

## Knowledge, Attitude, and Practice among Palestinian Oncology Nurses toward Chemotherapy Administration in West-Bank: A Cross-Sectional Study

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**Abstract:** Nurses play a crucial role as advocates for patients. To effectively fulfill this role, nurses must possess strong proficiency in chemotherapy administration and undergo continuous assessment. Therefore, this study aimed to assess the knowledge, attitude, and practice level among Palestinian oncology nurses regarding chemotherapy administration. A descriptive cross-sectional study was conducted in the oncology departments of five government hospitals and one private hospital in the West Bank from February to April 2023. Descriptive statistics were utilized, including frequency, percentages, mean scores, and standard deviation. Inferential statistics involved independent t-tests and one-way ANOVAs. The study was comprised of 72 nurses working in cancer units at the time of the research. Demographic data revealed that 63.9% of the participants were female, while 36.1% were male. Additionally, 43.1% of nurses were aged between 21 and 30 years. Furthermore, more than two-thirds of the nurses held a bachelor's degree, and 72.2% were married. Regarding professional experience, 22.2% had less than 1 year, while 37.5% had over 4 years. Notably, 50% of nurses demonstrated poor knowledge of chemotherapy administration, 44.4% had adequate knowledge, and only 5.6% possessed good knowledge. Regarding attitude, 72.20% of nurses had a favorable view of chemotherapy administration, and 27.8% had a positive attitude. Regarding practice, 80.6% exhibited good practice, 18.1% had moderate practice, and only 1.4% demonstrated poor practice. The study findings highlight a significant knowledge gap in chemotherapy administration among oncology nurses in the West Bank. This underscores the need for targeted interventions and further research to address and generalize these findings.

**Keywords:** Oncology Nurses, Chemotherapy Administration, Knowledge, Attitudes, Practice.

### Introduction

Cancer has emerged as a significant worldwide health issue, ranking as the second most prevalent cause of mortality on an international scale. There is a global surge in the incidence of cancer diagnoses among the population. Mortality was the consequence of approximately ten million of the nearly nineteen million cancer cases diagnosed in 2020 [1]. Cancer is an extremely severe health concern in Palestine. A multitude of studies have provided evidence of the multifaceted impacts that cancer has on the populace. The tendency of Palestinian cancer patients to incorrectly diagnose numerous benign tumors as malignant was identified in a study.

Consequently, patients frequently exhibit symptoms of symptoms in an advanced stage. This highlights the criticality of improving the precision of diagnostic techniques [2]. Furthermore, a wide range of knowledge, attitudes, and practices among Palestinian oncology nurses are shaped by multiple causes. According to a study, hand hygiene awareness among Palestinian nurses and doctors is insignificant. However, more education is required to enhance their behaviors and attitudes—which are critical for reducing infections associated with healthcare [3].

Cancer continues to be a significant cause of death worldwide, highlighting the need for strong efforts in the advancement of highly targeted and efficient anti-cancer medications. Despite several advancements in the identification of new anti-cancer options, cancer remains one of the leading

causes of mortality globally, accounting for a significant number of fatalities annually. Conventional cancer treatments like surgery, radiotherapy, and chemotherapy have made progress in reducing mortality rates. However, they often lack precision and can result in considerable toxicity and side effects. The changing landscape of anti-cancer drug development has moved towards agents that demonstrate a high level of specificity for specific biological targets found primarily in cancer cells while minimizing harm to normal cells [4,5].

In oncology, nurses' negative attitudes and severe knowledge gaps in cancer pain management indicate the need for quality improvement and educational programs to advance their expertise in this area [6]. Additionally, palliative care should receive more attention in colleges of nursing, as demonstrated by the comparatively poor attitudes displayed by Palestinian nursing students toward providing care for terminally ill patients and their families [7].

A study underscored the significant link between nurses' knowledge and their educational and training backgrounds, underscoring the crucial role of continuous education and training in effectively managing chemotherapy [8].

Furthermore, knowledge, attitudes, and practices of sexual healthcare among oncology nurses are shaped by their professional beliefs, clinical communication skills, and self-efficacy [9], while oncology nurses at the Turkish Palestinian Friendship Hospital in the Gaza Strip report moderate degrees

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of burnout and secondary traumatic stress disorder despite having high levels of compassion satisfaction [10].

The oncology nurse is responsible for various responsibilities to ensure effective and safe administration; preparing prescriptions, giving medications, reporting adverse drug reactions, assessing treatment efficacy, and advising patients about their medications are all part of the job [11]. Despite the challenges that arise in delivering care for cancer patients and their families, oncology nurses strive to deliver optimal care and accurately administer chemotherapy [12]. A study assessed the effectiveness of nurses in a clinical environment when it came to giving chemotherapy. The results showed that a considerable portion of nurses lacked experience and competence, and most had a bad attitude toward giving chemotherapy. These findings highlight the importance of designing and carrying out educational and training initiatives for in-service training to enhance nurses' attitudes, knowledge, and abilities [13].

Consequently, oncology nurses must possess sufficient knowledge, a positive outlook, and effective practices regarding the administration of chemotherapy. Consequently, this study aims to evaluate the nurses' knowledge, attitudes, and practices regarding chemotherapy administration in oncology units in Palestinian hospitals.

## Methods

**Study design and setting:** In a few hospitals in the West Bank of Palestine, a descriptive cross-sectional study was carried out to evaluate the knowledge, attitudes, and practices of Palestinian oncology nurses about the administration of chemotherapy. Between February 19 and April 27, 2023, six Palestinian hospitals (five public and one private) with an oncology section were the sites of the study. The population in this study consisted of Palestinian staff nurses working in oncology units. Thirty-one participants from Beit Jala Governmental Hospital (Al-Hussein), four participants from Palestinian Medical Complex-Ramallah, three participants from Thabet Thabet Hospital, three participants from Shaheed Dr. Khalil Suleiman Governmental Hospital, 11 participants from Al-Watani Hospital, and 20 participants from Istishari Arab Hospital. The inclusion criteria in this study were staff nurses who work in oncology units in the selected hospitals in the West Bank in Palestine. The exclusion criteria included those who did not meet the inclusion criteria and did not provide informed consent, were on leave, or were not accessible during the data collection period. The researcher calculated the sample size using g-power version 3 as follows: an effect size of 0.5, a study power of 0.80, an alpha error of 0.05, and a total sample size of 120 nurses. The researcher adds 10% to the sample size as a non-response rate. Because it includes specified criteria for determining the sample, the convenience sampling approach will be utilized to choose it.

**Instruments:** The questionnaire utilized in the study examining the knowledge, attitude, and practice of Palestinian oncology nurses on chemotherapy administration was developed by Achsah [14]. The instrument consisted of five sections. The first section included questions about the participant's gender, marital status, maternal history, professional qualifications, and years of experience in an oncology unit. Participants were asked to tick the box corresponding to their response to each question. The second section provides a knowledge questionnaire for healthcare workers to test their knowledge about the proper use of personal protection equipment and other safety measures during chemotherapy administration. Twenty multiple-choice questions covering a range of chemotherapeutic safety concerns are

included in the questionnaire. These topics cover selecting gloves and gowns for personal protection equipment (PPE), avoiding contamination, and post-exposure care. The third section presents an attitude scale with 10 items and matching answer possibilities. After reading each question, the respondents must select the best answer by checking the corresponding square. The assessment questions assess the respondents' beliefs on the necessity, effectiveness, and self-assurance in their capacity to use PPE and protect themselves against chemotherapeutic exposure.

The scale also assessed the efficacy of the PPE and how its reuse affected the respondents' impression of protection. The objective of the 20-item observational checklist—described in Section 4—is to evaluate the degree to which nursing personnel adhere to safety procedures when giving chemotherapy medications. The checklist covers items such as describing protocols, donning the proper PPE, securely supplying and preparing chemotherapy medications, acceptably disposing of trash, and adhering to safety precautions when transferring goods. The purpose of the checklist is to guarantee that nursing staff members adhere to the proper safety protocols to avoid exposure to chemotherapeutic chemicals and preserve a secure work environment. In the fifth section, the cutoff point was taken from the questionnaire by Achsah Merlight [14]. A collective score of 15–20 indicates high knowledge by paragraph, a score of 10–14 shows acceptable knowledge, and a score of 0–9 indicates inadequate knowledge, according to the scoring interpretation for the knowledge questionnaire. A cumulative score of 30–40 on the attitude scale denotes an excellent attitude, a score between 20 and 29 denotes a favorable attitude, and a score below 29 denotes an unpleasant attitude. Lastly, the practice checklist's scoring interpretation is as follows: a total score of 15–20 denotes good practice, 10–14 denotes moderate practice, and a score of less than 10 denotes bad practice. These interpretations of the scores will facilitate the categorization of the study's results and the understanding of Palestinian oncology nurses' knowledge, attitudes, and practice in the administration of chemotherapy.

**Pilot study:** Previous studies show that the reliability of instruments was affirmed, and the study demonstrated significant internal consistency within each scale, confirming that the items within these scales consistently measured similar constructs [14]. Prior to the main study, a pilot study with 10 Palestinian oncology nurses evaluated the viability of the research concept and tools. It revealed that the questionnaire was easy to understand and took around thirty minutes to finish. The pilot research also revealed possible problems with data collecting, which allowed the study design to be adjusted as needed. These realizations influenced the primary study's Palestinian oncology nurses' best practices for giving chemotherapy.

**Procedure:** The study's primary investigators informed the qualifying oncology nurses of the study's objective and volunteer nature by distributing questionnaires to them following clearance from the Ministry of Health. Nurses consented to participate and completed permission papers after learning about it. After that, structured attitude and systematic knowledge questionnaires were presented to them in order to assess their attitudes and knowledge regarding chemotherapy. In order to evaluate the nurses' abilities and adherence to recommended practices, the investigators also watched while they administered chemotherapy to patients.

**Ethical considerations:** Concerns concerning confidentiality were addressed throughout the study. The implied agreement was obtained, and there was the possibility of

withdrawing from the research without penalty, and no names were on the survey data collection materials. The information was only used for research purposes. Many procedures were taken in data collection, storage, and display to preserve anonymity.

**Data analysis:** The data were analyzed using the Statistical Package for Social Sciences (SPSS) Version 28. Data entries were completed and reviewed twice for outliers or mistakes. The Shapiro-Wilk test was used to determine the normality of the data. The Shapiro-Wilk tests in Table 1 reveal that the score is normally distributed ( $p = 0.05$ ). The data were analyzed using descriptive and inferential statistics. The study variables were described using frequency, percentages, mean score, and standard deviation (SD) in descriptive statistics. Regarding inferential statistics, the independent t-test and one-way ANOVA were employed to compare total scores for demographic factors' knowledge, attitude, and practice.

## Results

The findings of this study encompass several key points, including the frequency and percentages of demographic variables, as well as the knowledge, attitude, and practice levels among oncology nurses regarding chemotherapy administration.

**Demographic variables of the participants:** (Table 1) presents the demographic variables of oncology nurses. Of 72 nurses, 63.9% were female and 36.1% were male. 43.1% of nurses were aged between 21 and 30 years old. More than two-thirds of nurses hold a bachelor's degree, and 72.2% are married. 22.2% of nurses have less than 1 year of professional experience, while 37.5% have more than 4 years of experience.

**Table (1):** Demographic Variables of Oncology Nurses (n=72).

Demographic variables		N	%
Age group	21-30 years old	31	43.1%
	31-40 years old	27	37.5%
	>40 years old	14	19.4%
Gender	Male	26	36.1%
	Female	46	63.9%
Professions	GNM	22	30.6%
	B.Sc. Nursing	50	69.4%
Job title	Staff Nurse	52	72.2%
	Ward Sister	14	19.4%
	Head Nurse	6	8.3%
Marital Status	Married	52	72.2%
	Single	20	27.8%
	Widow	0	0
Experience	<1 year	16	22.2%
	1-2 years	12	16.7%
	3-4 years	17	23.6%
	>4 years	27	37.5%

The knowledge of chemotherapy administration among oncology nurses: (Table 2) presents the knowledge of chemotherapy administration among oncology nurses. Half of nurses have poor knowledge of chemotherapy administration; 44.4% have adequate knowledge, and only 5.6% have good knowledge.

The frequency and percentages for each knowledge item: The frequency and percentages for each knowledge item are shown in (Table 2). More than two-thirds of nurses (69.4%) correctly identified the prevalent system in health care workers following exposure to dangerous medications. Furthermore, 65.3% properly answered the contamination prevention methods and the rapid eye treatment following exposure to risky substances. On the other hand, most nurses (86.1%) erroneously identified the type of gloves to be used during chemotherapy medication delivery. (Table 2) has further information.

**Table (2):** Frequency and percentages for each knowledge item (n=72).

Item	Correct answer		Incorrect answer	
	N	%	N	%
Standard PPE, which is used by the nurse while administering chemotherapy	38	52.8%	34	47.2%
Additional protective equipment used during the administration of chemotherapy	44	61.1%	28	38.9%
Type of gown to be selected	15	20.8%	57	79.2%
Type of material used for preparing the gown	20	27.8%	52	72.2%
Type of gown to be avoided while administration of chemotherapy drugs	34	47.2%	38	52.8%
Type of gloves to be selected during administration of chemotherapy drugs	10	13.9%	62	86.1%
Gloves used by caregivers should be made up of which type of material	32	44.4%	40	55.6%
Safety measures to prevent contamination	47	65.3%	25	34.7%
Immediate care of the eye after exposure to risky drugs	47	65.3%	25	34.7%
Common route of exposure to risky drugs	31	43.1%	41	56.9%
Standard precautions to be taken while handling chemotherapy	37	51.4%	35	48.6%
Long standard precautions to be continued	22	30.6%	50	69.4%
Common system seen in healthcare workers after exposure to risky drugs	50	69.4%	22	30.6%
Common reproductive outcomes of exposed female health workers to risky drugs	30	41.7%	42	58.3%
The drug is excreted in the urine of healthcare workers after exposure to chemotherapy	39	54.2%	33	45.8%
Percentage of cyclophosphamide drug excreted in the urine of exposed person	34	47.2%	38	52.8%
The test is used to find the chemotherapy exposure in the urine	29	40.3%	43	59.7%
Chemotherapy drugs to be prepared for administration	32	44.4%	40	55.6%
Polluted air from the cytotoxic drug preparation area is filtered	24	33.3%	48	66.7%
The effective chemical used for neutralizing all chemotherapy drugs	41	56.9%	31	43.1%
Total knowledge (%)	Poor		Adequate	Good
	50%		44.4%	5.6%

**The attitude level toward chemotherapy administration among oncology nurses:** (Table 3) presents the attitude level toward chemotherapy administration among oncology nurses. More than two-thirds of nurses have a favorable attitude toward chemotherapy administration, and the rest, 27.8%, have a good attitude.

**The mean score for each item toward the attitude toward chemotherapy administration:** (Table 3) presents the mean score for each item toward the attitude toward chemotherapy administration. The highest positive item reported by nurses was that PPE makes me do my job to the best of my abilities and reuse of disposable PPE makes me feel less protected, with ( $3.46 \pm 0.529$ ) and ( $3.13 \pm 0.804$ ), respectively. At the same time, the lowest mean score was in the confident category to use PPE properly with ( $1.93 \pm 0.699$ ).

**Table (3):** Mean score for each item and total percentage toward the attitude of chemotherapy administration (n=72).

Item	Mean	SD
PPE prevents me from doing my job to the best of my abilities.	3.46	0.529
Wearing PPE makes patients worry	2.14	0.756
I do not think PPE is necessary	3.00	0.919
I do not have time to use PPE	2.86	0.954
People would think I am overly conscious	2.31	0.833
I am confident that I can use PPE properly	1.93	0.699
I am confident that I can protect myself from chemotherapy exposure	3.11	0.703
I am given enough information on how to protect myself from chemotherapy exposure.	2.94	0.820
Reusing disposable PPE makes me feel less protected.	3.13	0.804
I am provided with the best available PPE	3.04	0.701
Total attitude (%)	Unfavorable 0%	Favorable 72.2%
		Good 27.8%

**The practice level of chemotherapy administration among oncology nurses:** (Table 4) presents the practice level of chemotherapy administration among oncology nurses. Most nurses (80.6%) had good practice toward chemotherapy administration, while (18.1%) had moderate practice. Only (1.4%) had poor practice.

**The frequency and percentages for each item toward the practice of chemotherapy administration:** (Table 4) presents

**Table (4):** Frequency and percentages for each item toward the practice of chemotherapy administration (N=72).

Item	Applied		Not applied	
	N	%	N	%
Explains procedure	70	97.2%	2	2.8%
Performs Hand hygiene	71	98.6%	1	1.4%
Wears appropriate PPE	65	90.3%	7	9.7%
Wears lint-free fabric low permeability gown	35	48.6%	37	51.4%
Wears double gloving and chemotherapy-resistant gloves	54	75.0%	18	25.0%
Wears mask.	51	70.8%	21	29.2%
Wears eye goggles.	24	33.3%	48	66.7%
Change gloves immediately if contaminated.	70	97.2%	2	2.8%
Prepares chemotherapy agents in the biological safety cabinet area.	68	94.4%	4	5.6%
Uses caution sticker and administers chemotherapy drugs.	62	86.1%	10	13.9%
Stores the chemotherapeutic agents in an area labelled.	62	86.1%	10	13.9%
Transports the chemotherapeutic agents in zip-lock bags.	41	56.9%	31	43.1%
Place contaminated disposable items in a plastic bag.	54	75.0%	18	25.0%
Cleanses biosafety cabinet area safely.	65	90.3%	7	9.7%
Removes PPE safely.	63	87.5%	9	12.5%
Disposes of PPE safely.	66	91.7%	6	8.3%
Performs Hand hygiene.	66	91.7%	6	8.3%
Disposable excess chemotherapeutic agents which are used is discarded in a chemotherapy waste container.	50	69.4%	22	30.6%
Uses appropriate containers for segregation and disposal of chemotherapy waste.	57	79.2%	15	20.8%
Follows safety standards for the transportation of chemotherapy waste.	64	88.9%	8	11.1%
Total practice (%)	Poor 1.4%		Moderate 18.1%	Good 80.6%

the frequency and percentages for each item in the practice of chemotherapy administration. The highest applied practice reported by nurses was performing hand hygiene, explaining procedures, and changing gloves immediately if contaminated, with 98.6%, 97.2%, and 97.2%, respectively. The highest non-applied practice was wearing eye goggles and a lint-free fabric low-permeability gown, with 66.7% and 51.4%, respectively. More details are shown in (Table 5).

**Difference between demographic variables in terms of knowledge, attitude, and practice scores:** (Table 5) compares demographic characteristics in terms of knowledge, attitude, and practice scores. One-way ANOVA with an independent t-test was conducted to analyze the differences between research variables. Regarding knowledge and practice scores, there was a considerable variation in job titles. According to a Tukey post-hoc test, head nurses have higher knowledge scores than staff nurses and ward sisters (p = 0.05). Furthermore, staff nurses outperform head nurses and ward sisters in terms of practice (p = 0.05).

A significant difference was found in the attitude score (p = 0.047) regarding marital status. This means married nurses have a more positive attitude than single nurses. Married and single nurses may have distinct goals and aspirations for their careers. Married nurses could be more concerned with patient care and long-term career stability, which might translate into a more positive outlook on difficult activities like administering chemotherapy. However, no significant differences were found in all other variables.

**Table (5):** Difference between demographic variables in terms of knowledge, attitude and practice scores (n=72).

Demographic-variables <sup>a</sup>	n <sup>a</sup>	Knowledge-scores <sup>a</sup>			P-value <sup>a</sup>	n <sup>a</sup>	Attitude-score <sup>a</sup>			P-value <sup>a</sup>	n <sup>a</sup>	Practice-scores <sup>a</sup>			P-value <sup>a</sup>
		Mean <sup>a</sup>	SD <sup>a</sup>				Mean <sup>a</sup>	SD <sup>a</sup>				Mean <sup>a</sup>	SD <sup>a</sup>		
Age group <sup>a</sup>	21-30 years old <sup>a</sup>	31 <sup>a</sup>	8.90 <sup>a</sup>	2.80 <sup>a</sup>	0.599 <sup>a</sup>	31 <sup>a</sup>	27.54 <sup>a</sup>	2.79 <sup>a</sup>	0.589 <sup>a</sup>	31 <sup>a</sup>	16.77 <sup>a</sup>	1.56 <sup>a</sup>	0.056 <sup>a</sup>		
	31-40 years old <sup>a</sup>	27 <sup>a</sup>	8.92 <sup>a</sup>	3.91 <sup>a</sup>		27 <sup>a</sup>	28.00 <sup>a</sup>	3.50 <sup>a</sup>		27 <sup>a</sup>	15.59 <sup>a</sup>	1.926 <sup>a</sup>			
	>40 years old <sup>a</sup>	14 <sup>a</sup>	9.92 <sup>a</sup>	3.29 <sup>a</sup>		14 <sup>a</sup>	28.57 <sup>a</sup>	3.03 <sup>a</sup>		14 <sup>a</sup>	15.50 <sup>a</sup>	3.15 <sup>a</sup>			
Gender <sup>a</sup>	Male <sup>a</sup>	26 <sup>a</sup>	9.23 <sup>a</sup>	2.81 <sup>a</sup>	0.821 <sup>a</sup>	26 <sup>a</sup>	27.73 <sup>a</sup>	2.82 <sup>a</sup>	0.705 <sup>a</sup>	26 <sup>a</sup>	16.15 <sup>a</sup>	2.54 <sup>a</sup>	0.835 <sup>a</sup>		
	Female <sup>a</sup>	46 <sup>a</sup>	9.04 <sup>a</sup>	3.61 <sup>a</sup>		46 <sup>a</sup>	28.02 <sup>a</sup>	3.27 <sup>a</sup>		46 <sup>a</sup>	16.04 <sup>a</sup>	1.90 <sup>a</sup>			
Professions <sup>a</sup>	GNM <sup>a</sup>	22 <sup>a</sup>	9.36 <sup>a</sup>	3.36 <sup>a</sup>	0.673 <sup>a</sup>	22 <sup>a</sup>	27.90 <sup>a</sup>	3.08 <sup>a</sup>	0.989 <sup>a</sup>	22 <sup>a</sup>	16.63 <sup>a</sup>	1.619 <sup>a</sup>	0.147 <sup>a</sup>		
	B.Sc. Nursing <sup>a</sup>	50 <sup>a</sup>	9.00 <sup>a</sup>	3.34 <sup>a</sup>		50 <sup>a</sup>	27.92 <sup>a</sup>	3.14 <sup>a</sup>		50 <sup>a</sup>	15.84 <sup>a</sup>	2.30 <sup>a</sup>			
	Staff Nurse <sup>a</sup>	52 <sup>a</sup>	9.61 <sup>a</sup>	3.14 <sup>a</sup>		52 <sup>a</sup>	28.26 <sup>a</sup>	3.266 <sup>a</sup>		52 <sup>a</sup>	16.7 <sup>a</sup>	1.67 <sup>a</sup>			
Job title <sup>a</sup>	Ward Sister <sup>a</sup>	14 <sup>a</sup>	6.35 <sup>a</sup>	2.37 <sup>a</sup>	<.001 <sup>a</sup>	14 <sup>a</sup>	26.42 <sup>a</sup>	2.20 <sup>a</sup>	0.135 <sup>a</sup>	14 <sup>a</sup>	14.4 <sup>a</sup>	2.34 <sup>a</sup>	<.001 <sup>a</sup>		
	Head Nurse <sup>a</sup>	6 <sup>a</sup>	11.16 <sup>a</sup>	3.60 <sup>a</sup>		6 <sup>a</sup>	28.33 <sup>a</sup>	2.732 <sup>a</sup>		6 <sup>a</sup>	13.8 <sup>a</sup>	1.83 <sup>a</sup>			
Marital Status <sup>a</sup>	Married <sup>a</sup>	52 <sup>a</sup>	9.5769 <sup>a</sup>	3.28601 <sup>a</sup>	.055 <sup>a</sup>	52 <sup>a</sup>	28.3654 <sup>a</sup>	3.21168 <sup>a</sup>	0.047 <sup>a</sup>	52 <sup>a</sup>	16.1346 <sup>a</sup>	2.38 <sup>a</sup>	0.746 <sup>a</sup>		
	Single <sup>a</sup>	20 <sup>a</sup>	7.9000 <sup>a</sup>	3.21018 <sup>a</sup>		20 <sup>a</sup>	26.7500 <sup>a</sup>	2.51050 <sup>a</sup>		20 <sup>a</sup>	15.9500 <sup>a</sup>	1.35627 <sup>a</sup>			
Experience <sup>a</sup>	<1 year <sup>a</sup>	16 <sup>a</sup>	9.0625 <sup>a</sup>	3.10846 <sup>a</sup>	0.752 <sup>a</sup>	16 <sup>a</sup>	27.6875 <sup>a</sup>	2.57472 <sup>a</sup>	0.986 <sup>a</sup>	16 <sup>a</sup>	16.2500 <sup>a</sup>	1.18322 <sup>a</sup>	0.668 <sup>a</sup>		
	1-2 years <sup>a</sup>	12 <sup>a</sup>	9.9167 <sup>a</sup>	2.15146 <sup>a</sup>		12 <sup>a</sup>	27.8333 <sup>a</sup>	2.88675 <sup>a</sup>		12 <sup>a</sup>	16.6667 <sup>a</sup>	1.77525 <sup>a</sup>			
	3-4 years <sup>a</sup>	17 <sup>a</sup>	9.2941 <sup>a</sup>	3.85300 <sup>a</sup>		17 <sup>a</sup>	28.0588 <sup>a</sup>	2.70348 <sup>a</sup>		17 <sup>a</sup>	15.7059 <sup>a</sup>	2.28486 <sup>a</sup>			
	>4 years <sup>a</sup>	27 <sup>a</sup>	8.6667 <sup>a</sup>	3.61620 <sup>a</sup>		27 <sup>a</sup>	28.0000 <sup>a</sup>	3.79271 <sup>a</sup>		27 <sup>a</sup>	15.9630 <sup>a</sup>	2.62358 <sup>a</sup>			

## Discussion

The current study aimed to analyze Palestinian oncology nurses' knowledge, attitudes, and behaviors regarding chemotherapy treatment in West Bank hospitals. The investigation included a total of 72 samples. Knowledge was measured using a structured questionnaire, attitude was measured using a Likert's four-point scale, and practice was evaluated using an observational checklist. Based on conjecture, descriptive and inferential statistics were used to analyze the data.

**The knowledge level among oncology nurses toward chemotherapy administration:** The study discovered that just 5.6% of oncology nurses were competent in giving chemotherapy, which is concerning information. This emphasizes how urgently oncology departments need to improve training and education. It is alarming that half of the nurses lacked enough knowledge in this area, considering how crucial chemotherapy delivery is to cancer nursing care. A small sample size may result in fewer reliable or broadly applicable findings in a study examining nurses' proficiency in delivering chemotherapy. Previous studies indicated that education and training initiatives might greatly enhance nurses' understanding of administering chemotherapy. These results highlighted the significance of continuous professional development programs designed to increase the competency of oncology nurses in administering chemotherapy, which might result in better patient outcomes [15]. Reports on oncology nurses' comprehension of hazardous pharmaceutical exposure were conflicting. Most nurses answered incorrectly when asked what gloves should be used when giving chemotherapy drugs. When it came to typical systems observed in healthcare professionals following exposure to hazardous medicines, safety precautions to avoid contamination, and prompt treatment of the eyes following exposure, almost two-thirds of the nurses provided accurate answers. This is worrisome since wearing the appropriate gloves is necessary to prevent exposure to potentially harmful drugs. Research indicates that dangerous drug-handling training programs may greatly enhance nurses' knowledge and skills, underscoring the need for continuing education in this area. These findings highlight the necessity of programs designed to increase oncology nurses' understanding of handling hazardous drugs, especially concerning choosing the right gloves [16].

The study's findings indicated that when it came to administering chemotherapy, 50% of nurses had inadequate understanding, 44.4% had enough knowledge, and only 5.6% had strong knowledge. The results were consistent with a previous study's findings in that chemotherapy was one of the medications with a high alert level, and more than 60% of respondents (67.1%; 188/280) had knowledge scores lower than 70% [11]. Moreover, these findings contradicted research conducted in Egypt's Damanhur Oncology Center, which discovered that 60% of the nurses assessed had an outstanding overall knowledge score for intravenous chemotherapy. An investigation into the chemotherapy department of Bangladesh also revealed that most participants had a respectable degree of chemotherapy expertise [18].

**The attitudes perception among oncology nurses toward chemotherapy administration:** According to the study results, more than two-thirds of oncology nurses had a favorable opinion of chemotherapy delivery, demonstrating how highly they thought of this component of patient care. Furthermore, a considerable percentage of nurses were proficient in the administration of chemotherapy. Studies indicated that nurse attitudes might be positively impacted by training programs, emphasizing the need of continuing education in improving

patient outcomes[19]. The study demonstrated nurses' favorable opinions on the delivery of chemotherapy and the significance of PPE. Although nurses understood the value of PPE for safety, further training was required to increase confidence and guarantee appropriate use. Maintaining a sufficient supply of PPE was essential to allay nurses' worries about reusing it and guaranteeing their safety. These results highlighted how crucial it was to provide nurses with enough PPE and ongoing training to safely and confidently deliver chemotherapy. Furthermore, the study discovered that 72.20% of cancer nurses felt positive about giving chemotherapy, which was in line with earlier studies showing high levels of safe conduct in this domain [20].

**The practice level among oncology nurses toward chemotherapy administration:** The study results revealed that most oncology nurses were competent in administering chemotherapy, which was an essential component of effective cancer treatment. Their thorough education and training, which prioritize safe and efficient administration techniques, were probably responsible for this favorable result. However, the fact that a tiny proportion of nurses practice poorly or inferiorly emphasizes how crucial it was to keep learning and developing to fill in any knowledge or skill gaps. In order to increase the caliber of care given, more training or mentorship programs might be helpful in addition to continuous quality improvement projects that seek to identify and address systemic problems that lead to subpar treatment. Although the study recommended that oncology nurses had sufficient training in the delivery of chemotherapy, sustained efforts were required to maintain and improve practice standards throughout time. The study discovered that 80.6% of participants administered chemotherapy with good skill, compared to 18.1% of people who did it with poor ability. Bad behaviors were only used by 1.4% of people. The results aligned with research in Bangladesh in the chemotherapy department, titled "Evaluation of knowledge and practice of handling chemotherapy agents by nurses." According to the study, over two-thirds (66.7%) of the participants had some chemotherapy experience [18]. These results also contradicted a study conducted at the Damanhur Oncology Center in Egypt, which discovered that 100% of the nurses in the study had subpar overall practice ratings for intravenous chemotherapy [17].

**The differences in knowledge, attitude, and practice of oncology nurses toward chemotherapy administration:** With a focus on the influence of demographic factors, the study examined the variations in the knowledge, attitudes, and practices of oncology nurses about the administration of chemotherapy. The findings revealed a significant difference in attitude ratings amongst nurses with varying marital statuses, suggesting that married nurses are more likely than single nurses to have a favorable attitude regarding administering chemotherapy. This observation ran counter to previous study findings. Nurses' degree of knowledge, attitude, and practice about taking safety precautions when handling chemotherapy medications does not correlate with the demographic characteristics they have chosen, including age, gender, marital status, professional qualification, and length of employment with chemotherapy drugs. However, this aligned with the fact that no significant differences were observed in other variables, such as knowledge and practice. At the same time, the findings suggest that other demographic factors, such as age or education level, may not enormously influence oncology nurses' knowledge, attitudes, and practice toward chemotherapy administration [14]. There are several limitations to the current study. The study was limited to three months. Additionally, our findings' generalizability was hampered by the fact that the sample was excluded from An-Najah National University Hospital.

## Conclusion

Overall, there was a clear knowledge gap among oncology nurses regarding chemotherapy administration in the West Bank. Therefore, there was an enormous opportunity to improve and expand the knowledge base of oncology nurses. Finally, additional studies in other health facilities were required to generalize the findings across Palestine. Based on the study's findings, the researchers offered many recommendations. A larger number of samples could be used in a study to improve generalization. Similar studies could be conducted to understand the causes of knowledge gaps in chemotherapy administration. Ongoing education and training programs could enhance nurses' knowledge, attitude, and practice toward chemotherapy administration. Having standard guidelines for the administration of chemotherapy could help nurses improve their practice. Risk-reduction methods should be used at all phases of the pharmaceutical use process, from preparation and storage through administration and monitoring. The findings underscored the need for solid knowledge and instructional programs for oncology nurses to develop their practice and habits in chemotherapy delivery. Ongoing training and support to ensure that nurses feel confident and safe administering chemotherapy. Ample supplies of PPE are available to protect healthcare workers. Increasing the employment of nurses in the oncology department reduces the workload on the staff and contributes to a more satisfactory outcome for patients.

## Disclosure Statement

- **Ethical approval:** The Palestinian Ministry of Health provided its permission letter two weeks before the study started.
- **Consent for Publication:** I grant permission to publish my article titled "Knowledge, Attitude, and Practice among Palestinian Oncology Nurses toward Chemotherapy Administration in West-Bank: A Cross-Sectional Study." I understand the purpose and content of the publication and agree to its dissemination.
- **Data availability statement:** Data used for this study will be made available upon request.
- **Author's contribution:** Adam Marawa'a: conceptualization, writing-original draft, data curation, formal analysis. Rebhi Bsharat: Conceptualization, methodology, resources, software, supervision, validation. Hamdallah Khaled: formal analysis, validation, visualization, and writing review & editing.
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## References

- 1] Sung W-W, Ko P-Y, Chen W-J, Wang S-C, Chen S-L. Trends in the kidney cancer mortality-to-incidence ratios according to health care expenditures of 56 countries. *Sci Rep* 2021;11:1479. <https://doi.org/10.1038/s41598-020-79367-y>.
- 2] Mansour R, Amarin JZ, Al-Ani A, Al-Hussaini M, Mansour A. Palestinian Patients with Cancer at King Hussein Cancer Center. *Front Oncol* 2022;12. <https://doi.org/10.3389/fonc.2022.997492>.
- 3] Dreidi MM, Alrimawi I, Saifan AR, Batiha A-M. Hand Hygiene Knowledge, Practices and Attitudes among Nurses and Physicians. *Health (N Y)* 2016;8:456–62. <https://doi.org/10.4236/health.2016.85048>.
- 4] Hawash M. Highlights on Specific Biological Targets; Cyclin-Dependent Kinases, Epidermal Growth Factor Receptors, Ras Protein, and Cancer Stem Cells in Anti-cancer Drug Development. *Drug Res* 2019;69:471–8. <https://doi.org/10.1055/a-0898-7347>.
- 5] Hawash M. Recent advances of tubulin inhibitors targeting the colchicine binding site for cancer therapy. *Biomolecules*. 2022;12(12):1843. <https://doi.org/10.3390/biom12121843>
- 6] Oncology Nurses Knowledge and Attitudes Regarding Cancer Pain Management. *Asian Pac J Cancer Prev APJCP* 2015;16:7501–6. <https://doi.org/10.7314/apjcp.2015.16.17.7501>.
- 7] Abu-El-Noor NI, Abu-El-Noor MK. Attitude of Palestinian Nursing Students Toward Caring for Dying Patients: A Call for Change in Health Education Policy. *J Holist Nurs Off J Am Holist Nurses Assoc* 2016;34:193–9. <https://doi.org/10.1177/0898010115596492>.
- 8] Watheeq HH, Al-Ashour IA. Nurse's knowledge toward oncology patients during chemotherapy management. *Int J Health Sci* 2022;1063–76. <https://doi.org/10.53730/ijhs.v6nS8.10668>.
- 9] Xie J, Zhou Y, Luo X, Cheng Q, Luo Y, Kang Y, et al. Knowledge, attitude, and practice of sexual healthcare and its influencing factors among oncology nurses: a multicenter study. *Sex Med* 2023;11:qfad001. <https://doi.org/10.1093/sexmed/qfad001>.
- 10] Khattab T, Aljeesh Y. Professional Quality of Life among Oncology Nurses at Turkish Palestinian Friendship Hospital in Gaza Strip. *Nurs Health Sci J NHSJ* 2022;2:232–9. <https://doi.org/10.53713/nhs.v2i3.178>.
- 11] Zyoud SH, Khaled SM, Kawasmi BM, Habeba AM, Hamadneh AT, Anabosi HH, et al. Knowledge about the administration and regulation of high alert medications among nurses in Palestine: a cross-sectional study. *BMC Nurs* 2019;18:11. <https://doi.org/10.1186/s12912-019-0336-0>.
- 12] Young AM, Charalambous A, Owen RI, Njodzeka B, Oldenmenger WH, Alqudimat MR, et al. Essential oncology nursing care along the cancer continuum. *Lancet Oncol* 2020;21:e555–63. [https://doi.org/10.1016/S1470-2045\(20\)30612-4](https://doi.org/10.1016/S1470-2045(20)30612-4).
- 13] Al-Mahdy Y, Emam M, Hallinger P. Assessing the contribution of principal instructional leadership and collective teacher efficacy to teacher commitment in Oman. *Teach Teach Educ* 2018;69. <https://doi.org/10.1016/j.tate.2017.10.007>.
- 14] Choudhary MMD. To Assess the Effectiveness of Self-Instructional Module on Knowledge Regarding Financial Funds among the Treatment of Cancer Patients in Selected Cancer Hospitals. 2023;4.
- 15] Tabrizi R, Moosazadeh M, Akbari M, Dabbaghmanesh MH, Mohamadkhani M, Asemi Z, et al. High Prevalence of Vitamin D Deficiency among Iranian Population: A Systematic Review and Meta-Analysis. *Iran J Med Sci* 2018;43:125–39.
- 16] Rahayu NW, Ferdiana R, Kusumawardani SS. A systematic review of ontology use in E-Learning recommender system. *Comput Educ Artif Intell* 2022;3:100047. <https://doi.org/10.1016/j.caeai.2022.100047>.
- 17] Mamdouh Zakaria M, Mohamed Alaa S, Mohamed Desoky G. Oncology Nurses' Knowledge and Practices regarding Safe Administration of Intravenous Chemotherapy. *Egypt J Health Care* 2022;13:1218–31. <https://doi.org/10.21608/ehc.2022.225111>.
- 18] Hosen M, Hasan M, Islam M, Raseduzzaman M, Islam M, Islam M, et al. Evaluation of knowledge and practice of handling chemotherapy agents by nurses: a multi-centre studies in Bangladesh. *Int J Community Med Public Health* 2019;6:4175. <https://doi.org/10.18203/2394-6040.ijcmph20194471>.
- 19] Karimian A, Azizian K, Parsian H, Raffieian S, Shafiei-Irannejad V, Kheyrollah M, et al. CRISPR/Cas9 technology as a potent molecular tool for gene therapy. *J Cell Physiol* 2019;234:12267–77. <https://doi.org/10.1002/jcp.27972>.
- 20] Koulounti M, Roupia Z, Charalambous C, Noula M. Assessment of Nurse's Safe Behavior Towards Chemotherapy Management. *Mater Socio-Medica* 2019;31:282–5. <https://doi.org/10.5455/msm.2019.31.282-285>.