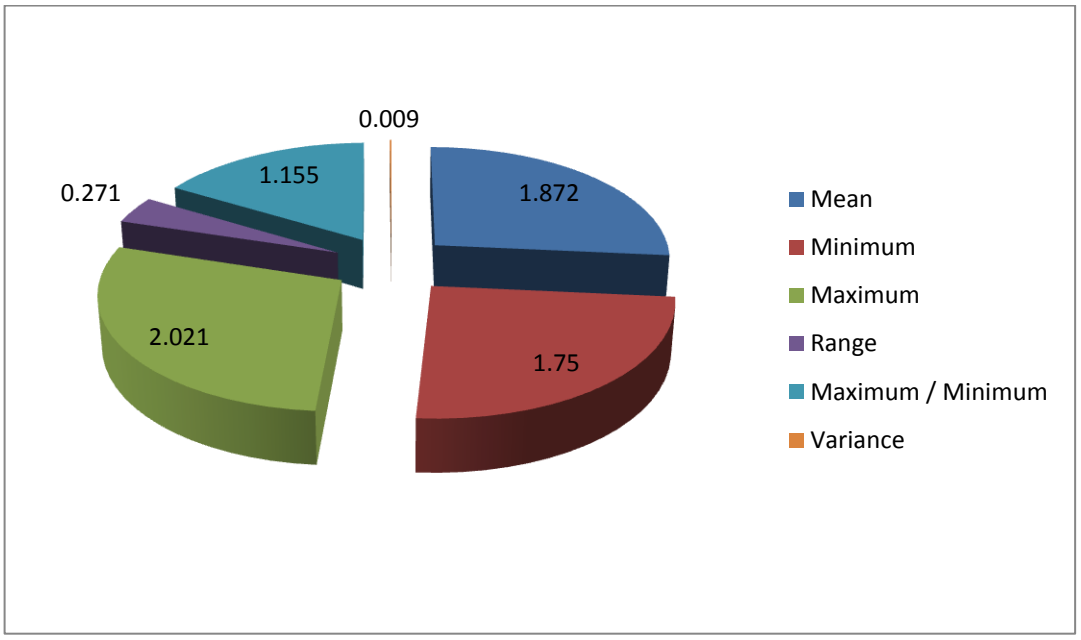
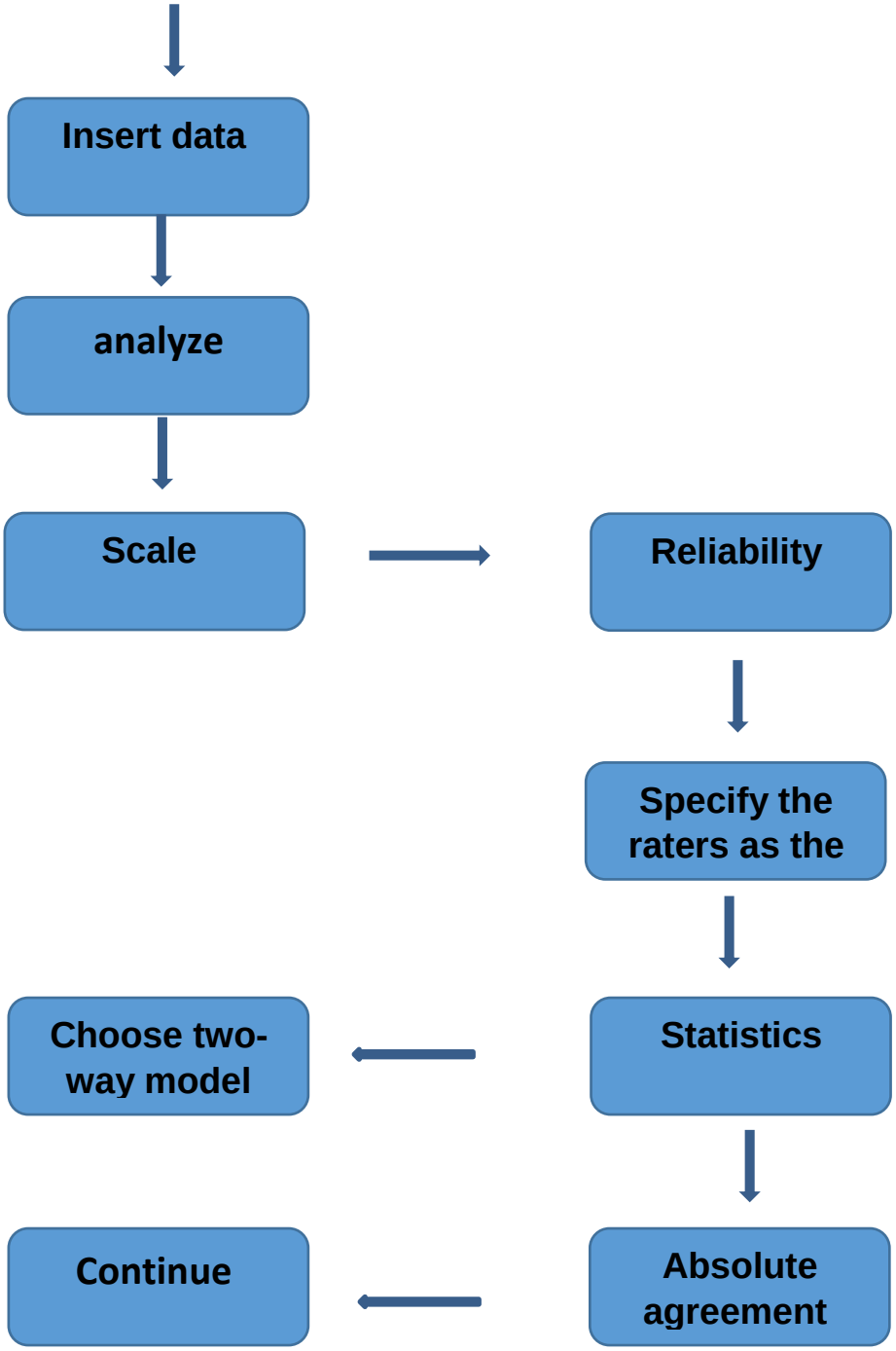


Figure (3.1): statistical distribution for pilot study.

(SPSS version 26 reliability steps



Figure(3.2) : Reliability processing steps.

3.10.Ethical consideration:

One of the most significant aspects of quantitative and qualitative research is ethical considerations, since this type of study often employs human beings. Ordinarily the consent may be obtained verbally (oral or written), an a count of the nature of the study. This kind of an ethical grade may protect confidentiality and dignity of the study subjects. for this reason, formal consent form applied for each participant after explaining the research objectives in order to obtain their formal agreement(appendix 5).

3.11.Data collection:

The self-report approach was used to complete the first and 2nd portions of the prepared tool, which took around 5 to 10 minutes to complete. While the third portion took 1-7 days to conduct three observations for each participant, the fourth component took 1-7 days. The data gathering took a total of 41 days., it started from (Jan 18th to 27th Feb. 2022).

3.12.Data analysis:

In order to reach the specific objectives of this study the collected information tabulated and analyzed via descriptive and inferential statistical methods, by using (Statistical Package for the social sciences) program version 26 .

3.12.1.Descriptive data analysis

The following parameters were calculated using descriptive statistics to explain socio - demographics and item responses:

•Frequency (F)

.Percentage (%) as $\frac{\text{part}}{\text{Whole}} \times 100$.

3.12.2.Inferential data analysis .

- Mean of score (M.S) as $\frac{\text{sum of score}}{n}$
- Standard Deviation (±SD) is calculated as following

$$SD = \frac{\sqrt{\sum ni=1(xi-\mu)2}}{n}$$

Where n = Number of replicates

xi = Replicate i

$\tilde{x}$ = Mean of replicates

Correlation Coefficient Formula

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n \sum x\,2 - (\sum x)\,2][n \sum y2 - (\sum y)\,2]}}$$

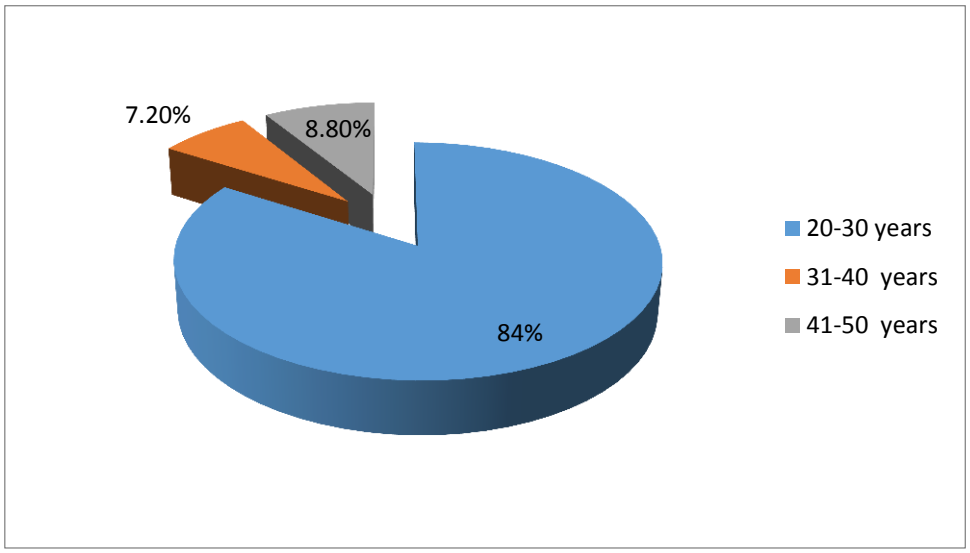
Chapter Four:

Results

Chapter Four

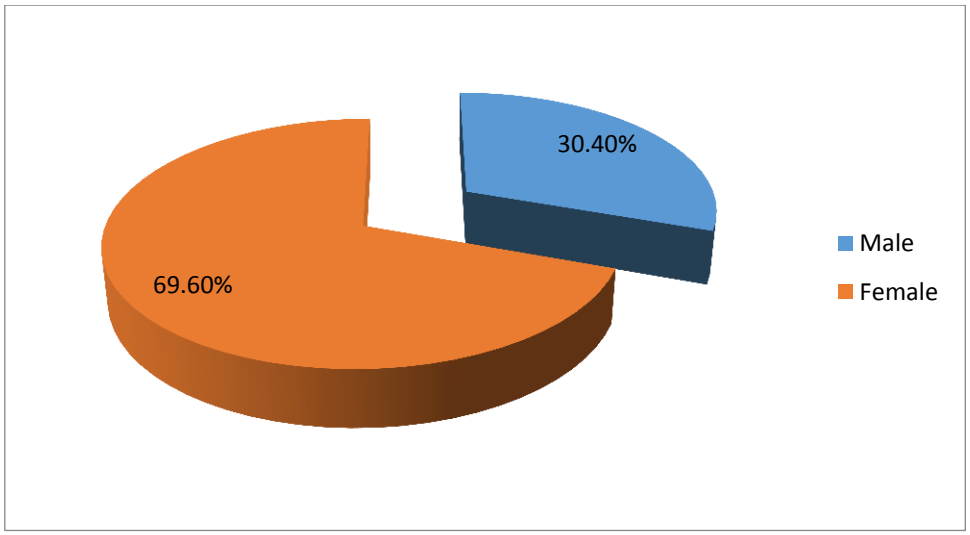
Results:

This chapter presents the collected data after statistical management as structured tablets, to make it easy for scientific and logical interpretation in order to reach the study objectives.



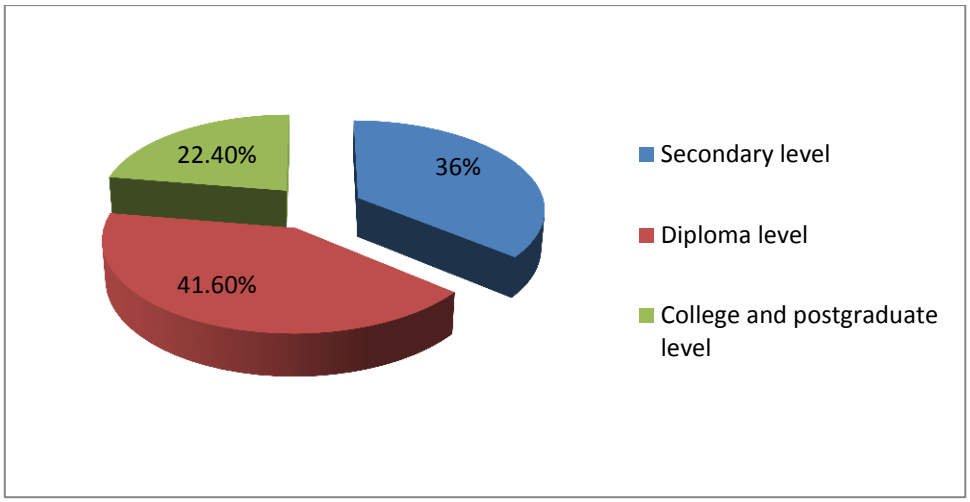
(Fig4.1): Distribution of the study sample age

This figure revealed that most of the study population 105 (84.0%) were between (20-30) years age group.



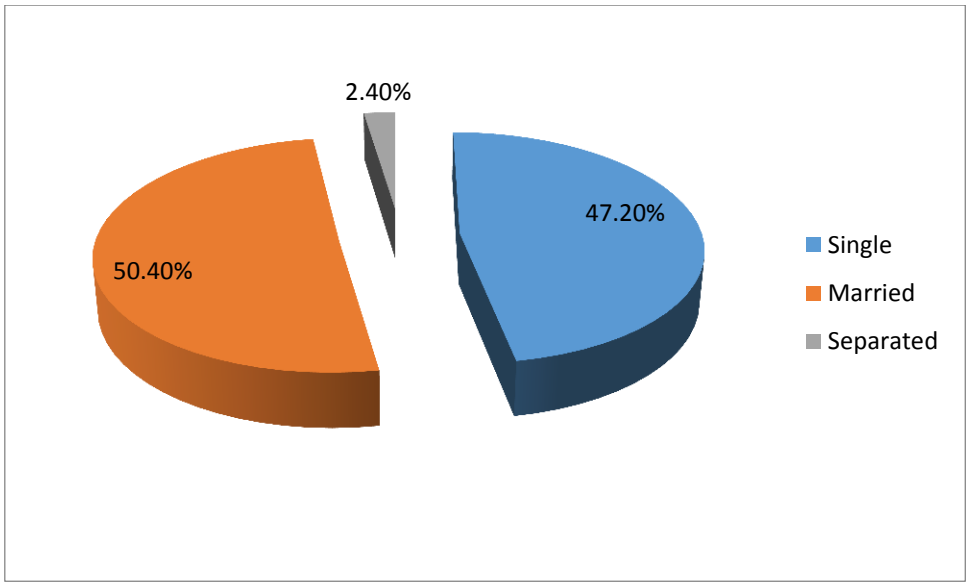
(Fig4 .2): Distribution of the study sample related to gender

This figure revealed that most of the study population, 87 (69.6%) were female



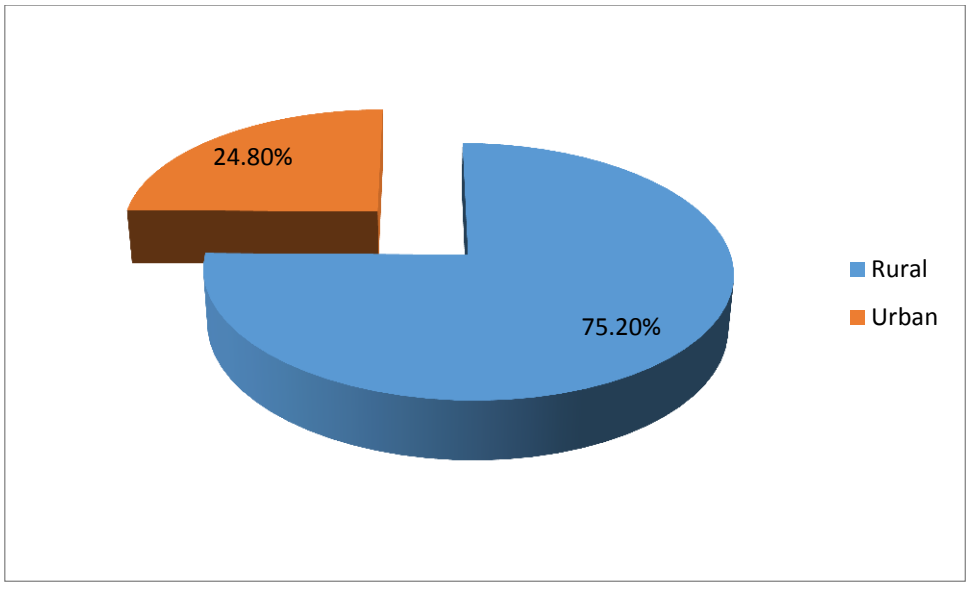
(Fig 4.3): Distribution of the study sample according to educational status

This figure revealed that most of the study sample 52 (41.6%) were diploma holder**.**



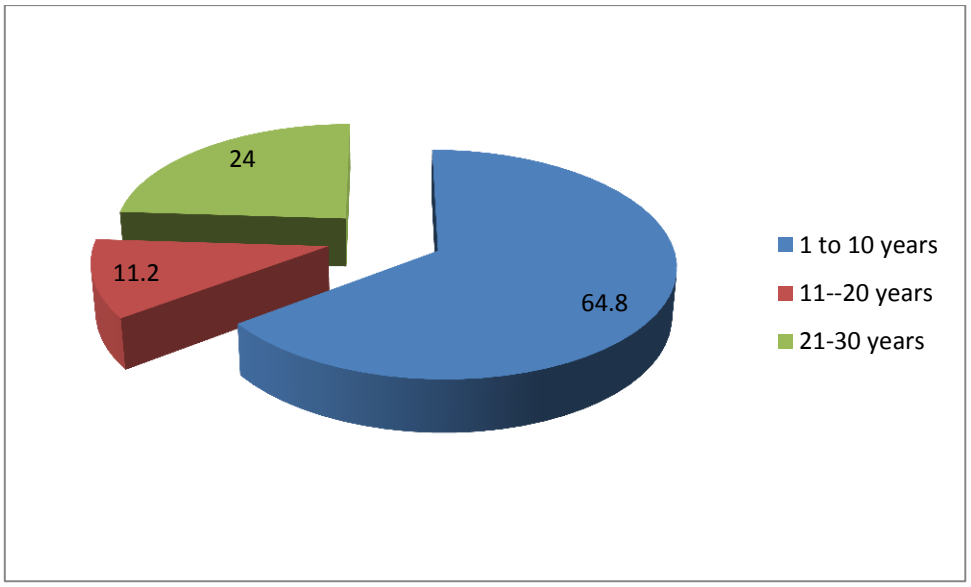
(Fig 4.4): Distribution of the study sample according to marital status

The results in this pie chart shows that high percent 63 (50.4%) of the study sample were married.



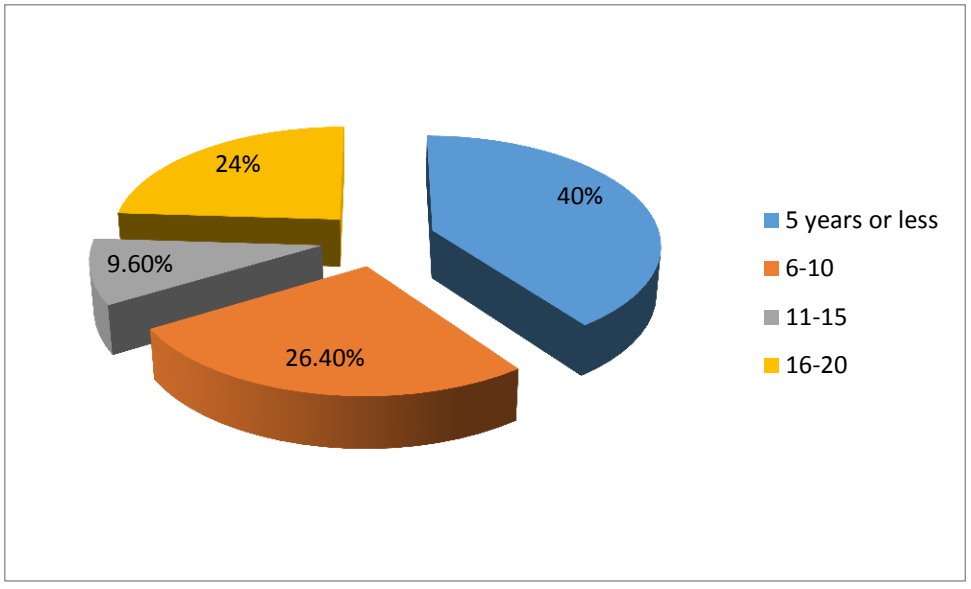
(Fig 4.5): Distribution of the study sample according to residency

This figure revealed that most of the study sample 94 (75.2%) were rural area residency.



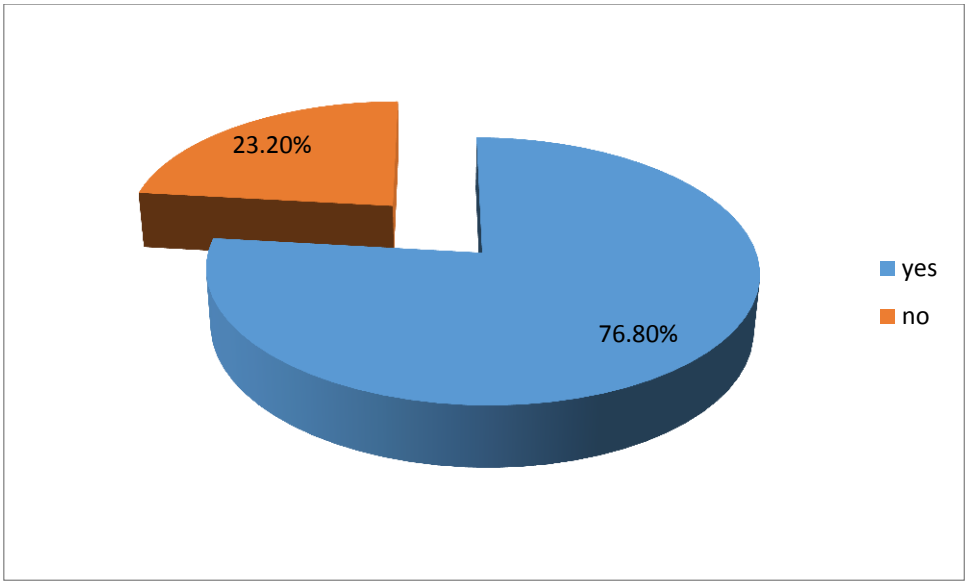
(Fig 4.6): Distribution of the study sample related to their employment characteristics(years of experience)

This figure recorded that the study sample presented that the higher percentage 81 (64.8%) were between (1 to 10) years of experience in the nursing.



(Fig 4.7): Distribution of the study sample related to their employment characteristics(years of experience in oncology).

This figure recorded that the study sample presented that 50 (40.0%) were with (5 years or less than 5 years) of experience in the oncology specialty.



(Fig 4.8): Distribution of the study sample according to their employment characteristics(Formal training in safe handling of chemotherapeutic drugs).

This figure recorded that the study sample presented that the higher percentage 96(76.8%) attend formal training program directed to safe handling of cytotoxic drugs.

Table (4.1.1.): Practices of the study sample related to preparation of chemotherapy (cytotoxic)

No.	Items	Always Do		Sometimes Do		Never Do		Mean ±SD	Level
		F	%	F	%	F	%		
1	Receipt of medicines from the pharmacy in closed containers	13	10.4	52	41.6	60	48.0	1.62±0.668	Poor Practice
2	It separates other drugs from chemotherapy drugs	29	23.2	50	40.0	40.0	36.8	1.86±0.766	Fair Practice
3	Gather the tools needed to prepare the medicine	69	55.2	44	35.2	12	9.6	2.46±0.666	Good Practice
4	Choose the appropriate gloves for preparing the chemotherapy drug	19	15.2	48	38.4	58	46.4	1.69±0.723	Fair Practice
5	Wearing gloves while preparing medication	57	45.6	53	42.4	15	12.0	2.34±0.683	Fair Practice
6	Wear a gown when preparing the medication	63	50.4	62	49.6	0	0	2.50±0.502	Good Practice
7	Use eye protection goggles	0	0	0	0	125	100.0	1.00±0.000	Poor Practice
8	Take off gloves after every medication	14	11.2	46	36.8	65	52.0	1.59±0.685	Poor Practice
9	Wear mask throughout the preparation process	0	0	0	0	125	100.0	1.00±0.000	Poor Practice
10	Wipe bottles and ampoules with an alcohol swab after removing the outer cap	0	0	0	0	125	100.0	1.00±0.000	Poor Practice
11	Review the prescription of medicines after preparation	44	35.2	69	55.2	12	9.6	2.26±0.621	Fair Practice
12	Separate chemotherapy waste from other waste	10	8.0	56	44.8	59	47.2	1.61±0.634	Poor Practice
13	Uses a container designated for chemotherapy waste collection	62	49.6	45	36.0	18	14.4	2.35±0.721	Fair Practice
Total								**1.79±0.512**	Fair **Practice**

MS (Poor Practice =1-1.6, Fair Practice = 1.7-2.3, Good Practice = 2.4-3)

Table (4.1.1.) presented that most of the study samples show poor level in their practices related to the items which followed to prepare any medication as a standard steps(1, 7, 8.9, 10,12),while fair level of practices recognized in the items which act a vital standard steps in the preparation of the cytotoxic drugs (2,4,5,11,13). While just two items recorded good practice (3,6), the integration among general and specific steps in this domain presented fair level of practices.

Table (4.1.2.): Practices of study sample related to administration of cytotoxic drugs (intravenous infusion).

No.	Items	Always Do		Sometimes Do		Never Do		Mean ±SD	Level
		F	%	F	%	F	%		
1	Hand washing	23	18.4	41	32.8	61	48.8	1.70±0.764	Fair practice
2	wearing a medical gown	50	40.0	44	35.2	31	24.8	2.15±0.794	Fair practice
3	wear a face mask	0	0	0	0	125	100.0	1.00±0.000	Poor Practice
4	wearing gloves	80	64.0	45	36.0	0	0	2.64±0.482	Good practice
5	Removing the cap from the intravenous tubing and connecting it to the venous cannula	92	73.6	27	21.6	6	4.8	2.69±0.560	Good practice
6	Cover the infusion tube and the medicine container with a cap when the drug is photosensitive	38	30.4	69	55.2	18	14.4	2.16±0.653	Fair practice
7	Use a clean bandage to protect the patient's skin from infusion drops	1	.8	47	37.6	77	61.6	1.39±0.506	Poor Practice
8	Verify the tightness of the intravenous cannula cover after the	29	23.2	68	54.4	28	22.4	2.01±0.678	Fair practice

	drug infusion has finished								
9	Assessment of the patient's condition while administering the drug	21	16.8	60	48.0	44	35.2	1.82±0.700	Fair practice
10	Use of yellow waste bags for disposal (gloves, gowns, intravenous infusion equipment)	48	38.4	56	44.8	21	16.8	2.22±0.714	Fair Practice
11	Use a yellow plastic container (sharps) to collect syringes, packages and needles	12	9.6	71	56.8	42	33.6	1.76±0.614	Fair practice
Total								**1.957±0.587**	Fair **Practice**

MS (Poor Practice =1-1.6, Fair Practice = 1.7-2.3, Good Practice = 2.4-3)

Table (4.1.2.) revealed that the majority of the study sample recorded fair level of practices related to cytotoxic drugs administration through intravenous infusion . (1.957±0.587).

Table (4.1.3.): Practices of study sample related to administration of cytotoxic drugs (intramuscular injection).

No	Items	Always Do		Sometimes Do		Never Do		Mean ±SD	Level
		F	%	F	%	F	%		
1	Sterilization of the injection area	61	48.8	46	36.8	18	14.4	2.34±0.720	Fair Practice
2	wear a face mask	00	00	00	00	125	100.0	1.00±0.000	Poor Practice
3	wear gown	54	43.2	70	56.0	1	0.8	2.42	Good Practice
4	wear gloves	58	46.4	67	53.6	00	00	2.46±0.666	Good Practice
5	Sterilization of the injection area	6	4.8	49	39.2	41	70	1.49±0.590	Poor Practice
Total								**1.94±0.464**	**Fair Practice**

MS (Poor Practice =1-1.6, Fair Practice = 1.7-2.3, Good Practice = 2.4-3)

Table (4.1.3.) shows that the mean and standard deviation 2.41 ± 0.917 (good level) related to 2 items (3, 4), a fair practice shows for Item(1), while remain items (2,5) recorded poor level (1.00 ± 0.000). The table recorded that the overall level of intramuscular injection of cytotoxic drugs were fair (1.94±0.464).

Table (4.1.4.): Practices of study sample related to oral administration of cytotoxic drugs .

No.	Items	Always Do		Sometimes Do		Never Do		Mean ±SD	Level
		F	%	F	%	F	%		
1	wear gloves	63	50.4	62	49.6	00	00	2.50±0.502	Good Practice
2	Put the treatment in a cup designated for this purpose	6	4.8	00	00	119	95.2	1.10±0.429	Poor Practice
3	Avoid touching the medicine directly by hand	00	00	41	32.8	84	67.2	1.33±0.471	Poor Practice
Total								**1.64±0.467**	**Poor Practice**

MS (Poor Practice =1-1.6, Fair Practice = 1.7-2.3, Good Practice = 2.4-3)

Table (4.1.4.) revealed that all the nurses who work in the oncology units recorded poor level related to oral administration of the cytotoxic drugs (1.64±0.467).

Table (4.1.5.): Practices of study sample related to Chemical waste management.

No.	Items	Always Do		Sometimes Do		Never Do		Mean ±SD	Level
		F	%	F	%	F	%		
1	Wear protective clothing (vest, face mask, gloves) when collecting waste	00	00	00	00	125	100.0	1.00±0.000	Poor Practice
2	Waste collection in a yellow plastic bag .	101	80.8	24	19.2	00	00	2.81±0.395	Good Practice
3	Install a sign indicating that the container is intended for chemical waste	125	100.0	00	00	00	00	3.00±0.000	Good Practice
4	Install sharps containers at arm-level	00	00	21	16.8	104	83.2	1.17±0.375	Poor Practice
5	Fill sharps containers 3/4 the size of the container	00	00	23	18.4	102	81.6	1.18±0.389	Poor Practice
6	Waste containers (plastic) are placed in a well-ventilated and lighted place	00	00	15	12.0	110	88.0	1.12±0.326	Poor Practice
7	Large (plastic) waste containers are placed far from patient rooms and corridors	00	00	49	39.2	76	60.8	1.39±0.490	Poor Practice
8	Large plastic waste containers with airtight lids.	57	45.6	66	52.8	2	1.6	2.44±0.530	Good Practice
Total								**1.76±0.313**	**Fair Practice**

MS (Poor Practice =1-1.6, Fair Practice = 1.7-2.3, Good Practice = 2.4-3)

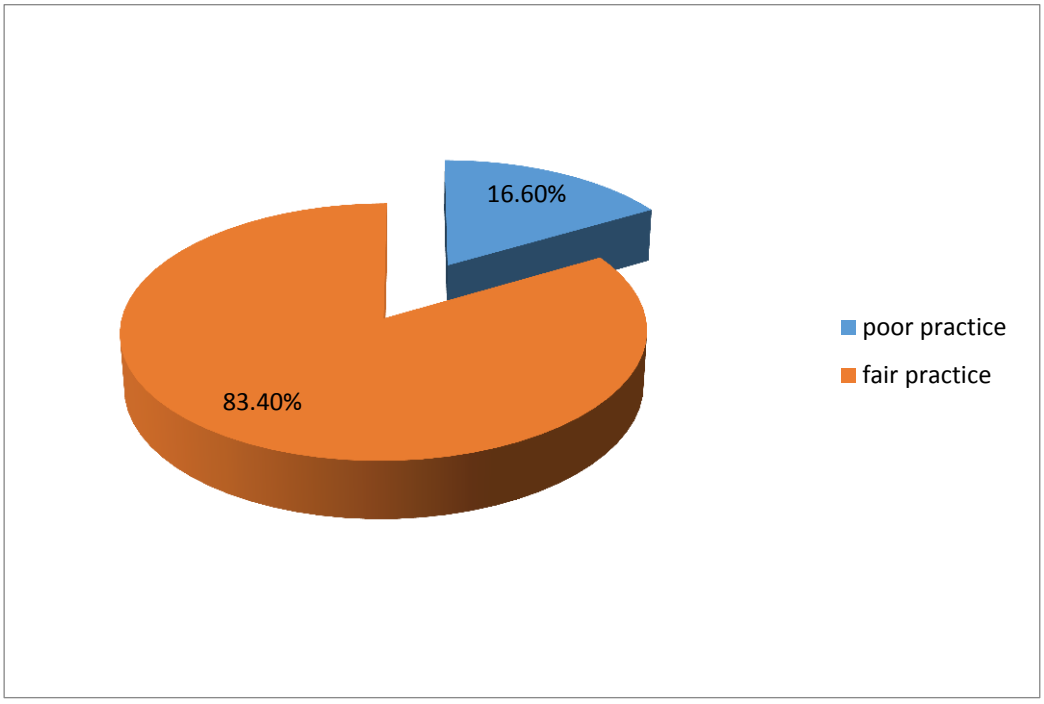
Table (4.1.5.) shows that most of the items related to chemical waste management produce a from the usage of cytotoxic drugs were recorded poor practice level (1, 4,5, 6, and 7), while remain items (2,3,and 8) recorded good level, and the overall mean score of this domain were fair (1.76±0.313).

Table (4.1.6.): Practices of study sample related to spilled liquid handling

No.	Items	Always Do		Sometimes Do		Never Do		Mean ±SD	Level
		F	%	F	%	F	%		
1	Determine the spill area	125	100.0	00	00	00	00	3.00±0.000	Good Practice
2	Reduces air flow into the area by closing doors and windows and turning off fans and air conditioning	2	1.6	28	22.4	95	76.0	1.26±0.474	Poor Practice
3	Wear personal protective equipment as described in the spill kit.	00	00	19	15.2	106	84.8	1.15±0.360	Poor Practice
4	Dry the area well with towels or towels.	00	00	40	32.0	85	68.0	1.32±0.468	Poor Practice
5	Liquid drying is carried out from the edge of the spill towards the center	00	00	14	11.2	111	88.8	1.11±0.317	Poor Practice
6	Once the spill is removed, clean the area at least three times with a mild detergent and clean water.	3	2.4	85	68.0	37	29.6	1.73±0.498	Fair Practice
7	Dry the area well with towels or towels. Dispose of all cleaning materials in a yellow plastic waste bag	84	67.2	41	32.8	00	00	2.67±0.471	Good Practice
8	Wash hands after cleaning.	68	54.4	57	45.6	98	78.4	2.54±0.500	Good Practice
Total								1.84±0.386	Fair Practice

MS (Poor Practice =1-1.6, Fair Practice = 1.7-2.3, Good Practice = 2.4-3)

Table (4.1.6.) indicated that most of the basic practices of Spilled liquid handling related to safe handling of cytotoxic drugs for the nurse who work in the oncology units recorded low mean score in the following items (2,3,4,and 5). while item (6) recorded fair level, the others remain items (1,7and 8) recorded good level. The overall level of nurses practices were recorded fair (1.84±0.386).



(Fig 4.9): Distribution of safe handling practices levels of the nurse in the oncology units.

This figure shows that the level of the nurses recorded moderate mean score for about six procedures with regard to safe handling of cytotoxic drugs which commonly performed in the oncology.

Table (4.2.): Correlation between overall practices of the Nurses and their demographical characteristics.

No.	Parameters	*r*	P value
1	Overall practice Gender	-0.293	0.001 S
2	Overall practice Age	-0.205	0.022 S
3	Overall practice Level of Education	- 0.009	0.917 NS
4	Overall practice Marital Status	0.045	0.617 NS
5	overall practice Residency	0.033	0.718 NS

***P*. probability ≤ 0.05**

Table (4.2.): shows that there is no significant relationships between the nurses practices with respect to safe handling of cytotoxic drugs and their demographical characteristics related to (gender, marital status, educational level and residency) in $P \leq 0.05$, while significant relationship founded between nurses practices and their ages and genders.

Table (4.3.): Correlation between overall practices of the Nurses and their employment characteristics.

No.		r	P
1	Overall practice	0.127	0.159 NS
	Years of Experienced		
2	Overall practice	0.021	0.812 NS
	Years of Experience in oncology		
3	Overall practice	0.216	0.016 S
	Formal training		

***P*. probability ≤ 0.05**

Table (4.3.) shows that there is no relationship between safe handling of cytotoxic drugs practices and the study sample years of experience in the field, while significant relationship found between the nurses practices and the formal training in oncology were distributed in $P \leq 0.05$.

Chapter Five:

Discussion

Chapter Five

Discussion

This chapter will presents an abstract interpretation over logical lattices and reasonable driven argumentation for statically outcomes which were supported by the available literatures, and the researchers opinion. Results of the study will be interpret according to the study objectives.

Part 1: Demographical features of study population.

During the data analysis path, the results in figure(4.1.),(4.2),(4.3).(4.4) and (4.5) point out, that abouts (84.0%) of all participants were between (20-30) years old,87 (58.4%) were female . In terms of education level, the majority of the sample (41.6 percent) had a high level of education (Institution). According to the findings, the majority of the group (50.4 percent) was married, Egyption study carried out by Nglaa,2018 which interested with Nurses' Performance Regarding Chemotherapy Administration in the Clinical setting Illustrated that (53.3%) of the studied nurses age was ≤30years with a mean 29.8±3.92, (86.7%) of them were female, (83.3 %) were married, (50.0%) diploma nursing holder.

Most of the nurses in these vital area were almost gone-to-middle adult age ,these areas need physical strength pulse proper educational preparation which clearly appears in the results .

Part 2: Employment characteristics of the sample.

Figure (4.6.),(4.7) and (4.8) In regards of years of experience, the findings shows that 64.8 percent have one to ten years of experience, with practically all of them having spent at least five

years in the oncology unit, This finding in the same line with Abd Al-Magid, Mohammed, Abd El latef& Mohammed, (2012) who found that more than half of nurses had more than five years of experience in the study that titled "nursing care standards for cancer patients undergoing chemotherapy".

Part 3: Evaluation the practical level of the study sample related to preparation of chemotherapy (cytotoxic)

Table (4.1.1.), represents that most of the study sample shows fair practice regarding preparation of chemotherapy (cytotoxic)drugs which considered as key element of handling of cytotoxic medications in a safe manner, as regards the total nurses' practice. The present study shows that majority of the studied nurses had unsatisfactory level of practice regarding chemotherapy .This was similar to a study by Shahrasbi et al.,2014 which reported high level of using PPE, concluded an adequate supply of hand rub solutions, and training program does not ensure an adequate performance of hand antisepsis still this issue needs focus program to improve adherence.

Table (4.1.2) shows that majority of the healthcare providers who participate in the study administration (intravenous infusion)fair . In Egypt study carried by Nglaa,2018 illustrated that, 20% of the studied nurses had satisfactory level of total practice regarding chemotherapy administration, while 80%ofthe studied nurses had unsatisfactory level of total practice regarding chemotherapy administration.

Table (4.1.3.): This table is regarding Practical level of the study sample related to chemotherapy administration

(intramuscular injection). and the results represent fair practice, but when we discuss each item of the table separately , there are (3) important items regarding the safe handling . (2) items records a good practice which focused upon the PPE, this study goes parallel with a study published in Grand Valley State University, carried out by (Cheryl ,2015), who assess the knowledge and practices of the healthcare workers, the result of the study shows that nearly (51%) of the study sample were with poor practice regarding drug administration.

The researchers, point of view related to safe handling of chemotherapy drugs during its administration standard actually have two integrated direction ,the first –one depends on the knowledge and practices related to fundamentals of medication administration steps, while the other direction focused on safe steps to prevent harm for patient and nurses who deal directly with those harmful drugs such as ensure to use PPE properly ,using drops to protect skin from drug drops ,disposing waste products ,for this reason the nurses who are involved in chemotherapy drugs administration , as aroutin daily work ,need to receive specific knowledge to proper handling to maintain their selves and patients from risks .

Table (4.1.4) This table revealed that (100%) of the nurse who work in the oncology units recorded poor level of practice related to Practical level of the study sample related to oral administration of chemotherapy drugs. In a study conducted by Yaakub in Nairobi in (2016) on knowledge and practice of proper handling of cytotoxics among healthcare workers at Kenyatta National Hospital, it was discovered that nearly a 1/4 of the

respondents expressed touching cytotoxic tablet with their hands when administering cytotoxic.

This might be due to a lack of understanding of how to handle oral chemotherapy, as demonstrated in a comparable study in which only 25percent of participants were aware of the particular handling technique.

Table (4.1.5.): the presented the results show that as a total mean is a poor practice, we can see that items (2, 8), record good practice related practical level of the study sample related to chemotherapy administration (Chemical waste management) . According to a research conducted by (Yaakub ,2016), only 15 (28 percent) personnel disposed of sharps in containers, whereas 21 (40.63 percent) cremated cytotoxic waste in an authorized facility. This is a major problem because the standards urge that all cytotoxic medications be disposed of in an authorized facility. According to one survey, the majority of employees (98 percent) were unaware of biological waste segregation and disposal.

Related to chemical waste disposal ,this issue need restricted policy which should be planned ,prepared and continuously monitored by hospital committee , for this purpose the nurses should be a worried how to handle and deal with this type of waste in this special centers by educational sessions manuals or written instructions for maintaining patient nurses safety.

Table (4.1.6.) shows that there is critically poor practice toward Spilled liquid handling in items (2, 3, 4, 5). The only two items (1, 7,8), that record good practice were related to wash hands or alcohol antisepsis method used. This results agree with a study published by (Friese, 2019) which finds that the majority (60%) of study sample reported zero or a low level of personal concern about the spill.

Spillage management is considered a start point of safety in the oncology centers .Nurses play a corner stone in this protective issue, Improvement of knowledge enhances safety practices by continuous education .Written instruction may act vitally to support this practices.

Table (4.2.) shows that there is no significant relationships between the nurse practices with respect to safe handling of cytotoxic drugs and their demographical characteristics related to (educational level, marital status and residency) in P value ≤ 0.05, while a significant relationship was founded between nurse practices and their age and gender and table (4.3.) represent that there is no relationship between the nurses practices and the study sample years of experience in the field. While significant relationship was found between the practice and formal ttraining were distributed in P value ≤ 0.05. According to a research conducted by Desta Naglaa Elsayed Mahdy in Egypt in 2018, with regards to the obstacles or variables influencing the use of safety procedures when handling cytotoxic medications. Despite the fact that nurse is the person who is accountable for preparing and administrating these drugs, the study found that nearly half of the nurses surveyed believe that there is insufficient in-service training and education regarding proper handling of cytotoxic agents provided by the cancer center's administrative staff. They all claimed that no standard rules for cytotoxic safe handling procedures are accessible at work. More than 3/4 of nurses said were ignorant of proper cytotoxic medication handling procedures. While Yaakub (2016) found no statistically significant relationship between demographic demographic factors and practice in Nairobi. The results of a fishers exact test relating the practice score to

different demographic characteristics revealed no statistically significant relationship between demographic factors and practicing.

One of the reasons for these results from the requirements for the safe treatment of cytotoxic drugs is knowledge and training of specialists. To achieve these results, it is necessary to intensify educational and training programs within the planning and gradation of health and nursing staff. In addition to the current conditions that have passed through the world as a result of the Corona epidemic, which negatively affected the provision of protective equipment Personality, the need to measure performance for long and repeated periods to reach an acceptable level aims to improve the level of nurses' practices and thus reduce complications for the patient and the nurse.

As the finding which presented in the tables and analyzed in chapter four and five the researcher accept the questions which estimated that there is significance relationships between nurses practices and formal training in safe handling of cytotoxic drugs.

The data clearly reported that the formal training play as effective factors to improve nurses practices in safe handling .

Chapter Six:

Conclusions

and

Recommendations

Chapter Six

Conclusions and recommendations

The result of this study may be concluted as the following:

Most of the study sample who agree to participate in the study were female, married, between (20-30) years old, diploma holder and rural area resident.

The majority of the study sample were nurses who have an experience in the oncology unit with ≤ 5 years.

Regarding the nurses practices with respect to the safe handling of cytotoxic drugs during their daily caring in the oncology units the statistical results recorded fair level of practices.

Eventually ,the clearly presented via the statistical analysis ,when investigating the first objective, the nurses practices show fair level related to standard safe handling measures .

No significant relationships found between the nurses practices and their demographical characteristics related to (educational status, residency and marital status) except their age and gender .

For answering the second study question statistical analysis find impact of age gender related to nurse practice while the other variables (educational status ,residency and marital status) didn't play as affecting factor .

Significant statistical found between the nurses practices and the training courses , while no relationship found between their

years of experience and practices.

The answer for the third question of the study ,according to the presented finding the training courses act as strong factor to enhance nurses practices .

Recommendations:

Depending on the results of the study it is beneficial to suggest the following recommendations:

1.A special manual focused on the policy, practices of safe handling of cytotoxic drugs should be prepared and distributed to the oncology departments which provide direct care to the patients to improve the nurses competence related to safety measures.

2 – Specific training sessions should be established regarding spillage and chemical waste management to maintain safety measures.

3- Further study may be carried out to assess the impact of cytotoxic drugs on the nurses health status.

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Appendices

Appendx (1)

(Approval)

University of Babylon
College of Nursing
Research Ethics Committee
Issue No:
Date: / /2022

جـــامـعة بـــابـــل
كـــلية التمريـض
لجنة اخلاقيات البحث العلمي

Approval Letter

To,
Hasanain Yhiya Shamran

The Research Ethics committee at the **University of Babylon, College of Nursing** has reviewed and discussed your application to conduct the research study entitled **" Safe Handling of Cytotoxic Drugs Practices for Nurses Working with Oncology Patients in Middle Euphrates Oncology Teaching Hospitals**

The Following documents have been reviewed and approved:

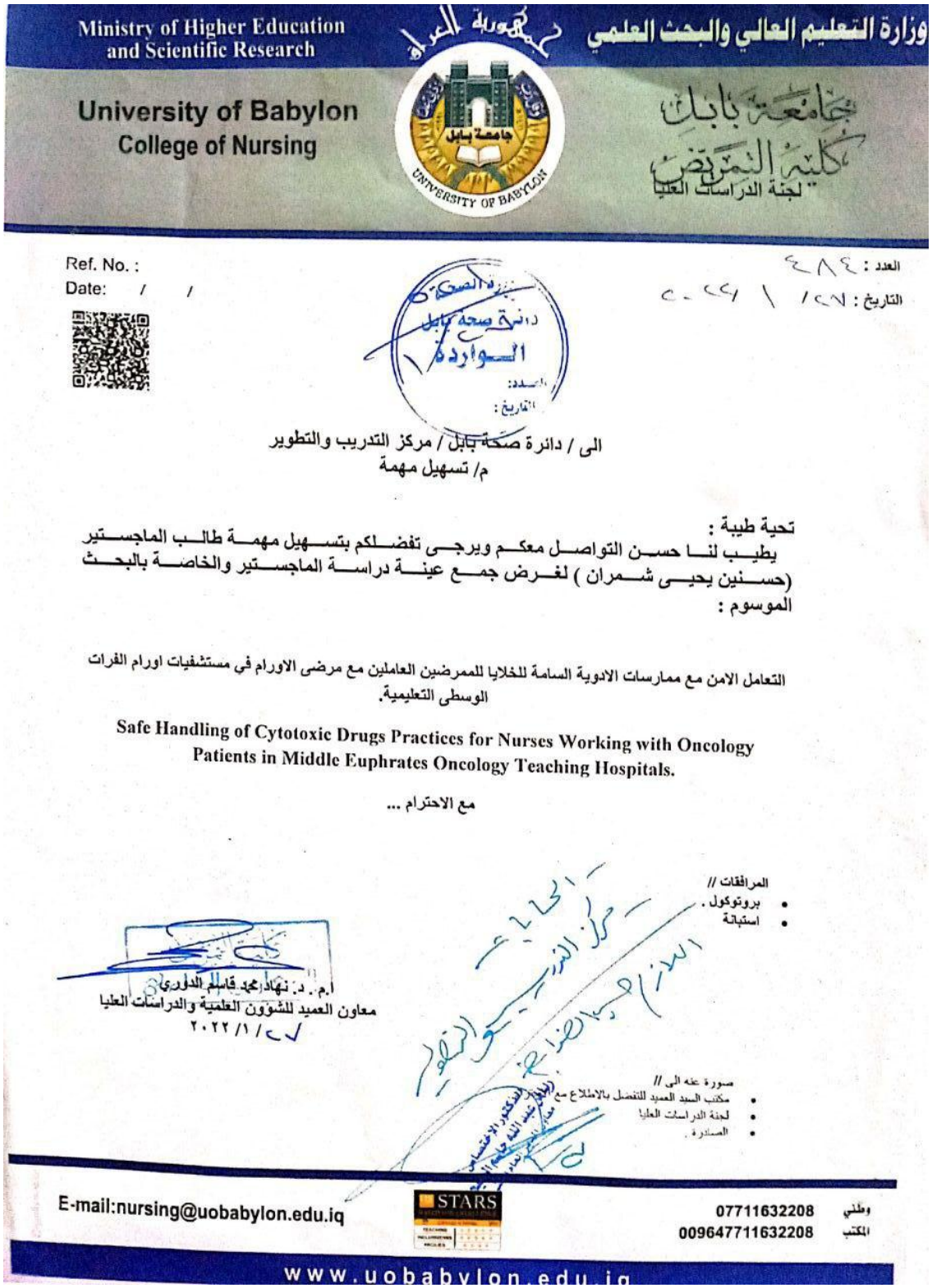
1. Research protocol
2. Research instrument/s
3. Participant informed consent

Committee Decision.

The committee approves the study to be conducted in the presented form. The Research Ethics committee expects to be informed about any changes occurring during the study, any revision in the protocol and participant informed consent.

Prof. Dr. Salma K. Jehad
Chair Committee
College of Nursing
Research Ethical Committee
24/ 1 /2022

Appendix (2A)



Ministry of Higher Education and Scientific Research
وزارة التعليم العالي والبحث العلمي
University of Babylon
College of Nursing
جامعة بابل
كلية التمريض
لجنة الدراسات العليا

Ref. No. :
Date: / /

العدد : ٤٨٤
التاريخ : ٢٠٢٢/١/٢٧

الى / دائرة صحة بابل / مركز التدريب والتطوير
م/ تسهيل مهمة

تحية طيبة :
يطيب لنا حسن التواصل معكم ويرجى تفضلكم بتسهيل مهمة طالب الماجستير (حسنين يحيى شمران) لغرض جمع عينة دراسة الماجستير والخاصة بالبحث الموسوم :

التعامل الامن مع ممارسات الادوية السامة للخلايا للممرضين العاملين مع مرضى الاورام في مستشفيات اورام الفرات الوسطى التعليمية.

Safe Handling of Cytotoxic Drugs Practices for Nurses Working with Oncology Patients in Middle Euphrates Oncology Teaching Hospitals.

مع الاحترام ...

المرافقات //
- بروتوكول .
- استبانة

ا.م . د. نهاد محمد قاسم الدوري
معاون العميد للشؤون العلمية والدراسات العليا
٢٠٢٢/١/

صورة عنه الى //
- مكتب السيد العميد للتفضل بالاطلاع مع
- لجنة الدراسات العليا
- الصادرة .

E-mail:nursing@uobabylon.edu.iq
STARS
وطني 07711632208
المكتب 009647711632208
www.uobabylon.edu.iq

Aappendix (2B)

جمهورية العراق

Ministry Of Health Babylon Health Directorate Email:- Babel_Healthmoh@yahoo.com Tel:282628 or 282621		وزارة الصحة والبيئة دائرة صحة محافظة بابل المدير العام مركز التدريب والتنمية البشرية وحدة أدارة البحوث العدد : ١٦٢ التاريخ: ٢ / ٢ /٢٠٢٢

إلى / مستشفى الأمام الصادق (ع)
مركز بابل لمعالجة الأورام

وزارة الصحة . دائرة صحة بابل مركز التدريب والتنمية البشرية

م/ تسهيل مهمة

تحية طيبة ...

أشارة إلى كتاب جامعة بابل / كلية التمريض / لجنة الدراسات العليا ذي العدد ٤٨٤ في ٢٠٢٢/١/٢٧

نـرفق لكم ربطا استمارات الموافقة المبدئية لمشروع البحث العائد للباحث طالب الدراسات العليا الماجستير (حسنين يحيى شمران).

للتفضل بالاطلاع وتسهيل مهمة الموما أليه من خلال توقيع وختم استمارات اجراء البحث المرفقة في مؤسساتكم وحسب الضوابط والإمكانات لاستحصال الموافقة المبدئية ليتسنى لنا أجراء اللازم على أن لا تتحمل مؤسساتكم أية تبعات مادية وقانونية .... مع الاحترام

المرفقات :
استمارة عدد /٢

الدكتور
محمد عبد الله عجرش
مدير مركز التدريب والتنمية البشرية
/ / ٢٠٢٢

نسخة منه إلى :

- مركز التدريب والتنمية البشرية / وحدة أدارة البحوث مع الأوليات .....

دائرة صحة محافظة بابل / مركز التدريب والتنمية البشرية // ايميل المركز babiltrainning@gmail.com

Appendix (2C)

Republic of Iraq
Al-Najaf Al-Ashraf Governorate
Najaf Health Directorate
Training and Human Development Center

No.
Date:

محافظة النجف الأشرف
مديرية صحة النجف
مركز التدريب و التنمية البشرية
العدد: ٧٤٢٢
التاريخ: ١٤/٣/٢٠٢٢

إلى/جامعة بابل / كلية التمريض

م / تسهيل مهمة

تحية طيبة ...

إشارة إلى كتابكم ذي العدد 486 في 1/27/2022 بخصوص تسهيل مهمة الباحث طالب الماجستير **(حسنين يحيى شمران)** للحصول على الموافقة الاخلاقية لإجراء البحث العلمي الموسوم:

Safe handhling of cytotoxic drug practices for nurses working with oncology patients in Middle Euphrates oncology teaching hospitals

حصلت موافقة اللجنة العلمية للبحوث في مركز دائرتنا على إجراء البحث في **(مركز الفرات الاوسط للاورام)** في دائرتنا مع التأكيد على الالتزام الكامل بتعليمات السلامة الحيوية والضوابط الاخلاقية والحصول على موافقة المشاركين قبل الشروع بالبحث والحفاظ على خصوصيتهم وعدم افشاء البيانات او استخدام العينات لغير اغراض البحث العلمي ... على أن لا تتحمل دائرتنا أية تبعات مادية.

للتفضل بالاطلاع .....مع الاحترام

الدكتور
احمد عباس طاهر الاسدي
المدير العام/وكالة
٢٠٢٢/٢/١٤

نسخة منه الى /
- مكتب المدير العام / للعلم مع الاحترام .
- مركز التدريب و التنمية البشرية / مع الأوليات .
- مستشفى الشهيد الدكتور حسن هنوس الحاتمي التخصصي/ تسهيل مهمة الباحث مع الاحترام

Appendix (2D)

Ministry of Higher Education and Scientific Research
University of Babylon
College of Nursing

وزارة التعليم العالي والبحث العلمي
جامعة بابل
كلية التمريض
لجنة الدراسات العليا

Ref. No. :
Date: / /

العدد : ٤٨٥
التاريخ : ٢٧ / ١ / ٢٠٢٢

الى / دائرة صحة الديوانية / مركز التدريب والتطوير
م/ تسهيل مهمة

تحية طيبة :

يطيب لنا حسن التواصل معكم ويرجى تفضلكم بتسهيل مهمة طالب الماجستير (حسنين يحيى شمران) لغرض جمع عينة دراسة الماجستير والخاصة بالبحث الموسوم :

التعامل الامن مع ممارسات الادوية السامة للخلايا للممرضين العاملين مع مرضى الاورام في مستشفيات اورام الفرات الوسطى التعليمية.

Safe Handling of Cytotoxic Drugs Practices for Nurses Working with Oncology Patients in Middle Euphrates Oncology Teaching Hospitals.

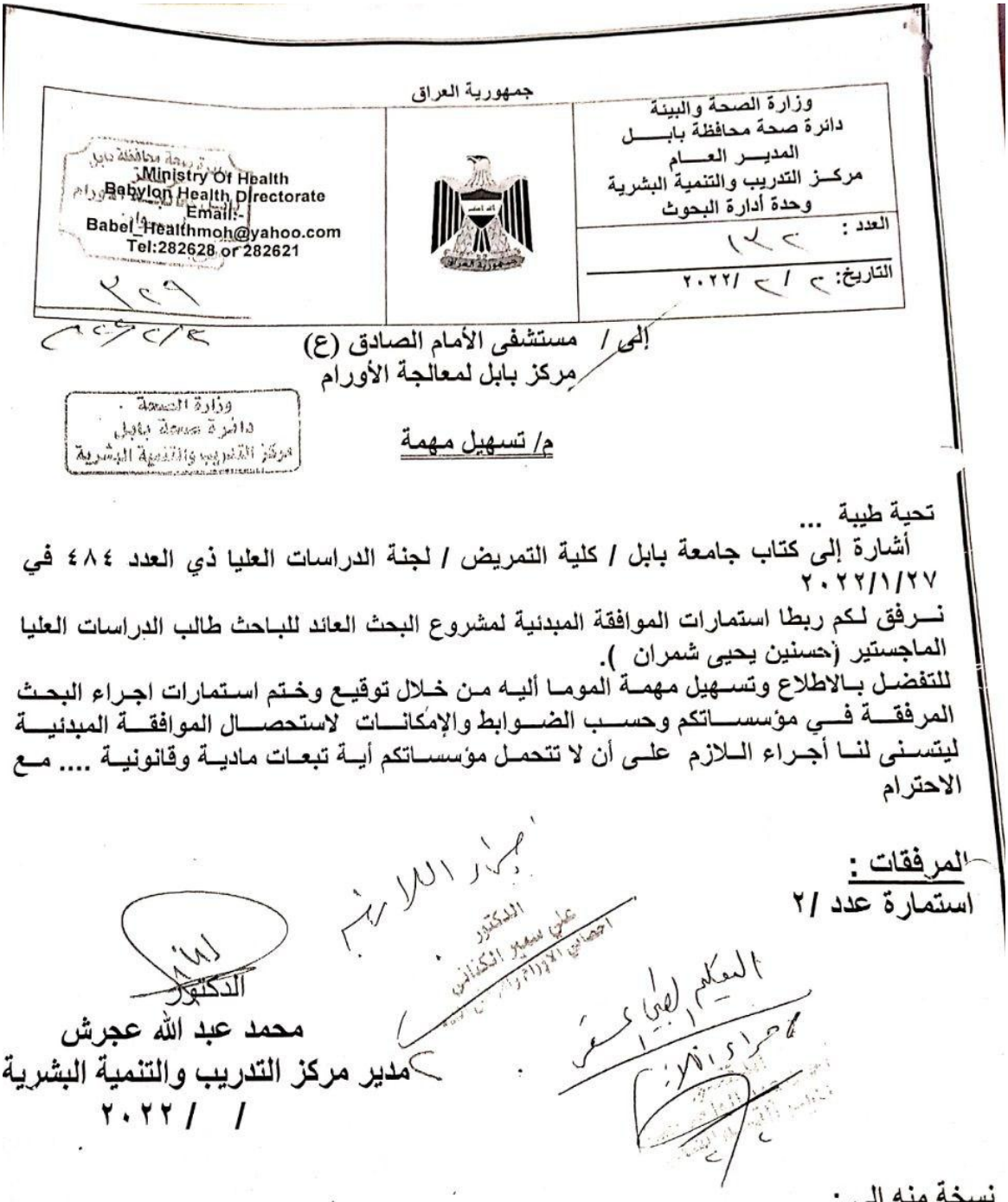
مع الاحترام ...

المرافقات //
- بروتوكول .
- استبانة

أ.م . د. نهاد محمد قاسم الدوري
معاون العميد للشؤون العلمية والدراسات العليا
٢٠٢٢/١/٢٧

صورة عنه الى //
- مكتب السيد العميد للتفضل بالاطلاع مع الاحترام
- لجنة الدراسات العليا
- الصادرة .

Appendix (2E)



جمهورية العراق

وزارة الصحة والبيئة
دائرة صحة محافظة بابـــل
المديـــر العـــام
مركـــز التدريب والتنمية البشرية
وحدة أدارة البحوث

العدد : ١٢٢

التاريخ: ٣ / ٢ /٢٠٢٢

Ministry Of Health
Babylon Health Directorate
Email:-
Babel_Healthmoh@yahoo.com
Tel:282628 or 282621

إلى / مستشفى الأمام الصادق (ع)
مركز بابل لمعالجة الأورام

وزارة الصحة
دائرة صحة بابل
مركز التدريب والتنمية البشرية

م/ تسهيل مهمة

تحية طيبة ...

أشارة إلى كتاب جامعة بابل / كلية التمريض / لجنة الدراسات العليا ذي العدد ٤٨٤ في ٢٠٢٢/١/٢٧

نـــرفق لـكم ربطا استمارات الموافقة المبدئية لمشروع البحث العائد للباحث طالب الدراسات العليا الماجستير (حسنين يحيى شمران).

للتفضل بـالاطلاع وتسـهيل مهمـة المومـا أليـه مـن خـلال توقيـع وختـم استمارات اجـراء البحـث المرفقـــة فـــي مؤسســـاتكم وحســـب الضـــوابط والإمكانـــات لاستحصـــال الموافقـــة المبدئيـــة ليتسـنى لنـا أجـراء الـلازم علـى أن لا تتحمـل مؤسسـاتكم أيـة تبعـات ماديـة وقانونيـة .... مـع الاحترام

المرفقات :
استمارة عدد /٢

الدكتور
محمد عبد الله عجرش
مدير مركز التدريب والتنمية البشرية
٢٠٢٢/ /

نسخة منه إلى :
- مركز التدريب والتنمية البشرية / وحدة أدارة البحوث مع الأوليات ...

سوزان ٢/٢/٢٠٢٢

Appendix(2 F)

Ministry of Higher Education and Scientific Research

وزارة التعليم العالي والبحث العلمي

جمهورية العراق

University of Babylon
College of Nursing

جامعة بابل
كلية التمريض
لجنة الدراسات العليا

Ref. No. :
Date: / /

العدد : ٤٨٧
التاريخ : ٢٠٢٢ / ١ / ٢٧

الى / دائرة صحة كربلاء / مركز التدريب والتطوير
م/ تسهيل مهمة

تحية طيبة :

يطيب لنا حسن التواصل معكم ويرجى تفضلكم بتسهيل مهمة طالب الماجستير (حسنين يحيى شمران) لغرض جمع عينة دراسة الماجستير والخاصة بالبحث الموسوم :

التعامل الامن مع ممارسات الادوية السامة للخلايا للممرضين العاملين مع مرضى الاورام في مستشفيات اورام الفرات الوسطى التعليمية.

Safe Handling of Cytotoxic Drugs Practices for Nurses Working with Oncology Patients in Middle Euphrates Oncology Teaching Hospitals.

مع الاحترام ...

المرفقات //
- بروتوكول .
- استبانة

أ.م . د. نهاد محمد قاسم الدوري
معاون العميد للشؤون العلمية والدراسات العليا
/ ١ / ٢٠٢٢

صورة عنه الى //
- مكتب السيد العميد للتفضل بالاطلاع مع الاحترام .
- لجنة الدراسات العليا
- الصادرة .

E-mail:nursing@uobabylon.edu.iq

STARS RATED FOR EXCELLENCE

وطني 07711632208
المكتب 009647711632208

Appendix (3A)

Nurse's Questionnaire

(Safe Handling of Cytotoxic Drugs Practices for Nurses Working with Oncology Patients in Middle Euphrates Oncology Teaching Hospitals.)

Researcher name:

Hassanain Yahya Shimran.

Part one:

Part (1): Demographical Characteristic:

1. Age: ☐ years old

2. **Gender:**

Male: ☐ Female: ☐

3. **Marital status:**

Single : ☐ married: ☐

Divorced: ☐ Widowed: ☐ Separated ☐

4. **Educational status** :

Secondary school : ☐

diploma : ☐ college : ☐

5.Residency : rural ☐ urban ☐

Part Two:

Employment data:

1-Years of experience ☐ years

2-Years of experience in oncology center ☐ years

3-Formal training in safe handling of chemotherapeutic drugs : ☐

numbers ☐

The third part :
First domain:
Nursing practices related to the preparation of chemotherapy (cytotoxic)

No	Items	1st observation		2nd observation		3rd observation	
		yes	No	Yes	no	yes	no
1	Receipt of medicines from the pharmacy in closed containers						
2	It separates other drugs from chemotherapy drugs						
3	Gather the tools needed to prepare the medicine .						
4	Choose the appropriate gloves for preparing the chemotherapy drug						
5	Wearing gloves while preparing medication						
6	Wear a gown when preparing the medication.						
7	Use eye protection goggles						
8	Take off gloves after every medication						
9	The mask is worn throughout the chemotherapy preparation process						
10	Wipe bottles and ampoules with an alcohol swab after removing the outer cap						
11	Review the prescription of medicines after preparation						
12	Separate chemotherapy waste from other waste						
13	Uses a container designated for chemotherapy waste collection						

Second domain:
Nurses' practices related to chemotherapy administration

First :intravenous infusion :

No	Items	1st observation		2nd observation		3rd observation	
		yes	no	Yes	no	yes	no
1	Hand washing						
2	wearing a medical gown						
3	wear a face mask						
4	wearing gloves						
5	Removing the cap from the intravenous tubing and connecting it to the venous cannula						
6	Cover the infusion tube and the medicine container with a cap when the drug is photosensitive						
7	Use a clean bandage to protect the patient's skin from infusion drops						
8	Verify the tightness of the intravenous cannula cover after the drug infusion has finished						
9	Assessment of the patient's condition while administering the drug						
10	Use of yellow waste bags for disposal (gloves, bra, intravenous infusion equipment)						
11	Use a yellow plastic container (sharps) to collect syringes, packages and needles						
	Second :For intramuscular injection						
1	Sterilization of the injection area						
2	wear a face mask						
3	wear gown						
4	wear gloves						
5	Sterilization of the injection area						

6	Do not return the needle cap						
7	Dispose of syringes, needles, and medicine packages in the sharps container						
	Third: For oral drugs						
1	wear gloves						
2	Put the treatment in a cup designated for this purpose						
3	Avoid touching the medicine directly by hand						

Third domain:
Chemical waste managment

No	Terms	1st observation		2nd observation		3rd observation	
		yes	no	Yes	no	Yes	no
1	Wear protective clothing (vest, face mask, gloves) when collecting waste						
2	Waste collection in a yellow plastic bag .						
3	Install a sign indicating that the container is intended for chemical waste						
4	Install sharps containers at arm-level						
5	Fill sharps containers 3/4 the size of the container						
6	Waste containers (plastic) are placed in a well-ventilated and lighted place						
7	Large (plastic) waste containers are placed far from patient rooms and corridors						
8	Large plastic waste containers with airtight lids.						

Fourth domain:

Spilled liquid handling

No	Items	1st observation		2nd observation		3rd observation	
		yes	no	yes	no	Yes	no
1	Determine the spill area						
2	Reduces air flow into the area by closing doors and windows and turning off fans and air conditioning						
3	Wear personal protective equipment as described in the spill kit.						
4	Dry the area well with towels or towels.						
5	Liquid drying is carried out from the edge of the spill towards the center						
6	Once the spill is removed, clean the area at least three times with a mild detergent and clean water.						
7	Dispose of all cleaning materials in a yellow plastic waste bag						
8	Wash hands after cleaning.						

Appendix (3B)

الاستبانة

(التعامل الآمن مع ممارسات الأدوية السامة للخلايا للممرضين العاملين مع مرضى الأورام في مستشفيات أورام الفرات الوسطى التعليمية)

الجزء الاول:

المعلومات الشخصية:

1- **العمر** : ☐ سنة

2- **الجنس** : ☐ ذكر ☐ انثى

3- **التحصيل الدراسي** : ☐ اعدادية التمريض ☐ دبلوم ☐ كلية

4- **الحالة الزوجية:** ☐ اعزب/باكر ☐ متزوج/متزوجه ☐ منفصل /منفصل ☐ ارمل /ارملة

5- السكن : ☐ ريف ☐ مدينة

الجزء الثاني :

معلومات عامة:

1- **سنوات الخبرة** ☐ سنة

2- **سنوات الخبرة في مجال الاورام** ☐ سنة

3- تدريب رسمي على التعامل الآمن مع أدوية العلاج الكيميائي

☐

العدد

☐

الجزء الثالث :

المجال الأول:
ممارسات التمريضيين المتعلقة بتحضير الادوية الكيميائية (السامة للخلايا)

ت	الفقرات	المشاهدة الاولى		المشاهدة الثانية		المشاهدة الثالثة	
		يعمل	لايعمل	يعمل	لايعمل	يعمل	لايعمل
1	استلام الادوية من الصيدلية في عبوات مغلقة						
2	يفصل الادوية الاخرى عن ادوية العلاج الكيميائي						
3	يجمع الادوات اللازمة لتحضير الدواء						
4	يختار القفازات المناسبة لتحضير دواء العلاج الكيميائي						
5	يرتدي القفازات اثناء تحضير الدواء						
6	ارتداء صدرية عند تحضير الدواء.						
7	يستخدم نظارات حماية العين						
8	ينزع القفازات بعد كل دواء						
9	يرتدي القناع طوال عملية تحضير العلاج الكيميائي						
10	يمسح الزجاجات والامبولات بمسحة الكحول بعد ازالة الغطاء الخارجي						
11	يراجع وصفة الادوية بعد التحضير						
12	يفصل نفايات العلاج الكيميائي عن النفايات الاخرى						
13	يستخدم حاوية مخصصة لجمع نفايات العلاج الكيميائي						

المجال الثاني:

ممارسات الممرضين المتعلقة بتحضير العلاج الكيميائي

أولاً: التسريب الوريدي

ت	الفقرات	المشاهدة الاولى		المشاهدة الثانية		المشاهدة الثالثة	
		يعمل	لايعمل	يعمل	لايعمل	يعمل	لايعمل
1	غسل اليدين						
3	يرتدي رداء طبي						
3	ارتداء قناع الوجه						
4	يرتدي قفازات						
5	ازالة الغطاء من انبوب التوصيل الوريدي وتوصيله بالقنى الوريدية						
6	تغطية انبوب التسريب الوريدي وعبوة الدواء بغطاء عندما يكون العقار ذو حساسة للضوء						
7	استعمال ضمادة نظيفة لتغطية الجلد لتوفير الحماية من قطرات العلاج المتسرب						
8	التاكد من احكام غطاء القنى الوريدية بعد انتهاء تسريب الدواء						
9	تقييم حالة المريض اثناء اعطاء الدواء						
10	استعمال اكياس النفايات الصفراء للتخلص من (القفازات ,الصدرية,معدات التسريب الوريدية)						
11	استعمال حاوية بلاستك الصفراء (المواد الحادة) لجمع المحاقن ,العبوات والابر						
	ثانيا: للحقن العضلي						
1	تعقيم منطقة الحقن						
2	ارتداء قناع الوجه						
3	ارتداء الصدرية						
4	ارتداء القفازات						
5	تعقيم منطقة الحقن						
	ثالثا:العلاج عن طريق الفم						
1	ارتداء القفازات						
2	وضع العلاج في كوب مخصص لهذا الغرض						
3	تجنب لمس الدواء باليد مباشرة						

المجال الثالث :

معالجة النفايات الكيميائية

ت	الفقرات	المشاهدة الاولى		المشاهدة الثانية		المشاهدة الثالثة	
		يعمل	لايعمل	يعمل	احيانا	احيانا	احيانا
1	ارتداء الملابس الواقية (صدرية,قناع وجه,قفازات)عند جمع النفايات						
2	تجمع النفايات في كيس بلاستك اصفر						
3	تثبيت علامه تشير بأن الحاوية مخصصة للنفايات الكيميائية						
4	تثبيت حاويات المواد الحادة على ارتفاع بمستوى الذراع						
5	التخلص من حاويات المواد الحادة عند امتلائها تقريبا 4/3 حجمها .						
6	توضع حاويات النفايات (البلاستك) في مكان جيد التهوية والاضاءة.						
7	توضع حاويات النفايات (البلاستك) الكبيرة في اماكن بعيدة عن غرف المرضى والممرات						
8	حاويات النفايات البلاستيكية الكبيرة ذات غطاء محكمه.						

المجال الرابع: معالجة السوائل المنسكبة

ت	الفقرات	المشاهدة الاولى		المشاهدة الثانية		المشاهدة الثالثة	
		يعمل	لايعمل	يعمل	لايعمل	يعمل	لايعمل
1	تحديد منطقة انسكاب السوائل						
2	يقلل تدفق الهواء الى المنطقة عن طريق اغلاق الابواب والنوافذ وايقاف تشغيل المراوح وتكييف الهواء						
3	يقوم بارتداء معدات الوقاية الشخصية كما هو موضح في مجموعة الانسكاب.						
4	يجفف المنطقة جيدًا باستخدام مناشف او فوط.						
5	تجفيف السوائل يتم من حافة الانسكاب باتجاه المركز						
6	بمجرد إزالة الانسكاب ، ينظف المنطقة ثلاث مرات على الأقل باستخدام منظف معتدل وماء نظيف.						
7	يتخلص من جميع مواد التنظيف في كيس نفايات بلاستك اصفر						
8	غسل اليدين بعد الانتهاء من التنظيف.						

الاستاذ الفاضل

تحية طيبة:-

يرجى تفضلكم بملئ الحقول ادناه وابداء رأيكم وملاحظاتكم فيما يخص اسئلة الاستبانة التي بين ايديكم والتي هي جزء من متطلبات البحث للحصول على درجة الماجستير في علوم التمريض.مع فائق الاحترام والتقدير لسيادتكم.

اسم الخبير الكامل:

اللقب العلمي:

سنوات الخدمة:

مكان العمل:

اسم الباحث

حسنين يحيى شمران

2022/ /

Appendix (4)

قائمة اسماء الأساتذة الخبراء

اسم الخبير	اللقب العلمي	الاختصاص	مكان العمل	سنوات الخبرة
1. د. حسن علوان بيعي	استاذ	طب الاسرة والمجتمع	كلية الحلة الجامعة	42
2. د. راجحه عبد الحسن حمزة	استاذ	تمرض البالغين	جامعة الكوفة / كلية التمريض	37
3. د. أمين عجيل ياسر	استاذ	تمريض صحة الاسرة والمجتمع	جامعة بابل / كلية التمريض	37
4. د. حسين هادي عطية	استاذ	تمريض البالغين	جامعة بغداد / كلية التمريض	36
5. د. حكيمة شاكر حسن	استاذ	تمريض البالغين	جامعة بغداد / كلية التمريض	32
6. د. شذى سعدي محمد	استاذ	تمريض البالغين	جامعة بابل / كلية التمريض	24
7. د. حسام عباس داود	استاذ مساعد	تمرض البالغين	جامعة كربلاء / كلية التمريض	21
8. د. ماهر خضير هاشم	استاذ مساعد	لغة عربية	جامعة بابل / كلية التمريض	15
9. د. صادق عبدالحسين حسن	استاذ مساعد	تمريض البالغين	جامعة بغداد / كلية التمريض	12

Appendix (5)

السيد / السيدة

أنت مدعو للمشاركة بمشروع بحث علمي بعنوان:

التعامل الآمن مع ممارسات الادوية السامة للخلايا للممرضين العاملين مع مرضى الأورام في مستشفيات أورام الفرات الوسطى التعليمية.

يرجى أن تأخذ الوقت المناسب لقراءة المعلومات الآتية بتأنٍ قبل أن تقرر إذا ما كنت راغباً بالمشاركة أم لا. وبإمكانك طلب مزيداً من الإيضاحات أو المعلومات الإضافية عن أي أمر مذكور بالاستمارة أو عن الدراسة من الباحث أو اي مختص أخر.

أولا : معلومات البحث	
اسم الباحث	
اسم المشرف	
أهداف البحث	
الفترة المتوقعة لمشاركة الشخص في البحث	
الاجراءات المتبعة في جمع العينات	
المخاطر المتوقعة كنتيجة للمشاركة في البحث	لا يوجد
الفوائد التي ستعود على الشخص مقابل الاشتراك في البحث	لا يوجد

ثانيا: معلومات للشخص المشارك بالبحث
1. ان المشاركة في هذا البحث طوعية
2. بامكانك سَحب مشارَكتك من الدِراسة متى شئت ولأي سبب
3. من حقك ان لا تجيب عن اي سؤال لا ترغب باجابته
4. ان مشاركتك بالبحث لن تحملك اي نفقات مالية
5. ان مشاركتك بالبحث لا يترتب عليها اي مسائلة قد تضر بك شخصيا أو بعملك.
6. ان اسمك سيكون سريا و إن المعلومات الناتجة عن مشاركتك سوف تعامل بسرية تامة ولن يطلّع عليها أي شخص ما عدا الباحث والمشرف ولجنه الاخلاقيات عند الضرورة.
7. وأن المعلومات التي ادليت بها والنتائج العلمية لهذا البحث هي للأغراض العلمية فقط ولن تكون هناك أية إشارة إلى لك أو لعائلتك في أي منشور عن هذه الدراسة.
8. ان من حقك بمعرفة النتائج العامة للبحث، او اي نتائج تتعلق بك بصورة خاصة.

ثالثا: معلومات الاتصال
في حال وجود اي استفسار او شكوى من قبلك حول مشروع البحث بإمكانك الاتصال بالباحث أو لجنة اخلاقيات البحث في جامعة بابل – كلية التمريض
اسم الباحث حسنين يحيى شمران **رقم الهاتف 07739978138 البريد الالكتروني hassanshimran2@gmail.com**
لجنة أخلاقيات الابحاث العلمية – جامعة بابل – كلية التمريض

اسم المشترك بالبحث:

توقيعه :

التاريخ:

في حال كون عمر الشخص المشارك اقل من 18 سنة، او كونه غير قادر على فهم أو قراءة الاستمارة يرجى توقيع ولي أمره الشرعي.

اسم ولي أمر المشترك:

الخلاصة

الخلفية العلمية : جميع أقسام المستشفى مسؤولة عن الإدارة الآمنة للأدوية السامة للخلايا ، ويجب اتباع عدد من الأساليب المختلفة. من حيث إعادة التكوين السام للخلايا والإدارة ، فإن المنتجات والأجهزة المختارة سيكون لها تأثير كبير على الممارسة اليومية.

الأهداف : تقييم ممارسات التمريضيين فيما يتعلق بالتعامل الآمن مع الأدوية السامة للخلايا.

المنهجية: دراسة وصفية بالملاحظة تم إجراؤها من الفترة ما بين 11تشرين الاول.2022 وحتى 1 نيسان 2022. أجريت الدراسة في مستشفيات الأورام التعليمية في الفرات الأوسط. تم اختيار عينة غير احتمالية (هادفة) قوامها (125) ممرضاً يعملون في مركز الأورام وفقاً لمعايير خاصة. من أجل تقييم ممارسات التمريضيين للتعامل الامن مع العقاقير السامة للخلايا ، تم إعداد نموذج استبيان خاصة مقسم إلى ثلاثة أجزاء ؛ الجزء الأول يتكون من الخصائص الديموغرافية ؛ الجزء الثاني يتضمن معلومات عامة ؛ بينما تتعامل المجموعة الثالثة مع (6) مجالات تتعلق بممارسات التعامل الآمن مع العقاقير السامة للخلايا المستخدمة في مركز الاورام لمعالجة المرضى ، وتم عرض الاستبيان على (9) من الخبراء لمعرفة مصداقيته ، ولمعرفة الموثوقية والثبات للاستبانه اجريت دراسة مصغرة واظهرت النتائج الاحصائية مقدار الثبات(0.98).

النتائج: أظهرت النتائج أن النسبة الأكبر من مجتمع الدراسة 105 (84٪) كانت بين (20-30) سنة ، 87 (69.6٪) كانوا من الذكور ، في حين أن معظم عينة الدراسة 52 (41.6٪) كانوا من حملة شهادة الدبلوم. فيما يتعلق بالحالة الاجتماعية لعينة الدراسة ، كانت النسبة الأعلى 63 (50.4٪) من المتزوجين . لايوجد على علاقات ذات دلالة إحصائية بين ممارسات التمريضيين فيما يتعلق بالتعامل الآمن مع الأدوية السامة للخلايا وخصائصها الديموغرافية.

الاستنتاج: فيما يتعلق بممارسات الممرضين فيما يتعلق بالتعامل الآمن مع الأدوية السامة للخلايا أثناء الرعاية اليومية في مراكز الأورام ، تظهر النتائج الإحصائية مستوى معتدلاً من الممارسات

التوصيات: بناءً على نتائج هذه الدراسة ، يوصي الباحث بما يلي: تهيئة دليل خاص يركز على السياسات المتبعة للتعامل الآمن مع الأدوية السامة للخلايا وتوزيعها على أقسام مراكز الاورام التي تقدم رعاية مباشرة للمرضى لتحسين كفاءة التمريضيين فيما يتعلق بتدابير السلامه للتمريضيين ذات الصلة.

وزارة التعليم العالي والبحث العلمي

جامعة بابل/كلية التمريض

التعامل الآمن مع ممارسات الادوية السامة للخلايا للممرضين العاملين مع مرضى الأورام في مستشفيات أورام الفرات الوسطى التعليمية.

رساله مقدمة

الى مجلس كلية التمريض ولجنة الدراسات العليا \ جامعة بابل

من قبل

حسنين يحيى شمران

وهي جزء من متطلبات نيل شهادة الماجستير في علوم التمريض

بإشراف

الأستاذ

د. سحر ادهم علي

شوال 1443 *ايار 2022*