

An-Najah National University
Faculty of Graduate Studies

**Assessment of Knowledge and Practice for Safe Handling of
Antineoplastic Drugs among Healthcare Providers in
Oncology Departments in Palestinian Hospitals**

By

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**This Thesis is Submitted in Partial Fulfillment of the Requirements for
the Degree of Master of Clinical Pharmacy, Faculty of Graduate
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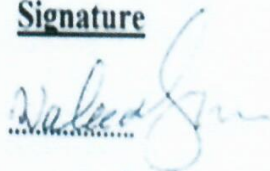
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- 3. Dr. Adham Abu-Taha / Internal Examiner**

Signature

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Dedication

I want to dedicate this work to my parents for their unconditional love, and
motivation

To my husband for his unwavering support, and patience

To my little princess Eilaz for filling my life with light moments

last but not least, to my best friend Nada Rajabi for her support and
encouragement

Raya M. Said

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First, and for most, I am always indebted to God, The most gracious, the most merciful.

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Last but not least, to all participants by whom this study was done. Without them, this work would not have been possible.

Raya M. Said

الإقرار

أنا الموقعة أدناه مقدمة الرسالة التي تحمل العنوان:

Assessment of Knowledge and Practice for Safe Handling of Antineoplastic Drugs among Healthcare Providers in Oncology Departments in Palestinian Hospitals

**تقييم معلومات وجودة أداء مقدمي الرعاية الصحية حول التدبير الآمن مع الأدوية
المضادة للأورام في أقسام الأورام في المستشفيات الفلسطينية**

أقر بأن ما اشتملت عليه الرسالة هو من نتاج جهدي الخاص، باستثناء ما تمت الإشارة إليه حيثما ورد، وأن هذه الرسالة ككل أو أي جزء منها لم يقدم من قبل لنيل أي درجة أو لقب علمي أو بحثي لدى أي مؤسسة تعليمية أو بحثية أخرى.

Declaration

The work provides in the thesis, unless otherwise referenced, is the own researcher's own work and has not been submitted elsewhere for any other degree or qualification.

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التوقيع:

Date: 06.02.2021

التاريخ:

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Synonyms and Abbreviations

¹ Synonyms	anticancer agents/drugs, antineoplastic drugs, antineoplastic, cytostatic agents/ drugs, cytostatics, cytotoxic agents/drugs. In this thesis, the synonyms are used interchangeably
χ^2	Chi-square test
ANPD	Antineoplastic Drug
ASHP	American Society of Hospital Pharmacists
ASTM	American Society for Testing and Materials
AVH	Augusta Victoria Hospital
BSC	Biological Safety Cabinet
CSTD	Closed-System Transfer Device
DNA	Deoxyribonucleic Acid
HCP	Healthcare Provider
HCW	Healthcare Worker
HD	Hazardous Drug
IARC	International Agency for Research on Cancer
ISOPP	International Society of Oncology Pharmacy Practitioners
IV	Intravenous
LAFW	Laminar Airflow Workbench
NIH	National Institutes of Health
NIOSH	National Institute for Occupational Safety and Health
NNUH	An-Najah National University Hospital
ONS	Oncology Nursing Society
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
RNA	Ribonucleic Acid
SD	Standard Deviation
SPSS	Statistical Package for the Social Science
USP	United States Pharmacopeia

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Abstract

Background: Due to increasing cancer incidence and introducing more complex treatment regimens, the demand for using antineoplastic drugs (ANPDs) is expected to increase; this will lead to more occupational exposure to these drugs among healthcare providers (HCPs). Due to their toxicity, these drugs require extreme precautions when being handled and used.

Objectives: The current study aimed to assess the knowledge and practice among nurses, pharmacists, pharmacist assistants toward the safe handling of ANPDs, also to identify the association of this knowledge on practice, and determine the barriers that hinder HCPs from using safety measures; in the quantitative study. Then, to explore the perceptions and beliefs of HCPs regarding their workplaces' needs to handle ANPDs safely; in the qualitative study.

Methods: An explanatory sequential mixed-methods study was conducted from August to November 2018 in six Palestinian hospitals, using an anonymous self-administered data collection form. The data were collected on staffs' knowledge, practice, and barriers, and the analysis was

done using SPSS version 25. A *p-value* <0.05 with a 95% confidence interval was considered statistically significant.

Results: A total of 96 HCPs participated in this study. Their mean $\pm$ SD age was 31.9 ± 8.6 years, ranging from 22-55 years. Most of them were nurses (n= 60,62.5%), with a female predominance (n= 66,68.8%). About two-thirds of the participants were not trained on the safe handling of ANPDs. Their knowledge and practice scores toward safe handling of ANPDs were relatively good, with the mean $\pm$ SD scores for knowledge and practice were 84.6 ± 13.8 , 74.33 ± 25.8 , respectively. Participants' education level and those that received training were significantly associated with knowledge grade ($P=0.015$), ($P=0.04$), respectively. High workload, lack of policy, and unavailability of personal protective equipment were the main barriers reported.

Conclusions: While the HCPs' knowledge of safe handling of ANPDs is acceptable, training is not appropriate. Periodic and consistent training and update of HCPs' knowledge supported by policies to follow guidelines implantation is recommended.

Keywords: Antineoplastic Drugs, Safe handling, Knowledge, Occupational exposure, Palestine.

Chapter one

Introduction

1.1 Background

"To avoid the worst ... Put the safety first."

Cancer is not just a single disease; it is a group of numerous diseases, all are sharing in common biological properties of the cells that compose the tumors, including unregulated cell growth, impaired cellular differentiation, invasiveness, and metastatic potential [1].

Worldwide, more than 18 million new cases of cancer were diagnosed in 2018 [2]. Furthermore, that number is expected to rise to 27.5 million new cancer cases by 2040 [3]. In Palestine, about three thousand cancer cases were diagnosed in 2018, with a 5.8% increase than the cases diagnosed in 2017 [4].

Antineoplastic Drugs¹ (ANPDs) are medicines designed to stop or slow cancerous cells' growth. Including alkylating agents, anti-metabolites, antibiotics, mitotic inhibitors, and hormones. Currently, ANPDs are prepared and administered to treat cancer and other rheumatologic and immunologic diseases [5, 6].

Each of these drugs had a distinctive pharmacological property that interferes with cell division. Unfortunately, due to their nonselective mode of action, they exhibit their effects on cancerous and healthy cells, which

leads to adverse health effects for patients and healthcare providers (HCPs) who handle them during their daily duties [7].

This increased cancer incidence, combined with the use of high-dose chemotherapy and a combination of more complex treatment regimens, and the use of ANPDs for diseases other than cancer, would increase the HCPs' risk of exposure to these drugs.

1.2 Hazardous Effects of Antineoplastic Drugs on Healthcare Workers

The term "*hazardous drug*" (HD) was first introduced by the American Society of Health-System Pharmacists (ASHP) in 1990 [8]. In 2014, it was revised by the National Institute for Occupational Safety and Health (NIOSH) [9]. (Appendix A, Table 1.1 comprises the two definitions). Currently, HD is defined as a drug with one of the following characteristics: carcinogenicity, genotoxicity, reproductive toxicity, teratogenicity, or a drug with a composition or toxicity profile close to HD [9]. Indeed, slightly more than half of the hazardous drugs are classified as antineoplastic agents, while the remainder includes some hormonal agents, immune-suppressants, antiviral medications, and others [10].

The toxic effects of ANPDs have been well known since their release in the 1940s [11]. Nevertheless, it took about four decades before the first study reported elevated indicators of mutagenic substances in urine samples from oncology nurses working with these drugs [12]. This finding was supported by various researches examining urine mutagenicity, gene

aberrations, sister chromatid exchange of HCPs who handle these drugs [13-17].

Over time, the literature associated exposure to ANPDs in the workplace with acute or chronic health effects to HCPs. Acute effects include irritation to the skin and eyes, vomiting, light headache, dizziness, hair loss, sore throat, cough, and allergic reactions [18-21]. Chronic effects include adverse reproductive outcomes (such as infertility, spontaneous abortions, congenital disabilities, and congenital malformations) [22-25], leukemia, and other cancers [26].

Considering the nature of ANPDs and the ability of many of them to bind to DNA, RNA, and proteins, it would be expected that many of them are both mutagenic and carcinogenic. (Appendix A, Table 1.2) lists the known human carcinogens among ANPDs in clinical use by the International Agency for Research on Cancer (IARC), which is based on *"the strength of the evidence of carcinogenicity arising from human and experimental animal data."* [27].

1.3 Occupational Exposure to Antineoplastic Drugs

In the United States, more than 8 million healthcare workers are potentially exposed to ANPDs in their workplaces [28]. Occupational exposure to ANPDs could begin upon receipt of the product from the manufacture. It has been reported that the surface of the drug vials and cartons may be contaminated with ANPDs as supplied by manufacturers [29-32]. Contaminated drug packaging and vials represent a risk of dermal

exposure to cytotoxic drugs for employees even before preparing ANPDs for patient treatment.

Exposure to ANPDs may occur through dermal and mucosal absorption, inhalation of contaminated aerosol and particulates, unintentional needlestick injection, or accidental ingestion from hand-to-mouth contact [33]. Examples of potential opportunities for exposure to ANPDs based on practice shows in (Appendix A, Table 1.3).

The risk of occupational exposure can be dramatically minimized by; application of engineering controls such as Biological Safety Cabinet (BSC) and Closed-System Transfer Devices (CSTDs), and using proper procedures and Personal Protective Equipment (PPE) during handling ANPDs [9].

Engineering controls provide the highest level of protection against ANPDs exposure. A CSTDs is the only engineering control available for drug administration. Although these devices are available since 1990, many organizations have not considered them to handle ANPDs [34].

1.4 History of Safe Handling Guidelines

In the early 1980s, after recognizing severe health risks to the exposed health care workers, many health professional organizations in the United States and other countries have published guidelines for the safe handling of hazardous ANPDs [35]. In 1981, the Society of Hospital Pharmacists of Australia released the first safe handling guidelines [36]. Followed by

different guidelines from several organizations including the Oncology Nursing Society (ONS) in 1982 [37], the National Institutes of Health (NIH) in 1983 [38], the ASHP in 1985 [39], the American Medical Association's Council on Scientific Affairs in 1985 [40] and the Occupational Safety and Health Administration (OSHA) in 1986 [41].

Despite the existence of all these guidelines at that time, many reports indicated continuing healthcare workers' exposure to antineoplastic drugs in workplace settings [42, 43]. Thus, the National Institute for Occupational Safety and Health (NIOSH) published a NIOSH Alert in 2004 [9]. Then followed by, the International Society of Oncology Pharmacy Practitioners (ISOPP) standards on the safe handling of cytotoxic drugs in 2007 [44]. In 2016, the United States Pharmacopeia (USP) convention released a new general chapter, Chapter <800>: Hazardous Drugs_Handling in Healthcare Settings–[45]. Even with these guidelines, studies continue to document ongoing exposure [46-52]. In 2018, many professional organizations updated their guidelines, including the ASHP [53] and the ONS [54].

1.5 Recommendations for Safe Handling of Antineoplastic Drugs

The following recommendation is a summary of the highlights of safe handling guidelines, which have been described in more detail in (NIOSH Alert [9], USP Chapter <800> [45], and ASHP Guidelines [53]). They include engineering controls, administrative controls, work practice controls, and PPE.

1.5.1 General Precautions

The critical component of USP <800> is the identification of hazardous ANPDs in the workplace. Each facility must create and maintain its own list of HDs and review the list annually [45]. Also, all personnel involved in ANPDs handling should possess a recognized qualification or have certified training relevant to their position. Retraining and competency testing should be done yearly. This training should consist of the following elements; the potential risk of exposure, utilization of BSC, how to use PPE, spill kit, and how to deal with transport and cleaning procedure. (Appendix A, Table 1.4) [55] summarizes the PPE needed for possible practices in the health care setting. In contrast, (Appendix A, Table 1.5) [54] shows the standards for appropriate PPE.

1.5.2 Receiving and Storage of Antineoplastic Drugs

Drug packages, bins, shelves, and storage areas for ANPDs must mark with distinctive labels identifying special handling precautions. Antineoplastic drug stock should be stored separately from other medications. The area of storage should have sufficient exhaust ventilation to dilute and remove any airborne contaminants.

Any person involved in receiving or unpacking antineoplastic drugs must follow strict procedures when handling them. Two pairs of chemotherapy gloves, respiratory protection, and eye protection should be worn to protect from dermal and inhalation exposures [9, 44, 53].

1.5.3 Antineoplastic Drugs Preparation

The compounding of antineoplastic drugs should occur in a controlled area where access is limited to authorized personnel trained in handling requirements. For preparing antineoplastic drugs, a designed room supplied with a BSC or an isolator is required. BSCs and isolators should be appropriately cleaned and maintained to ensure maximum efficiency and reduce personnel exposure [45, 53, 54]. A horizontal Laminar Airflow workbench (LAFW) should not be used for antineoplastic drug preparation, as this design results in significant exposure of the worker and work area [15].

Supplemental engineering controls such as CSTD components reduce leakage during the transfer of HDs from vials to syringes or IV bags during preparation and they adjust controls to offer an additional level of protection [56].

Only individuals trained in this type of practice should do so. While reconstituting and admixing antineoplastic drugs, PPE must be worn, including (double chemotherapy gloves, a disposable chemotherapy gown, facial protection, inhalation protection, head cover, and overshoes) [9, 44, 45, 53].

Chemotherapy gloves must meet the American Society for Testing and Materials (ASTM) standard, and they should be changed every 30 minutes. If torn, puncture, or contaminate, they must be changed

immediately. Also, hands must be washed with soap and water after removing gloves [45].

1.5.4 Antineoplastic Drugs Administration

Access to the administration area should be restricted to patients receiving therapy and essential staff. When the ANPDs are administered eating, drinking, and applying makeup should be avoided. For inpatient therapy, hanging or removing ANPDs should be scheduled to reduce family members and staff's exposure. For the administration of ANPDs in outpatient or clinic settings with patients and their family members near the compounding area, care must be taken to minimize environmental contamination and to maximize the effectiveness of decontamination activities [47, 57-61].

Appropriate PPE must be worn when administering ANPDs [55]. Two pairs of tested chemotherapy gloves, protective chemotherapy gown, eye/face protection, and respiratory protection are required for administering ANPDs. Use Luer-Lock fittings for all needleless systems, syringes, needles, ancillary devices, infusion tubing, and pumps. If a CSTD cannot be used, position gauze pads to catch leaks from needleless and other devices that may leak at connection points [54].

1.5.5 Antineoplastic Drugs Cleaning/ Spill Management

Written procedures must be developed to prevent spills and govern the cleaning of HD spills. These procedures must specify personnel responsible

for spill management, dependent on the spill's size and scope. Spills must be contained and cleaned up immediately [62].

Spill kits containing all of the materials needed to clean up spills of HDs should be readily available in all areas where HDs are stored, administered, or prepared. Signs must be available to warn of restricted access to the spill area [56].

1.6 Problem Statement

Evidence from many studies has shown that HCP are exposed to cytotoxic hazards through the preparation and administration of ANPDs due to unsafe handling practices [63]. Studies involving the biological monitoring of staff and their working environment have demonstrated adverse health effects [64].

Therefore, the knowledge and safe practice in handling ANPDs are of paramount importance to help prevent occupational dangers to the HCPs, patients, and people who visit the hospital's oncology departments.

1.7 Rationale/Justification

Studies to assess the health care provider's knowledge and practice on the safe handling of ANPDs have not been done in Palestine. This study seeks to find the level of knowledge and practice of HCP at Oncology Palestinian hospitals in the handling of ANPDs.

This study's findings will promote safe ANPDs handling practice, which will enable HCP to reduce the level of hazardous exposure to themselves, their patients, and the public. It will also strengthen the implementation of institutional guidelines by training health care workers on correct ANPDs handling procedures and practices.

1.8 Study Objective

1.8.1 General Objective

To assess the knowledge and practice on the safe handling of antineoplastic drugs among HCPs at Palestinian oncology hospitals.

1.8.2 Specific Objectives

1. To determine the level of knowledge on the safe handling of antineoplastic medications by HCP at Palestinian hospitals.
2. To assess the practice of handling antineoplastic drugs among HCPs in our hospitals.
3. To find out the challenges and barriers faced by HCP when handling these drugs in Palestinian hospitals.

1.9 Research Questions

1. What is the level of HCPs' knowledge in handling antineoplastic drugs in Palestine?

2. What is the practice of handling antineoplastic drugs by HCP in Palestine?
3. Are there any challenges faced by health care workers when handling antineoplastic drugs in Palestine?

Chapter Two

Literature Review

2.1 Knowledge and Practice of Handling Antineoplastic Drugs

Lack of knowledge, economic, and sociocultural factors significantly influences the malicious behavior related to the handling of ANPDs by HCWs [65, 66]. The primary source of information for the safe handling of antineoplastic drugs is in-service training [67]. Many studies were done to assess the knowledge and practice of the safe handling of ANPDs among HCWs and they indicated inadequate knowledge or practice regarding the safe handling of ANPDs.

Several similar studies to our study were done in the Middle East and Gulf countries, including:

2.1.1 Kingdom of Saudi Arabia

In 1997, a study was conducted by Al-Ghamdi et al. to investigate the conditions and proficiency of handling cytotoxic drugs, showed serious inadequacies in equipment and expertise in handling cytotoxic agents in their hospitals[68].

2.1.2 Israel

In 2001, a study was done by Ben-Ami et al. on 31 hospital-based nurses daily exposed to cytotoxic drugs, showed a gap between the nurses' knowledge and their actual behavior and compliance with safety

procedures. This study also claimed that hospitals' inspective and supportive systems increase nurses' willingness to protect themselves [69].

2.1.3 Turkey

In 2004, a cross-sectional study carried out by Turk et al. found that the level of knowledge of the nurses concerning antineoplastics was not satisfactory. Furthermore, the nurses did not comply with the recommended health safety measures. This study also revealed that in-service training is a handy tool to increase knowledge level [70].

In 2006, another descriptive study was conducted by Kosgeroglu et al. in west Turkey. Nurses showed that their actual administration method was insufficient according to their level of information. The ratio for nurses' usage of the BSC during the preparation of chemotherapeutic drugs was meager. Furthermore, only 7.4% of nurses had received in-service education about chemotherapeutics [71].

2.1.4 Cyprus

In 2010, a cross-sectional study was performed by Kyprianou et al. found that most nurses were aware of the potential hazards associated with the handling of ANPDs. And, they had a high level of compliance with PPE and BSC during reconstitution and preparation of ANPDs. However, only 33% reported having received specialized training for safe handling of ANPDs [72].

2.1.5 Jordan

In 2015, a study was done by Al-Azzam et al. on pharmacists and nurses to evaluate their compliance with standard safety guidelines during the preparation and administrations of antineoplastic medications in Jordanian hospitals. This study showed a satisfactory knowledge level of exposure risks for these drugs. However, the safety measures used in their hospitals were not in compliance with the guidelines and required further improvement [73].

2.1.6 Iraq

In 2016, a cross-sectional study design was undertaken on oncology nurses (n= 27) by Esmail et al. showed that most of the nurses had fair knowledge and practices of safe handling chemotherapy [74].

2.1.7 Iran

In 2018, a cross-sectional study was performed on oncology nurses (n= 80) by Alehashem and Baniyadi, which reported adequate knowledge, attitude, and practice score. However, the training and information sources were not appropriate [66].

2.1.8 Egypt

In 2019, a similar study was done by Zayed et al. among the oncology nurses (n=55) at the oncology department in Tanta University Hospital demonstrated an inadequate practice of safe handling of ANPDs

and poor implementation of guidelines among the oncology nurses. This necessitating more frequent in-service training and an audit system to monitor and evaluate performance after training [75].

A lot of additional studies in this field had done in other countries, such as;

In 2014, NIOSH conducted one of the most extensive web surveys of healthcare workers in the United States. In this survey, Boiano et al. found that the nurses did not always follow safe handling practices despite guidelines at that time [76].

In 2015, a similar study took place in Pakistan. Nurses were found to be deficient in knowledge of handling ANPDs. About 20% of them were not trained in handling cytotoxic drugs, and 43.3% believed that PPE was unnecessary during work [77].

In 2015, a cross-sectional study aimed to assess the knowledge, perception, and behavior of all HCWs, not only nurses, regarding the safe handling of ANPDs was conducted in Canada. This study suggested that knowledge associated with the safe handling of antineoplastic drugs can be improved, especially among job categories not tasked with drug preparation or drug administration. Moreover, it also showed a gap between knowledge and compliance with glove usage and hand hygiene. Training is also recommended to improve healthcare workers' perceptions of the risks associated with antineoplastic drugs [7].

In 2016, a cross-sectional study was conducted in Kenya among healthcare workers to assess the knowledge, practice, and challenges on the safe handling of cytotoxic drugs by Sheikh. This study showed a considerable gap between their workers' knowledge and practice [78].

In 2017, a cross-sectional descriptive study among oncology nurses (n= 100) was conducted in Nigeria by Nawagbo et al. this study showed a good knowledge of chemotherapy occupational protective measures and guidelines among the nurses translated to good practice [79].

2.2 Challenges Associated with the Handling of Antineoplastic Drugs

Despite that HCPs are knowledgeable about ANPDs exposure, their use of safety measures during the handling of these drugs is low [80]. The challenges that workers most reported include high workload, limited time, unavailability of PPE, and PPE comfort [11, 17, 81].

Chapter Three

Methodology

3.1 Study Design

An explanatory sequential mixed-methods study was achieved using a semi-structural self-administered data collection form to assess the knowledge and practice among nurses, pharmacists, and pharmacist assistants toward the safe handling of ANPDs in Palestinian hospitals, also to identify the association of this knowledge on their practice, and determine the barriers that hinder them from using safety measures; in the quantitative study. Then, to explore the perceptions and beliefs of HCPs regarding their workplaces' needs to handle antineoplastic drugs safely; in the qualitative study.

3.2 Period and Location of the Study

This study was conducted from August to November 2018 at the six oncology hospitals in Palestine (governmental and private centers) were selected. Two of them in the south; Augusta Victoria Hospital (AVH) in Jerusalem, and Beit Jala Governmental Hospital in Bethlehem – Adult Department and Huda Al-Masri Pediatric Department –, And four in the north; An-Najah National University Hospital (NNUH) in Nablus, Al Watani Hospital in Nablus, Martyr Dr. Thabet Thabet Governmental Hospital in Tulkarm, and finally Jenin Governmental Hospital in Jenin.

3.3 Study Population

All nurses, pharmacists, and pharmacist assistants who were handling antineoplastic drugs in the drug stores, hospitals' pharmacies, daycare units, and inpatients' oncology wards in mentioned hospitals at the time of data collection. Each center was visited multiple times to involve the largest possible sample size. Due to the scarcity of physicians who directly handle ANPDs drugs in our hospitals, they were not included in this study.

3.4 Inclusion and Exclusion Criteria

All nurses, pharmacists, and pharmacist assistants who handle antineoplastic drugs in mentioned hospitals during the study period were included. HCPs who skipped the practice section were excluded only from the analysis of this section.

3.5 Data Collection Procedure

A semi-structured, self-administered data collection form was developed from multiple sources to meet the study objectives. It consisted of sociodemographic characteristics, knowledge, and practice on antineoplastic drugs' safe handling, barriers to use safety measures, and three open-ended questions. Many questions were adapted from a similar study done in Kenya [78]. This data collection form was validated; the validation process was simply by various studies, cross-referencing to clarify the participant's understandings, and finally analyzing the findings

and comparison against the guideline's recommendations. All collected data were used only for the current study.

3.6 Data Collection Form

The finalized data collection form (Appendix B) was divided into two main parts; part one contains forced-choice questions, which consists of four sections:

1. The first section was covered the sociodemographic data, including; age, gender, marital status, level of education, occupation, years of experience in the profession, and training.
2. The second section was aimed to evaluate the level of knowledge regarding the safe handling of ANPDs; using PPE, hand washing, cleaning, disposal, and effects of exposure to cytotoxic drugs.
3. The third section was made to determine the current practice towards the standard procedure of ANPDs handling.
4. The Last section valuated barriers that faced HCPs to use PPE.

Part two contained three open-ended questions regarding policies and safe handling protocols of antineoplastic drugs.

3.7 Variables of the Study

The dependent variables of the study were the knowledge and the practice of HCPs toward the safe handling of ANPDs. While the

independent variables were: clinical setting, age in years, gender, profession, educational level, experience on the safe handling of ANPDs in years, and ever receiving training related to safe handling practices. When the association between knowledge and practice was studied, knowledge was the dependent variable. Then the practice was the dependent variable when the association between practice and barriers was checked.

3.8 Data Management and Analysis

Data from data collection forms were statistically described in terms of mean $\pm$ standard deviation ($\pm$ SD), and range, or frequencies (number of cases), and percentages when appropriate. A comparison between the study groups was made using Chi-square (χ^2) test. Fisher's exact test was used instead when the expected frequency is less than five. Two-sided p values less than 0.05 were considered statistically significant. All statistical calculations were done using the computer program IBM ® SPSS (Statistical Package for the Social Science; IBM Corp, Armonk, NY, USA) release 25 for Microsoft Windows. All the answers from the open-ended question were entered into Microsoft Excel® 2016 and then carefully being coded and analyzed.

3.9 Operational Definition

3.9.1 Knowledge

Respondents were asked ten questions about the safe handling of antineoplastic drugs. Respondents were awarded one point for each right

answer and zero for the wrong answer. The sum was categorized into three categories; good, fair, poor knowledge. The participants who scored 7.5 and above were considered to have good knowledge; those who scored 5 to 7.5 were considered fair. Those who scored below five were considered to have poor knowledge.

3.9.2 Practice

Each participant responded to a set of questions applicable to their scope of practice of handling ANPDs. The practice was assessed by three categories; good, fair, and poor. If a study participant responded correctly to a question, was given a score of one point. An overall score was determined for each study participant by adding up the scores across the practice questions applied to study participants. A score of 75% and above was considered good, 50% to 75% fair, and below 50% poor.

3.10 Ethical Considerations

3.10.1 Ethical Approval

Permissions to carry out this study were confirmed by the Institutional Review Board (IRB), the Palestinian Ministry of Health, and the An-NNUH (Appendix C, D, E).

3.10.2 Informed Consent

Informed consent from study participants was sought. Each participant was requested to sign a consent form before inclusion in the study

(Appendix F). This was done only after the risks, benefits, and ethical considerations are fully explained and understood by the participants.

3.10.3 Confidentiality

The information regarding the study participants' identity was kept confidential. Identification information such as participant's names was not included in the data collection forms. A serial number was assigned to each participant.

Chapter Four

Results

4.1 Sociodemographic Profile of Study Participants

A total of 96 healthcare providers were invited to participate in the study; all of them responded. Four of them were excluded from the practice section; because they left it blank. Fifty-six participants answered the open-ended questions.

The mean $\pm$ SD age was 31.9 ± 8.6 years, with a median of 28 and a range from 22 to 55 years old. More than two-thirds of the study participants were female (n= 66, 69%). About half of them were married (n= 56, 58%). Most of the HCPs were nurses (n= 60, 63%) while 28 (29%) were pharmacists. More than half were Bachelor's degree holders (n= 65, 68%). About half of the participants (n= 54, 56%) make 50 or less preparation or administration in a typical week. The sociodemographic characteristic of the study participants is presented in (Table 4.1).

4.2 Training Among Study Participants

Only thirty-four (35%) of study participants reported having been trained in the handling of antineoplastic drugs; they include 29 nurses (85%) and five pharmacists (14.7%). None of the pharmacist assistants in this study ever received any training related to safe drug handling of ANPDs. Twenty-two (64.7%) had received their training for more than one year before the time of the study, and 11 (35.3%) less than 12 months.

Thirty (88%) obtained their training from workshops. (Figure 4.1) shows the source of formal training that study participants received.

4.3 Assessment of Knowledge

4.3.1 Level of Knowledge on the Safe Handling of Antineoplastic Drugs

The mean $\pm$ SD score of knowledge was 8.46 ± 1.4 out of 10, with a median of 9.0 and a range from 5 to 10 points. Generally, the level of knowledge was high, with 76 HCPs (79.2%) had a good knowledge scoring – 7.5 or above score–, and with no poor knowledge –score less than 5– (Figure 4.2). A summary of HCPs' level of knowledge is described in (Table 4.2) which shows that 100% of HCPs' understood the need to wear gloves when handling antineoplastic drugs and that safe handling protects them from HD exposure. However, only 36 (37.5%) knew that the surgical mask could not protect from cytotoxic aerosols.

4.3.2 Association between Demographic Characteristics and Knowledge Status

Healthcare workers who are masters' degree holders (9.21 ± 0.58) had a higher level of knowledge compared to Bachelor's degree holders (8.42 ± 1.36), and to Diploma degree holders (8.00 ± 1.73), they significantly differed $p = 0.044$. Furthermore, workers who had received formal training had a higher level of knowledge than those who never received any training on the safe handling of ANPDs; they significantly differed $\chi^2 = 4.204$, $p = 0.04$, $p < 0.05$. The Chi-square tests also indicated no statistically

significant differences between the level of knowledge and hospitals, age, gender, or profession. (Table 4.3) shows the association between the level of knowledge and demographic characteristics.

4.4 Assessment of Practice

4.4.1 Practice in the Safe Handling of Antineoplastic Drugs

The study participants answered the questions related to their scope of practice in the handling of antineoplastic drugs. Some of them were involved in more than one scope of practice. Most healthcare workers were involved in the administration of antineoplastic drugs (n= 58, 60.4%), followed by 53 (55.2%), 52 (54.2%), 50 (52.1%), and 41 (42.7%) in receiving and storage, cleaning, disposal, and preparing of antineoplastic drugs, respectively.

4.4.2 Safety Measures During Several Practices

Fifty-three respondents were involved in receiving and storage practice. The mean $\pm$ SD score for them was 65.5 ± 27.5 , with a median of 75.0 and a range from 0.0 to 100.0 score. Among them, forty (75.5%) segregated the cytotoxic drugs from other medicines during storage. About half of the participants (n= 30, 56.6%) used PPE when receiving cytotoxic drugs (Table 4.4).

Forty-one respondents were involved in preparation and compounding practice. The mean $\pm$ SD score for them was 81.0 ± 14.8 , with a median of 82.6 and a 37.5 to 100.0 score range. All of them used

PPE while preparing cytotoxic drugs. Only 6 (14.6%) always used a CSTD. Furthermore, 15 (36.6%) used Lure-lock fitting for all needles, syringes, infusions (Table 4.4). Of all participants involved in preparation practice, there were 18 pharmacists (43.9%) and 23 nurses (56.1%) (Table 4.5).

Fifty-eight respondents were involved in administration practice. The mean $\pm$ SD score was 86.6 ± 13.1 , with a median of 90.7 and a 40.0 to 100.0 score range. All were using PPE when they were administering the cytotoxic drugs. Per contra, 43 (74.1%) used PPE when handling patients' excreta (Table 4.4).

Fifty-two respondents were involved in cleaning practice. The mean $\pm$ SD score for them was 80.2 ± 20.1 , with a median of 86.2 and 16.67 to 100.0 range. Most of them (n= 51, 98.1%) washed their hands after cleaning cytotoxic areas and spills. In contrast, thirty-two (61.5%) had a cytotoxic spill kit available in their workplace. About half of the HCPs 28 (53.8%) used cleaning reagents when cleaning cytotoxic areas (Table 4.4).

Fifty respondents were involved in disposal practice. The mean $\pm$ SD score for them was 79.6 ± 17.6 , with a median of 79.6 and a range from 12.5 to 100.0 score. Most of them (n= 49, 98.0%) washed their hands with soap and water immediately after the disposal of cytotoxic drugs. Furthermore, thirty (60.0%) segregated cytotoxic waste before disposal (Table 4.4).

Concerning the type of PPE used in each practice with the handling of antineoplastic practice, (Table 4.6) shows that there is no obligation in using PPE during the receiving and storage of antineoplastic drugs. While there is a little commitment to other practices.

4.4.3 Practice Score

The mean $\pm$ SD practice score was 74.6 ± 25.8 , with a median of 80.0 and a range from 0.0 to 100.0 score. Two-thirds (63.0%) of healthcare workers scored a good practice –75.0% or above score-, while 21(22.8%) had a fair practice-50% - and 13 (14.1%) had poor practice (Figure 4.3).

4.4.4 Association Between Demographic Characteristics and Practice Score

Chi-square test or Fishers' exact test of association between practice score and different demographic characteristics were performed. Younger HCPs had a better practice than older ones; findings were statistically significant between practice score and age $\chi^2 = 9.69$, $p = 0.008$, $p < 0.05$. Also, Nurses showed a better Practice than Pharmacists; ($p = 0.000$). and years of experience ($p = 0.037$). However, there was no statistically significant association between practice score and gender and education level. (Table 4.7)

4.4.5 Association Between Practice Score and Knowledge Status

Compering knowledge states with practice scores, 57.5% of healthcare workers who had good knowledge had a good practice, while

16.4% had poor practice. And 84.2% who had fair knowledge had good practice, while only 5.3% had poor practice. There was no statistically significant between knowledge state and practice scores using the Chi-square test ($p = 0.144$) (Table 4.7).

4.5 Barriers to use Personal Protective Equipment's

4.5.1 Challenges to Safe Handling of Antineoplastic Drugs

The HCPs' barriers towards using PPE were assessed by nine reasons that may prevent them from wearing protective measures. The high workload was the most significant barrier considered by participants (58; 63.0%), while no policy required PPE as a second challenge (51; 55.5%) (Table 4.8).

4.5.2 Association Between Challenges and Practice

Chi-square test or Fishers' exact test of association between practice score and different barriers to using PPE were performed. Findings were statistically significant $\chi^2 = 26.71$, $p = 0.000$, $p < 0.05$ between practice score and the barrier of not trained to use PPE. Furthermore, $p = 0.000$ between practice score and availability of policy requiring PPE use. However, there was no statistically significant association between practice score and high workload, thinking that PPE unnecessary and PPE uncomfortable to wear (Table 4.8).

4.6 Open-ended Questions Survey

Fifty-six participants have answered four open-ended questions;

Question one was: *"In your opinion, what changes are needed to improve the safe handling practice in your workplace?"* The majority of healthcare workers (37 out of 56) said that they need more training programs on the safe handling of cytotoxic drugs, and some (19 out of 56) indicated the need to provide a PPE in their hospitals. Others said that they need an adequate staff number to deal with a high workload. While other answers were related to improving the workplace conditions, include; allocate a place to prepare ANPDs and a safety station such as eyewash and emergency shower for any accident, bring BSC, apply policies and protocol for safe handling of cytotoxic drugs, and provide suitable containers for sharp disposal of items contaminated with cytotoxic drugs. (figure 4.3)

Question two was: *"What would be the top two benefits of putting a chemotherapy safety protocol in your workplace?"* Almost all the participants (48 from 56) put protection for themselves at the top of the list. Protection for the patients was the second benefit from their view. Also, many said this would reduce medical errors. Other benefits mentioned by HCPs were: Facilitating the handling of these drugs, preparing more sterile preparations, reducing the incidence of leakage, and improving workers' disciplines to PPE (Figure 4.4).

Table 4.1: Sociodemographic and occupational characteristics of study participants in the Palestinian hospitals (N= 96)

Demographic characteristics	Classification	n (%)
<i>Clinical Setting</i>	Beit Jala Hospital (Bethlehem)	13 (13.5)
	Huda Almasri Department (Bethlehem)	9 (9.4)
	Augusta Victoria Hospital (Jerusalem)	19 (19.8)
	An-Najah National University Hospital (Nablus)	28 (29.2)
	Al Watani Hospital (Nablus)	15 (15.6)
	Martyr Dr. Thabet Thabet Governmental Hospital (Tulkarm)	8 (8.3)
	Jenin Government Hospital (Jenin)	4 (4.2)
<i>Age Category (Years)</i>	≤ 30	58 (64.4)
	> 30	32 (35.6)
<i>Age Distribution</i>	Mean = 31.9 SD = 8.641 Max = 55 Min= 22	
<i>Gender</i>	Male	30 (31.3)
	Female	66 (68.8)
<i>Marital status</i>	Single	40 (41.7)
	Married	56 (58.3)
<i>Profession</i>	Pharmacist	28 (29.2)
	Nurse	60 (62.5)
	Pharmacist assistant	8 (8.3)
<i>Education Level</i>	Master degree	14 (14.6)
	Bachelor's degree	65 (67.7)
	Diploma Certificate	17 (17.7)
<i>Experience (Years)</i>	< 1 year	11 (11.5)
	1 to 3 years	25 (26.0)
	3 to 5 years	19 (19.8)
	> 5 years	41 (42.7)
<i>Number of Preparations/Administration (Typical Week)</i>	≤ 50	54 (62.1)
	> 50	33 (37.9)
<i>SD: Standard Deviation</i>		

Table 4.2: Items related to knowledge towards the safe handling of antineoplastic drugs among healthcare providers at Palestinian hospitals, stratified by profession

Item	Overall n (%) N=96	Pharmacist n (%) n=28	Nurse n (%) n=60	Pharmacist assistant n (%) n=8
<i>Knew that the gloves should be worn when handling cytotoxic drugs</i>	96 (100.0)	28 (100.0)	60 (100.0)	8 (100.0)
<i>Knew that not all types of gloves provide the same level of protection when handling cytotoxic drugs</i>	81(84.4)	28 (100.0)	46 (76.7)	6 (75.0)
<i>Knew that a surgical mask can't protect from cytotoxic aerosols</i>	36 (37.5)	13 (46.4)	18 (30.0)	5 (62.5)
<i>Knew that the disposable safety gown for handling cytotoxic drugs could not be re-worn</i>	68 (70.8)	19 (67.8)	42 (70.0)	7 (87.5)
<i>Knew that the cytotoxic drugs could enter the body through skin contact with drug-contaminated surfaces</i>	93 (96.9)	28 (100.0)	56 (93.5)	8 (100.0)
<i>Knew that the cleaning of cytotoxic spills should be done by trained personnel only</i>	81 (84.4)	27 (96.4)	46 (76.7)	8 (100.0)
<i>Knew that there is a separate disposal method for cytotoxic drugs</i>	93 (96.9)	27 (96.4)	58 (96.7)	8 (100.0)
<i>Knew that cancer is one of the possible health effects due to workplace exposure to cytotoxic drugs</i>	89 (92.7)	26 (92.8)	54 (90.0)	8 (100.0)
<i>Knew that the safe handling of cytotoxic drugs is important because it protects healthcare workers from hazardous drug exposure</i>	96 (100.0)	28 (100.0)	60 (100.0)	8 (100.0)
<i>Knew that the safe handling of cytotoxic drugs is important because it protects patients from hazardous drug exposure</i>	80 (83.3)	23 (82.1)	49 (81.7)	8 (100.0)

Table 4.3: Association between demographic characteristics and knowledge towards the safe handling of antineoplastic drugs among healthcare providers at Palestinian hospitals

Demographic characteristic		Knowledge ^a		P-value
		Good n (%)	Fair n (%)	
Clinical Setting	Beit Jala Hospital	11 (84.6)	2 (15.4)	0.275 ^F
	Huda Almasri Department	9 (100.0)	0 (0.0)	
	Augusta Victoria Hospital	14 (73.7)	5 (26.3)	
	An-Najah National Hospital	18 (64.3)	10 (35.7)	
	Al Watani Hospital	13 (86.7)	2 (13.3)	
	Martyr Dr. Thabet Thabet Governmental Hospital	7 (87.5)	1 (12.5)	
	Jenin Government Hospital	4 (100.0)	0 (0.0)	
Age Category (Years)	≤ 30	44 (75.9)	14 (24.1)	0.343 ^C
	> 30	27 (84.4)	5 (15.6)	
Gender	Male	21 (70.0)	9 (30.0)	0.136 ^C
	Female	55 (83.3)	11 (16.7)	
Profession	Pharmacist	24 (85.7)	4 (14.3)	0.428 ^C
	Nurse	45 (75.0)	15 (25.0)	
	Pharmacist assistant	7 (87.5)	1(12.5)	
Education Level	Master degree	14 (100.0)	0 (0.0)	0.044 ^{F *}
	Bachelor’s degree	51 (78.5)	14 (21.5)	
	Diploma Certificate	11 (64.7)	6 (35.3)	
Experience (Years)	< 1 year	8 (72.7)	3 (27.3)	0.613 ^F
	1 to 3 years	20 80.0)	5 (20.0)	
	3 to 5 years	17 (89.5)	2 (10.5)	
	> 5 years	31 (75.6)	10 (24.4)	
previous training	Yes	30 (90.9)	3 (9.1)	0.040 ^{C *}
	No	46 (73.0)	17 (27.0)	
^a Good Knowledge (Score ≥ 7.5) Fair Knowledge (5 -7.5 Score) Poor Knowledge (Score < 5) [*] Statistically significant (P < 0.05) ^F Fisher's exact test ^C Chi-square test				

Table 4.4: Safety measures reported by study participants in each practice on antineoplastic drugs handling

Practice	Safety measure	n (%)
<i>Receiving and Storage</i> n=53	Wearing PPE when receiving	30 (56.6)
	Segregating cytotoxic drugs	40 (75.5)
	Washing hands after handling	32 (60.4)
	Labeling with a product identifier	36 (67.9)
<i>Preparation and Compounding</i> n=41	Reconstitute in a designated room	33 (80.5)
	Wearing PPE when preparing	41(100.0)
	Preparing in a BSC	31 (75.6)
	Hands Washing before wearing PPE	37 (90.2)
	Wiping vials before reconstitution	30 (73.2)
	Using CSTD, e.g., the PhaSeal® CSTD	6 (14.6)
	always using Luer-lock fittings for all needles, syringes, infusions	15 (36.6)
	Changing gloves immediately when torn	40 (97.6)
<i>Administration</i> n=58	Wearing PPE when administering	56 (96.6)
	Wearing PPE when removing the infusion	54 (93.1)
	Wearing PPE when handling patients' excreta	43 (74.1)
	Do not re-use PPE from the previous day's work	55 (94.8)
	Hands Washing after removing PPE	58 (100.0)
	Do not touch cytotoxic tablets with bare hands	49 (84.5)
<i>Cleaning</i> n=52	Availability of cytotoxic spill kit	32 (61.5)
	Wearing PPE when cleaning	50 (96.2)
	Demarcate of spill area before cleaning	36 (69.2)
	Cleaning from outside towards the center	43 (82.7)
	Using of cleaning reagents	28 (53.8)
	Washing Hands after cleaning	51 (98.1)
<i>Disposal</i> n=50	Wearing PPE when disposing	48 (96.0)
	Segregating of cytotoxic waste	30 (60.0)
	Washing Hands after disposal	49 (98.0)
PPE: Personal Protective Equipment BSC: Biological Safety Cabinet CSTD: Closed-System Drug Transfer Device		

Table 4.5: Personnel involved in the preparation of antineoplastic drugs among Palestinian hospitals stratified by profession

Institution Name	Profession	
	Pharmacist n (%)	Nurse n (%)
<i>Beit Jala Hospital</i>	0 (0.0) *	6 (100.0)
<i>Huda Almasri Department</i>	1 (12.5)	7 (87.5)
<i>Augusta Victoria Hospital</i>	9 (100.0)	0 (0.0)
<i>An-Najah National Hospital</i>	0 (0.0) *	2 (100.0)
<i>Al Watani Hospital</i>	3 (33.3)	6 (66.7)
<i>Dr.Thabet Thabet Hospital</i>	4 (80.0)	1 (20.0)
<i>Jenin Government Hospital</i>	1 (50.0)	1 (50.0)
Total	18 (43.9)	23 (56.1)

Table 4.6: Use of personal protective equipment by healthcare providers in each handling practice of antineoplastic drugs

PPE type	Receiving &Storage (n= 53)	Preparing (n=41)	Administrating (n= 58)	Cleaning (n= 52)	Disposal (n= 50)
<i>Gown (n, %)</i>	13 (24.5)	36 (87.8)	18 (31.0)	35(67.3)	17 (34.0)
<i>Gloves (n, %)</i>	30 (56.6)	41 (100)	54 (93.1)	49(94.2)	46 (92.0)
<i>Goggles/Face shield (n, %)</i>	5 (9.4)	16 (39.0)	11 (18.9)	30(57.6)	8 (16.0)
<i>Surgical Mask (n, %)</i>	12 (22.6)	29 (70.7)	28 (48.3)	20(38.4)	21 (42.0)
<i>N95 Mask (n, %)</i>	2 (3.7)	9 (21.9)	1 (1.7)	20(38.4)	1 (2.0)
<i>Headcover (n, %)</i>	5 (9.4)	10 (24.4)	8 (13.8)	22(42.3)	8 (16.0)
<i>Overshoes (n, %)</i>	5 (9.4)	12 (29.2)	8 (13.8)	28(53.8)	7 (14.0)

Table 4.7: Association between demographic characteristics and practice on the safe handling of antineoplastic drugs among healthcare providers in Palestine

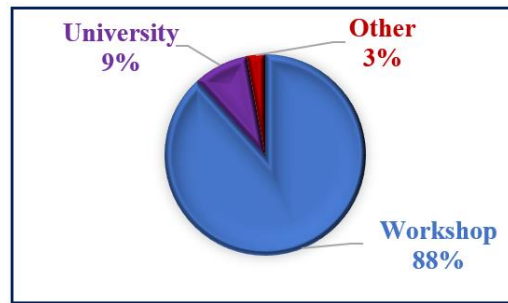
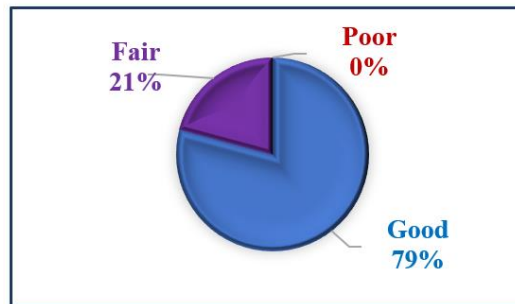
Demographic characteristic		Practice ^a			P-value
		Good n (%)	Fair n (%)	Poor n (%)	
Age Category (Years)	≤ 30	43 (78.2)	8 (14.5)	4 (7.3)	0.008 ^{*C}
	> 30	14 (45.2)	11 (35.5)	6 (19.3)	
Gender	Male	21 (75.0)	5 (17.9)	2 (7.1)	0.254 ^C
	Female	37 (57.8)	16 (25.0)	11 (17.2)	
Profession	Pharmacist	11 (40.7)	8 (29.6)	8 (29.6)	0.000 ^{F*}
	Nurse	47 (81.0)	10 (17.2)	1 (1.7)	
Education Level	Master degree	6 (46.2)	4 (30.8)	3 (23.1)	0.613 ^F
	Bachelor’s degree	43 (67.2)	13 (20.3)	8 (12.5)	
	Diploma	9 (60.0)	4 (26.7)	2 (13.3)	
Experience (Years)	< 1 year	6 (60.0)	0 (0.0)	4 (40.0)	0.037 ^{F*}
	1 to 3 years	19 (79.2)	5 (20.8)	0 (0.0)	
	3 to 5 years	11 (57.9)	5 (26.3)	3 (15.8)	
	> 5 years	22 (56.4)	11 (28.2)	6 (15.4)	
Knowledge State	Good knowledge	42 (57.5)	19 (26.0)	12 (16.5)	0.144 ^F
	Fair Knowledge	16 (84.2)	2 (10.5)	1 (5.3)	
^A Good Practice (Score ≥ 75%) Fair Practice (50-75% Score) Poor Practice (Score <50%) [*] Statistically significant (P < 0.05) ^F Fisher's exact test ^C Chi-square test					

Table 4.8: Barriers to safe handling of antineoplastic drugs among healthcare providers in Palestine

Barrier	Yes	No	Do not Know
	n (%)	n (%)	n (%)
<i>High workload (don't have time to use PPE)</i>	58 (63.0)	34 (37.0)	0 (0.0)
<i>Not trained to use PPE</i>	43 (46.7)	49 (53.3)	0 (0.0)
<i>PPE are uncomfortable to wear</i>	41 (44.5)	49 (53.3)	2 (2.2)
<i>PPE makes it harder to get the job done</i>	34 (36.9)	57 (62.0)	1 (1.1)
<i>There is no policy requiring PPE</i>	51 (55.5)	40 (43.4)	1 (1.1)

Table 4.9: Association between practice and barrier to using PPE

Barrier	Practice score			p-value
	Good	Fair	Poor	
High workload (n, %)	37 (63.8%)	12 (20.7%)	9 (15.5%)	0.763 ^C
Not trained how to use PPE (n, %)	16 (37.2%)	14 (32.6%)	13 (30.2%)	0.000 ^{C*}
PPE are uncomfortable to wear (n, %)	24 (58.5%)	9 (22.0%)	8 (19.5%)	0.127 ^F
PPE make it harder to get the job done (n, %)	20 (58.8%)	8 (23.59%)	6 (17.6%)	0.460 ^F
There is no policy requiring PPE (n, %)	22 (43.1%)	16 (31.4%)	13 (25.5%)	0.000 ^{F*}
* Statistically significant ($P < 0.05$) ^F Fisher's exact test ^C Chi-square test				

**Figure 4.1:** Source of formal training for study participants**Figure 4.2:** Knowledge score among study participants

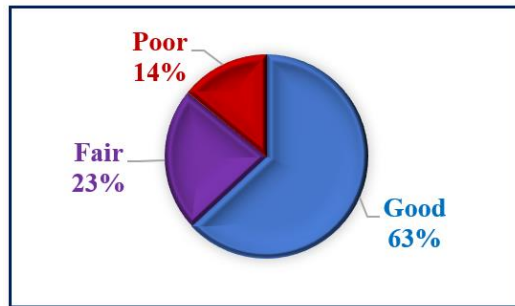


Figure 4.3: practice score among study participants

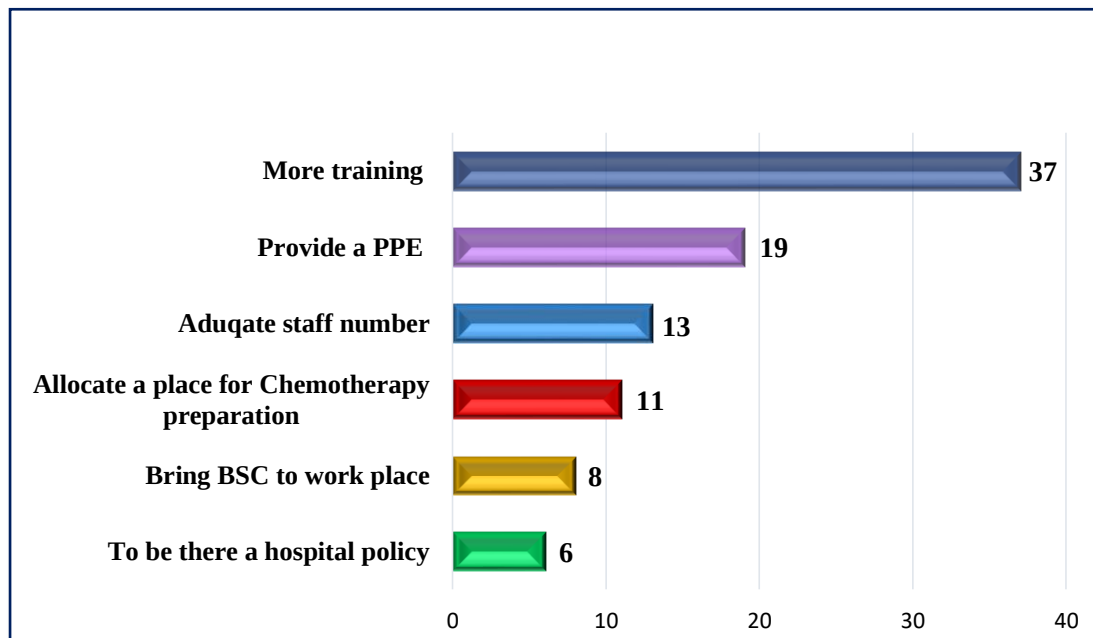


Figure 4.4: Study participants' answers to question one: In your opinion, what changes are needed to improve the safe handling practice in your workplace?

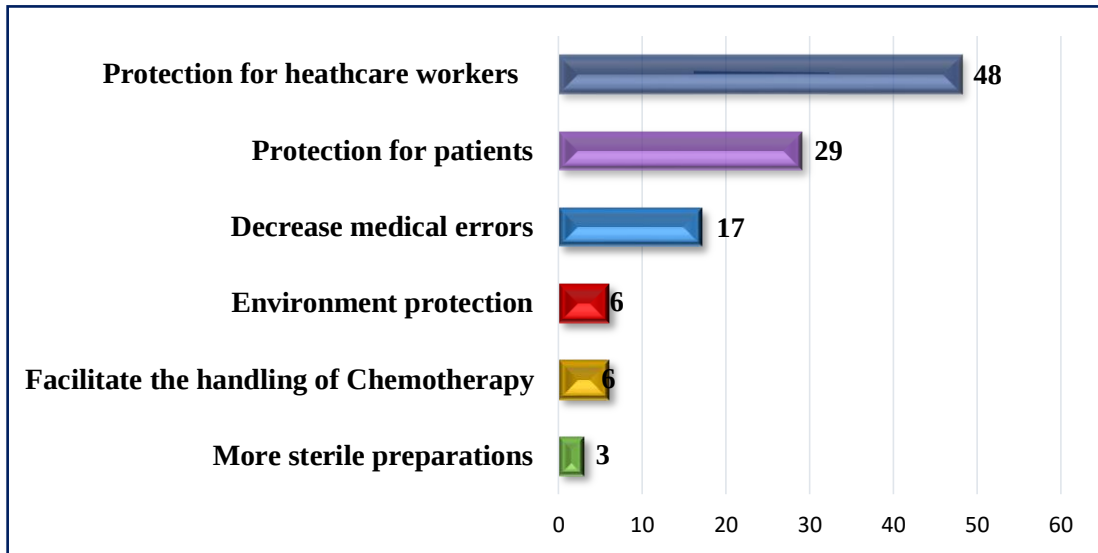


Figure 4.5: Study participants' answers to question two: What would be the top two benefits of putting a chemotherapy safety protocol in your workplace?

Chapter Five

Discussion, Conclusion, and Recommendations

5.1 Discussion

Antineoplastic drugs (ANPDs) results in disruption of growth of both normal and cancerous cells, which in turn lead to toxic side effects for both patients and HCPs who are involved in different steps of handling them such as receiving, preparing, administering, cleaning, and disposal of ANPDs wastes. Pharmacists and nurses are the HCPs most exposed to these drugs, so they need specialized training to ensure their safety as well as patients' safety [82].

This study was aimed to assess both the level of HCPs' knowledge about the safe handling of neoplastic drugs and to assess whether their handling practices conform to international guidelines.

As per our information, this is the first study assessing such an issue in Palestinian hospitals. Moreover, what distinguishes this study from studies done in other countries is that it is based on quantitative and qualitative measures. Using this approach, we were able to gather expanded data indicating the needs and points of view of HCPs.

5.1.1 Training

Our results indicate that only 34 (35.4%) of all participants had formal training on ANPDs safe handling. Of all pharmacists, just 5 (17.8%) mentioned that they had training. Further, none of the pharmacist assistants

had ever received training. This finding was similar to previous studies among oncology nurses in Iraq (18.52 %) [74], Cyprus (33.0%) [72], and Pakistan (30.0%) [83] reported having been trained in safe handling cytotoxic drugs. This does not comply with safe handling guidelines, which emphasize the importance of training all healthcare workers who handle these drugs. Several previous studies proved that training programs effectively increase knowledge and improve compliance with safe handling guidelines and PPE usage [70, 84, 85].

5.1.2 Knowledge

Regarding the level of knowledge about safe handling of ANPDs, our results suggest that the 79.2% HCPs had a good knowledge score, with a mean score of 84.6 ± 14.0 . The proportion of HCPs with good knowledge about ANPDs safe handling in this study was higher than previous reports among oncology nurses in Egypt (67.3%) [75], oncology nurses in Nigeria (61%) [79], oncology nurses in Turkey (58%) [70], health professionals in Ethiopia (52.7%) [86], and oncology nurses in Iraq (40.7%) [74]. In constant, it is lower than the knowledge proportion of oncology nurses in Bangladesh (91.66%) [87] and healthcare workers in Kenya (95.4 %) [78]. However, our HCPs' information on some items was not right, such as 60 (62.5%) of them thought that surgical masks could protect from cytotoxic aerosols. A nearly similar answer was shown among oncology nurses in Iraq (55.60%) [74]. All guidelines state that the surgical mask does not provide respiratory protection from drug exposure and must not be used

when respiratory protection from antineoplastic HD exposure is required [9, 53, 56]. Furthermore, 28 (29.2%) thought that the disposable safety gown could be re-worn.

The present study also showed a moderate significant association ($p=0.04$) between knowledge score and previous training of HCPs, which is similar to the finding of other studies done in Turkey ($p=0.001$) [70], Iran ($p=0.000$) [66, 88], Egypt ($p=0.000$) [75]. Also, this study showed a significant association ($p=0.015$) between knowledge and level of education, which corroborates the findings of a study done in Nigeria that found a statistically significant ($p=0.000$) relation between the level of education and knowledge of chemotherapy and their adverse effects [79].

5.1.3 Practice

Concerning HCPs' practice on the safe handling of ANPDs, the current study suggests that two-thirds (63.0%) of healthcare providers had good practice scores; this finding was higher than a study done in Jordan where 46.6% of their workers showed full compliance with guidelines [73].

Four items were established to assess HCPs' practice regarding the safe handling of ANPDs when receiving and storage them. The first item was about wearing PPE when receiving and storage ANPDs; 56.6% of our participants mentioned that they wore at least one PPE during storage ANPDs. This finding was in line with previous studies done in Kenya (48.05%) [78], Iran (65.0%) [66], and Egypt (85.5%) [75].

Concerning ANPDs safe preparation practice points, the present study found that 80.5% of HCPs reconstitute ANPDs in a designated room. This was nearly similar to previous studies done in Iran (79.5%)[66], Kenya (77%) [78], and Egypt (74.5%) [75]. Furthermore, noticeably higher than a study done in Bangladesh (39.6%) [87]. In our study, the majority of the HCPs (75.6%) reported that they prepared antineoplastic drugs in the BSC; this rate was higher compared to previous studies done in Jordan (65.1%) [73], Israel (55%) [69], Bangladesh (33.3%) [87], Turkey (32.5%) [70], and Kenya (32.26%)[78]. However, lower than a study done in Pakistan (93.33%) [77]. All participants in this study mentioned that they wear at least one PPE during ANPDs preparation. This was consistent with findings in Egypt (100%) [75], Jordan (98.0%) [73], Turkey (97.4%), and Kenya (81.0%) [78].

CSTD is a device that prevents escape during transferring drugs from one container to another [9]. In the current study, the majority of participants did not know about CSTD. Only 6 (14.6%) mentioned that they used CSTDs during the preparation of ANPDs. This finding was close to a study in Bangladesh, where most of their nurses were not aware of what CSTDs are [87]. The explanation for this small proportion is possibly due to the lack of such instruments in our hospitals.

Six elements were established to evaluate the administration procedure of ANPDs by nurses. Almost all (96.6 %) of nurses in this sample reported wearing at least one PPE during ANPD administration.

This result was comparable to previous research of oncology nurses in Egypt (100.0%) [75], Kenya (85 %) [78], and Turkey (61.3%) [67]. Concerning hand washing, all nurses in this study confirmed that they had washed their hands after removing. This result was much higher than it is in Jordan (75.2%) [73], Tanta; Egypt (65.71%) [75], Mansoura; Egypt (51.4%) [64], and Kenya (35.0%) [78].

It was alarming that three hospitals do not have a spill kit in their oncology department. These contravene all safe handling guidelines, which states that spill kits containing all of the materials needed to clean HD spills must be readily available in all areas where antineoplastics are routinely handled [9, 53, 56].

Our results showed that 40% of HCPs do not segregate cytotoxic waste from other medical wastes. A study done in Bangladesh found that most of their nurses did not follow guidelines for disposing of chemotherapy waste in the daycare unit [87]. Moreover, a study in Turkey showed that just 15.0 % of the cytotoxic contaminated wastes were correctly disposed of [70].

This study suggests that the young HCPs (≤ 30 years) had a better practice compared to those older than 30 years of age. Nonetheless, the practice has no association with age in other studies [78].

5.1.4 Barriers

Finally, regarding barriers faced HCPs toward using PPE, the high workload was the major barrier to them, followed by a lack of policy requiring the use of PPE (Table 4.8). Other studies have reported several barriers to use PPE, such as PPE availability, time limitations, and work pressure [89]. These barriers must be overcome, and educational programs that serve to raise awareness of HCPs about the importance of wearing PPEs should be implemented.

5.2 Study Weakness and Limitations

The quantitative part of this study was based on self-reporting data, which might have led to an over-reporting of compliance compared to what was practiced. Future studies employ additional methodologies, particularly observation and objective recording of health workers' practice, to allow a more precise assessment of their compliance with guidelines and regulations regarding safe handling of ANPDs. Moreover, this study does not assess the behavior and attitude of HCPs in Palestine.

5.3 Conclusion

Overall, there is a gap between the guidelines and actual practice among Palestinian HCPs on antineoplastic drugs' safe handling. Despite that, HCPs have a good knowledge regarding this issue. Further research is needed to increase compliance rates and prevent potential adverse health

effects associated with exposure to antineoplastic drugs, to assess workers' behavior and attitude toward handling ANPDs.

5.4 Main Outcomes and Recommendations

1. The number of participants who had received training on the safe handling of ANPDs was very low, which significantly affected their level of knowledge. Thus, that requires intervention strategies include education, continuous training, and supplying updated information regarding safe handling of antineoplastic drugs while emphasizing the importance of suggested safety equipment.
2. Participants' handling of antineoplastic drugs in several practices was not in compliance with guidelines. This shows us the urgent need for maintaining a uniform and clear standard and policies regarding handling antineoplastic drugs safely in hospitals.
3. High workload and unavailability of personal protective equipment were the main reasons for the lack of discipline in PPE use by HCPs. So, managers must carefully consider workload by increasing staff numbers as HCPs should not be too busy to protect themselves from ANPDs exposure. Furthermore, they should provide all protective equipment and a BSC for the staff to ensure their safety and limit exposure. As employees cannot use PPE unless it is provided, and that is an employers' responsibility.

4. Maintaining standard procedures and proper equipment types in the chemotherapy unit ensures safe medication and personal protection and prevents environmental contamination.
5. Alternative Duties are highly recommended to men and women who are attempting to conceive, pregnant women, or breastfeeding moms.
6. A medical surveillance program should be provided to all HCPs who handle ANPDs, which assess and documents symptom complaints, physical findings, and laboratory values

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APPENDIX A

Guidelines Summaries

Table 1.1: Comparison of 2004 NIOSH and 1990 ASHP definitions of hazardous drugs	
NIOSH^a	ASHP^b
Carcinogenicity	Carcinogenicity in animal models, in the patient population, or both as reported by the International Agency for Research on Cancer
Teratogenicity or developmental toxicity	Teratogenicity in animal studies or treated patients
Reproductive toxicity	Fertility impairment in animal studies or treated patients
Organ toxicity at low doses in humans (<10 mg/day) or animals (<1mg/kg/day)	Evidence of serious organ or other toxicity at low doses in animal models or treated patients
Genotoxicity	Genotoxicity (i.e., mutagenicity and clastogenicity in short-term test systems)
Structure and toxicity profile of new drugs that mimic existing drugs determined hazardous by the above criteria	
a: the National Institute for Occupational Safety and Health b: American Society of Health-system Pharmacists Adapted from the American Society of Health-system Pharmacists, 2018 [53]	

Table 1.2: Classification of common antineoplastic drugs based on IARC		
Group 1: Human Carcinogens	Group 2A: Probable Human Carcinogens	Group 2B: possibly carcinogenic to humans
Arsenic trioxide Azathioprine Busulfan Chlorambucil Chlornaphazine Cyclophosphamide Etoposide Melphalan Semustine Tamoxifen Thiotepa Treosulfan MOPP ¹ regimen ECB ² regimen	Azacytidine Carmustine Chlorozotocin Cisplatin Doxorubicin HCl Lomustine Mechlorethamine HCl N-Ethyl-N-nitrosourea N-Methyl-nitrosourea Procarbazine HCl Teniposide	Bleomycin Mitomycin C
¹ Mechlorethamine-Vincristine (Oncovin)-Procarbazine-Prednisone ² Etoposide-cisplatin-bleomycin Adopted from the International Agency for Research on Cancer, 2020 [27]		

Table 1.3: Examples of potential opportunities for exposure to antineoplastic drugs based on activity	
Activity	Potential Opportunities for Exposure
<i>Receipt</i>	- Contacting drug residue present on drug containers, individual dosage units, outer containers, work surfaces, or floors
<i>Compounding</i>	- Constituting or reconstituting powdered or lyophilized HDs - Withdrawing or diluting injectable HDs from parenteral containers - Expelling air or HDs from syringes - Contacting ANPDs residue present on PPE or other garments - Maintenance activities for potentially contaminated equipment and devices
<i>Administration</i>	- Generating aerosols during the administration of ANPDs by various routes (e.g., injection, irrigation, oral, inhalation, or topical application) - Performing specific specialized procedures (e.g., intraoperative intraperitoneal injection or bladder instillation) - Priming an IV administration set
<i>Patient-care activities</i>	- Handling body fluids (e.g., urine, feces, sweat, or vomit) or body-fluid contaminated clothing, dressings, linens, and other materials
<i>Spills</i>	Spill generation, management, and disposal
<i>Transport</i>	Moving HDs within a healthcare setting
<i>Waste</i>	Collection and disposal of hazardous waste and trace contaminated waste
Adopted from the American Society of Health-system Pharmacists, 2018 [53]	

Table 1.4: PPE needed for different practices in the health care setting	
Practice	PPE needed
<i>Receiving and storage</i>	- Single chemotherapy gloves - Protective chemotherapy gown
<i>Preparation of ANPDs</i>	- Double chemotherapy gloves - Protective chemotherapy gown - Respiratory protection - Head/hair cover - Shoe covers
<i>Administration of ANPDs</i>	- Double chemotherapy gloves - Protective chemotherapy gown - Eye/face protection ◦ If there is risk of emesis, or if liquid could splash - Respiratory protection ◦ If inhalation potential
<i>Disposal, cleaning, spills, and exposure to the excreta of patients receiving drugs</i>	- Double chemotherapy gloves - Protective chemotherapy gown - Eye/face protection ◦ If liquid could splash ◦ Always use for spills - Respiratory protection ◦ If inhalation potential ◦ Always use for spills
Adopted from NIOSH list of antineoplastic and other hazardous drugs in health care settings, 2016 [55]	

Table 1.5: PPE needed for possible practices in the healthcare setting

PPE type	Selection criteria
<i>Gloves</i>	- Chemotherapy gloves (as tested to American Society for Testing and Materials International (ASTM) standard) should be used for all ANPDs - Powder-free gloves should be made of nitrile, polyurethane, neoprene, or latex material - polyvinyl chloride is not recommended
<i>Gowns</i>	- Disposable, lint-free, and rated to resist chemotherapy - Should have long sleeves and elastic or knit cuffs, fasten in the back (no open front), and be without seams or closures that could allow HD exposure
<i>Eye/face shields</i>	- Goggles should be worn with face shields when full eye and face protection is needed
<i>Respirators</i>	- A tested, NIOSH-certified, N95 or more protective respirator is sufficient for airborne particles; however, N95 respirators offer no protection against gases and vapors - Surgical masks do not protect against HD exposure
<i>Shoe, sleeve, and hair covers</i>	- Lint-free - Made of disposable materials - Sleeve covers should be polyethylene-coated or other laminate, with closed cuffs and no seams, openings, or closures that would allow exposure
Adopted from Toolkit for Safe Handling of Hazardous Drugs for Nurses in Oncology, 2018 [54]	

APPENDIX B

Data Collection Form



جامعة النجاح الوطنية
An-Najah National University

Data Collection Form**PART 1: FORCED-CHOICE QUESTIONS: (Four Sections)****Section 1: Socio-demographic Data**

- Institution Name: _____ Department: _____

- Age (Years) : _____

- Gender : ☐ Male ☐ Female

- Marital Status :
☐ Single ☐ Married ☐ Divorced ☐ Widowed ☐ Separated

- Highest level of Education:
☐ PhD ☐ Master degree ☐ Bachelor's degree ☐ Diploma Certificate

- Profession:
☐ Pharmacist ☐ Nurse ☐ Pharmacist assistant

- Years of experience in handling cytotoxic drugs:
☐ < 1 year ☐ 1 to 3 years ☐ 3 to 5 years ☐ > 5 years

- Number of preparation or administration weekly (typical) week? _____
☐ < 50 ☐ 50-99 ☐ ≥ 100

- Have you received any formal training on safe handling of cytotoxic drugs?
☐ Yes ☐ No

- If you answered yes, which formal training on safe handling of cytotoxic drugs did you receive?
☐ University ☐ College ☐ Workshop ☐ Other (Internet, textbook)

- If you answered yes, when did you receive your last training?
☐ ≤ 12 months ago ☐ > 12 months ago

**Section 2: Knowledge on Safe Handling of Cytotoxic drugs
And Thoughts about Exposure and Risk**

A. Your Knowledge on Safe Handling of Cytotoxic drugs:

Please circle one answer to each of the following statements

Statement	True	False	Don't Know
1. Gloves should be worn when handling cytotoxic drugs	1	2	3
2. All types of gloves provide the same level of protection when handling cytotoxic drugs	1	2	3
3. A surgical mask provides protection from cytotoxic aerosols	1	2	3
4. A disposable safety gown for handling cytotoxic drugs can be re-worn	1	2	3
5. Cytotoxic drugs can enter the body through skin contact with drug-contaminated surfaces	1	2	3
6. Cleaning of cytotoxic spills should be done by trained personnel only	1	2	3
7. There is a separated disposal method for cytotoxic drugs	1	2	3
8. One of the possible health effects due to work place exposure to cytotoxic drugs is cancer	1	2	3
9. Safe handling of cytotoxic drugs is important because it protects health care workers from hazardous drug exposure	1	2	3
10. Safe handling of cytotoxic drugs is important because it protects patients from hazardous drug exposure	1	2	3

Section 3: Practice on Safe Handling of cytotoxic drugs

Section 3.1: Receiving and Storage of Cytotoxic Drugs:

Are you responsible for receiving cytotoxic drugs?

☐ Yes

☐ No

If you answered "No" proceed to section 3.2

Complete this section ONLY if you are responsible for receiving and storage of cytotoxic drugs

1. Do you wear personal protective equipment (PPE) when receiving cytotoxic drugs?

☐ Yes

☐ No

☐ Don't Know

2. If you answered 'Yes' in question 1 above, which PPE do you wear?

Type of PPE	Yes	No	Don't Know
Gown	☐	☐	☐
Gloves /double gloves	☐	☐	☐
Goggles/face shield	☐	☐	☐
Surgical mask	☐	☐	☐
N95 mask	☐	☐	☐
Headcover	☐	☐	☐
Overshoes	☐	☐	☐
Others	☐	☐	☐

If "Others", please specify:

3. Do you segregate other medicines from cytotoxic drugs during storage?

☐ Yes

☐ No

☐ Don't Know

4. Do you label cytotoxic drugs with a product identifier and hazard statement / signal word?

☐ Yes

☐ No

☐ Don't Know

5. Do you wash your hands after handling cytotoxic drugs?

☐ Yes

☐ No

☐ Don't Know

Section 3.2: Preparation/Compounding of Cytotoxic Drugs

Are you responsible for preparation / compounding of cytotoxic drugs?

☐ Yes

☐ No

If you answered "No" proceed to section 3.3

Complete this section ONLY if you are responsible of preparation/compounding of cytotoxic drugs.

1. Do you reconstitute cytotoxic drugs in a designated room?

☐ Yes

☐ No

☐ Don't Know

2. Do you wear PPE when preparing cytotoxic drugs?

☐ Yes

☐ No

☐ Don't Know

3. If you answered 'Yes' in question 2 above, which PPE do you wear?

Type of PPE	Yes	No	Don't Know
Gown	☐	☐	☐
Gloves/double gloves	☐	☐	☐
Goggles/face shield	☐	☐	☐
Surgical mask	☐	☐	☐
N95 mask	☐	☐	☐
Headcover	☐	☐	☐
Overshoes	☐	☐	☐
Others	☐	☐	☐

If "Others", please specify:

4. Do you prepare cytotoxic drugs in a biological safety cabinet (BSC)?

☐ Yes

☐ No

☐ Don't Know

5. Do you wash your hands before wearing PPE?

☐ Yes

☐ No

☐ Don't Know

6. Do you wipe vials or ampoules after removing the outer packaging material before reconstitution?

☐ Yes

☐ No

☐ Don't Know

7. Do you always use a closed-system drug transfer device (CSTD) e.g. the PhaSeal® CSTD? Type _____

☐ Yes

☐ No

☐ Don't Know

8. Do you always use luer-lock fittings for all needles, syringes, infusions?

☐ Yes

☐ No

☐ Don't Know

9. Do you change your gloves every 30 minutes when reconstituting cytotoxic drugs?

☐ Yes

☐ No

☐ Don't Know

10. When handling cytotoxic drugs, do you change torn gloves immediately?

☐ Yes

☐ No

☐ Don't Know

Section 3.3: Administration of Cytotoxic drugs to Cancer Patients

Are you responsible for administration of cytotoxic drugs and nursing of cancer patients?

☐ Yes

☐ No

If you answered “No” proceed to section 3.4

Complete this section ONLY if you are responsible of administration of cytotoxic drugs.

1. Do you wear PPE when administering cytotoxic drugs?

☐ Yes

☐ No

☐ Don't Know

2. If you answered 'Yes' in question 1 above, which PPE do you wear?

Type of PPE	Yes	No	Don't Know	
Gown	☐	☐	☐	If “Others”, please specify: _____ _____ _____
Gloves/double gloves	☐	☐	☐	
Goggles/face shield	☐	☐	☐	
Surgical mask	☐	☐	☐	
N95 mask	☐	☐	☐	
Headcover	☐	☐	☐	
Overshoes	☐	☐	☐	
Others	☐	☐	☐	

3. Do you wear PPE when removing the infusion system used for cytotoxic administration? _____

☐ Yes

☐ No

☐ Don't Know

4. Do you wear PPE when handling excreta from a cancer patient who is receiving cytotoxic drugs?

☐ Yes

☐ No

☐ Don't Know

5. Do you re-use PPE used during the previous day's work?

☐ Yes

☐ No

☐ Don't Know

6. Do you wash your hands with soap and water immediately after removing PPE?

☐ Yes

☐ No

☐ Don't Know

7. Do you touch cytotoxic tablets with bare hands?

☐ Yes

☐ No

☐ Don't Know

Section 3.4: Cleaning of Cytotoxic preparation area and/or Cytotoxic Spills

Are you responsible for cleaning of the cytotoxic preparation area and cytotoxic spills?

☐ Yes

☐ No

If you answered “No” proceed to section 3.5

Complete this section ONLY if you are responsible for cleaning of the cytotoxic preparation area and/or cytotoxic spills.

1. Do you have a cytotoxic spill kit available?

☐ Yes

☐ No

☐ Don't Know

2. Do you wear PPE when cleaning cytotoxic spills / cytotoxic preparation area?

☐ Yes

☐ No

☐ Don't Know

3. If you answered 'Yes' in question 3 above, which PPE do you wear?

Type of PPE	Yes	No	Don't Know
Gown	☐	☐	☐
Gloves/double gloves	☐	☐	☐
Goggles/face shield	☐	☐	☐
Surgical mask	☐	☐	☐
N95 mask	☐	☐	☐
Headcover	☐	☐	☐
Overshoes	☐	☐	☐
Others	☐	☐	☐

If “Others”, please specify:

4. Do you clearly demarcate the area of cytotoxic spill before cleaning?

☐ Yes

☐ No

☐ Don't Know

5. Do you begin cleaning from outside the spill area gradually towards the center?

☐ Yes

☐ No

☐ Don't Know

6. Do you use cleaning reagents when cleaning the cytotoxic preparation area?

☐ Yes

☐ No

☐ Don't Know

7. Do you wash your hands with soap and water immediately after cleaning cytotoxic spills?

☐ Yes

☐ No

☐ Don't Know

Section 3.5: Disposal of Cytotoxic Drug Waste

Are you responsible for disposal of cytotoxic drug waste?

☐ Yes

☐ No

Complete this section ONLY if you are responsible for the disposal of cytotoxic drug waste.

1. Do you wear PPE when disposing cytotoxic drugs?

☐ Yes

☐ No

☐ Don't Know

2. If you answered 'Yes' in question 3 above, which PPE do you wear?

Type of PPE	Yes	No	Don't Know
Gown	☐	☐	☐
Gloves	☐	☐	☐
Goggles/face shield	☐	☐	☐
Surgical mask	☐	☐	☐
N95 mask	☐	☐	☐
Headcover	☐	☐	☐
Overshoes	☐	☐	☐
Others	☐	☐	☐

If "Others", please specify:

3. Do you segregate cytotoxic waste before disposal?

☐ Yes

☐ No

☐ Don't Know

4. Do you wash your hands with soap and water immediately after disposal of cytotoxic drugs?

☐ Yes

☐ No

☐ Don't Know

Section 4: Challenges to safe handling of cytotoxic drugs

1. Which Barrier of using PPE or the challenges that prevent you from handling cytotoxic drugs safely?
Tick the appropriate answer(s)

Barrier/challenge	Yes	No	Don't Know
Thinking that PPE are unnecessary	☐	☐	☐
High workload (don't have time to use PPE)	☐	☐	☐
not trained to use PPE	☐	☐	☐
PPE are uncomfortable to wear	☐	☐	☐
PPE make it harder to get the job done	☐	☐	☐
Availability of PPE	☐	☐	☐
There is no policy requiring PPE	☐	☐	☐
PPE is too expensive to use it all the time	☐	☐	☐
PPE makes me feel too hot	☐	☐	☐
Others	☐	☐	☐

If "Others", please specify:

.....

.....

PART 2: OPEN-ENDED QUESTIONS:

Q1. In your opinion, what changes are needed to improve the safe handling practice in your work place?

Q2. What would be the top two benefits from putting a chemotherapy safety protocol in your work place?

Q3. Is there anything else you would like to tell us about safe handling of ADs in your work place?

Thank you for participating in this study!

APPENDIX C

Institutional Review Board Approval Letter

An-Najah
National University
Faculty of medicine
& Health Sciences
Department of Graduate
Studies



جامعة النجاح
الوطنية
كلية الطب وعلوم الصحة
دائرة الدراسات العليا

IRB Approval Letter

Study Title:

"Assessment of Knowledge and Practice on Safe Handling of Antineoplastic Drugs among Health Care Providers in Oncology Palestinian Hospitals"

Submitted by:

Raya Said, Prof. Waleed M. Sweileh

Date Reviewed:

27th May 2018

Date Approved:

28th May 2018.

Your Study titled "Assessment of Knowledge and Practice on Safe Handling of Antineoplastic Drugs among Health Care Providers in Oncology Palestinian Hospitals" with archived number (13) May 2018 was reviewed by An-Najah National University IRB committee and was approved on 28th May, 2018.

Hasan Fitian, MD

IRB Committee Chairman

An-Najah National University

APPENDIX D

Ministry of Health Approval Letter I

State of Palestine
Ministry of Health - Nablus
General Directorate of Education in
Health



دولة فلسطين
وزارة الصحة - نابلس
الإدارة العامة للتعليم الصحي

Ref.:
Date:.....

الرقم: ٢٠٨ / ١٣٢٩ / ١٦٤٠
التاريخ: ٢٠١٨ / ١٠ / ١٦

الأخ مدير عام الإدارة العامة للمستشفيات المحترم،،،

تحية واحترام،،،

الموضوع: تسهيل مهمة طالبة ماجستير - جامعة النجاح

يرجى تسهيل مهمة الطالبة: راية موسى محمد سعيد- ماجستير صيدلة سريرية/ جامعة النجاح،
في عمل بحث بعنوان "تقييم معلومات وجودة اداء مقدمي الرعاية الصحية حول التدبير الآمن مع
الادوية المضادة للأورام في اقسام الأورام في المستشفيات الفلسطينية"، من خلال السماح للطالبة
بجمع معلومات من خلال مقابلة الممرضين والصيدلة (بعد اخذ موافقتهم) لجمع معلومات تتعلق بالبحث
من خلال تعبئة استبانة، وذلك في:

- مستشفى بيت جالا الحكومي

- مستشفى الوطني الحكومي

علما ان البحث تحت اشراف د. وليد صويلح. كما انه سيتم الالتزام بمعايير البحث العلمي والحفاظ على

سرية المعلومات.



مع الاحترام،،،

مدير عام التعليم الصحي

نسخة: عميد كلية الدراسات العليا المحترم/ جامعة النجاح

Ministry of Health Approval Letter II

State of Palestine
Ministry of Health - Nablus
General Directorate of Education in
Health



دولة فلسطين
وزارة الصحة- نابلس
الإدارة العامة للتعليم الصحي

Ref.:
Date:

الرقم: ١٧٤/١٨٠١٨
التاريخ: ١٨/١٢/٢٠١٨

الأخ مدير عام الإدارة العامة للمستشفيات المحترم،،،

تحية واحترام،،،

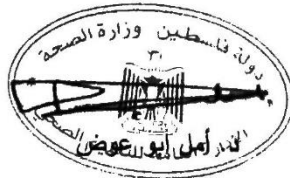
الموضوع: تسهيل مهمة طالبة ماجستير - جامعة النجاح

يرجى تسهيل مهمة الطالبة: راية موسى محمد سعيد- ماجستير صيدلة سريرية/ جامعة النجاح،
في عمل بحث بعنوان "تقييم معلومات وجودة اداء مقدمي الرعاية الصحية حول التدبير الآمن مع
الادوية المضادة للأورام في اقسام الأورام في المستشفيات الفلسطينية"، من خلال السماح للطالبة
بجمع معلومات من خلال مقابلة الممرضين والصيادلة (بعد اخذ موافقتهم) لجمع معلومات تتعلق بالبحث
من خلال تعبئة استبانة، وذلك في:

- مستشفى جنين الحكومي
- مستشفى طولكرم الحكومي

علما ان البحث تحت اشراف د. وليد صويح. كما انه سيتم الالتزام بمعايير البحث العلمي والحفاظ على

سرية المعلومات.



مدير عام التعليم الصحي

مع الاحترام،،،

نسخة: عميد كلية الدراسات العليا المحترم/ جامعة النجاح

APPENDIX F**Consent Form****Consent Form**

I hereby voluntarily agree to participate in the study as explained to me. My signature is a confirmation that I have understood the nature of the study and whatever information that I give will remain confidential and my identity will not be revealed in this study.

I also confirm that no monetary or material gains have been promised or given to me for participating in the study.

Signed:

Date:...../...../.....

I have explained the nature and purpose of this study to the above study participant and have sought his/her understanding for informed consent.

Signature of principal investigator:

Date:/...../.....

جامعة النجاح الوطنية

كلية الدراسات العليا

تقييم معلومات وجودة أداء مقدمي الرعاية الصحية حول التدبير الآمن مع
الأدوية المضادة للأورام في أقسام الأورام في المستشفيات الفلسطينية

إعداد

راية موسى سعيد

إشراف

أ. د. وليد صويلح

قدمت هذه الأطروحة استكمالاً لمتطلبات الحصول على درجة الماجستير في الصيدلة السريرية،
بكلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس - فلسطين.

2021

ب

تقييم معلومات وجودة أداء مقدمي الرعاية الصحية حول التدبير الآمن مع الأدوية المضادة

للأورام في أقسام الأورام في المستشفيات الفلسطينية

إعداد

راية موسى سعيد

إشراف

أ. د. وليد صويلح

الملخص

الخلفية: بسبب زيادة الإصابة بالسرطان وإدخال نظم علاج أكثر تعقيداً، من المتوقع أن يزداد الطلب على استخدام الأدوية المضادة للأورام (ANPDs)، مما سيؤدي إلى مزيد من التعرض المهني لهذه الأدوية بين مقدمي الرعاية الصحية (HCPs) وبالتالي فإن هذه الأدوية تتطلب احتياطات شديدة عند التعامل معها واستخدامها.

الأهداف: هدفت هذه الدراسة إلى تقييم المعرفة والممارسة بين الممرضين والصيادلة ومساعدى الصيادلة حول كيفية التعامل الآمن مع الأدوية المضادة للأورام، وأيضاً لتحديد ارتباط هذه المعرفة بالممارسة، ولتحديد العوائق التي تمنع مقدمي الرعاية الصحية من استخدام تدابير السلامة.

المنهجية: أجريت دراسة مقطعية من آب إلى تشرين الثاني 2018 في ستة مستشفيات فلسطينية، تم جمع المعلومات عن طريق استبيان احتوى على أسئلة تساعد في جمع المعلومات الديموغرافية لمقدمي الرعاية الطبية وممارستهم حول كيفية تداول الأدوية المضادة للسرطان بشكل آمن والحواجز التي قد تمنعهم من حماية أنفسهم من التعرض لمثل هذه الأدوية، تم إجراء التحليل باستخدام الإصدار 25 من برنامج الـSPSS، تم اعتبار ان القيمة الاحتمالية أقل من 0.05 على انها ذات دلالة إحصائية.

النتائج: اشترك 96 شخص من مقدمي الرعاية الصحية في هذه الدراسة، متوسط اعمارهم كان 31.9 ± 8.6 سنة، تراوحت اعمارهم ما بين 22 الى 55 سنة. اغلب المشتركين كانوا ممرضين (62.5%, 60)، مع أغلبية نسوية (66, 68.8%). لم يتم تدريب حوالي ثلثي المشتركين على التعامل الآمن مع الأدوية المضادة للأورام. كانت درجة معرفتهم وممارستهم تجاه التعامل الآمن مع هذه الأدوية جيدة نسبياً، حيث كان متوسط درجات المعرفة والممارسة 84.6 ± 13.8 ، 74.33 ± 25.8 على التوالي. ارتبط تلقي التدريب بمستوى معرفة بدرجة متوسطة. عبء العمل الكبير، ونقص الرقابة، وعدم توفر معدات الحماية الشخصية كانت العوائق الرئيسية لعدم استخدام معدات الوقاية الشخصية كما بلغ المشتركين.

الإستنتاج: بالرغم من أن معرفة مقدمي الرعاية الصحية بالتعامل الآمن مع الادوية المضادة للأورام كانت مقبولة، إلا أن توفير التدريب لهم لم يكن كافياً. يوصى بالتدريب الدوري والمستمر لمقدمي الرعاية الصحية بدعم من السياسات لاتباع المبادئ التوجيهية بهذا الشأن.