

Impact of Educational Guidelines on Oral Mucositis Severity and Quality of Life in Oncology Patients Receiving Chemotherapy: A Quasi-Experimental Study

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Abstract

Background: Oral mucositis (OM) is a prevalent side effect of chemotherapy that negatively impacts patient quality of life (QoL). Educational guidelines may provide strategies to mitigate these effects. **Objective:** To evaluate the effectiveness of educational guidelines on the severity of OM and QoL in oncology patients undergoing chemotherapy. **Methods:** A quasi-experimental study was conducted. Patients (n = 108) were randomly assigned to an intervention group receiving educational guidelines or a control group receiving routine care. Outcomes were assessed at baseline and at one and three months post-intervention. Data were collected using a structured interview including assessments of personal characteristics, clinical data, chemotherapy side effects, OM severity, and QoL. **Results:** Baseline QoL scores were comparable between groups. Post-intervention, the intervention group experienced significant improvements in QoL ($p \leq 0.05$), while the control group showed a decline. OM severity was significantly reduced in the intervention group compared to the control group at both time points ($p \leq 0.05$). **Conclusion:** Educational guidelines are an effective intervention for reducing OM severity and improving QoL in oncology patients receiving chemotherapy. Implementation of these guidelines can enhance patient well-being and support optimal treatment outcomes.

Keywords: Educational guidelines- oral mucositis- quality of life- cancer- chemotherapy

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Introduction

Cancer remains a significant contributor to global morbidity, mortality, and disability. With its increasing prevalence, healthcare systems are prioritizing efforts to improve the quality of life for cancer patients and mitigate the burden of the disease and its treatment, particularly chemotherapy [1]. Currently, cancer accounts for approximately 15% of annual deaths worldwide, rendering it one of the leading disease-related causes of demise. Chemotherapy, a commonly utilized cancer treatment, often entails both short- and long-term adverse effects [2].

Chemotherapy is widely employed in the treatment of malignancies, serving as the primary therapy for cancers affecting the lung, breast, bladder, colon, cervix, ovary, and prostate [3]. Similar to other therapies, chemotherapy can induce a spectrum of side effects, including nausea, vomiting, dyspepsia, ovarian failure, oral ulcers, oral mucosal mucositis, hyperuricemia, neuropathy, cardiomyopathy, hemorrhagic cystitis, and renal failure [4]. In patients administering anticancer medications,

renal dysfunction may exacerbate side effect frequency and severity, as reduced renal drug clearance is associated with this condition. Nevertheless, the authors acknowledge that confounding factors such as oral microbiota or genetic predisposition may influence this association and the precise mechanisms governing renal dysfunction [5]. Furthermore, oral mucositis (OM) emerges as a prevalent adverse effect associated with radiation and chemotherapy. In the face of these challenges, nurses serve a pivotal role in delivering specialized care to affected patients [6].

A Serious Adversity OM signifies a significant adverse effect attributable to radiation therapy and cytotoxic anti-cancer chemotherapy. It manifests in approximately 30–40% of cancer patients undergoing chemotherapy (e.g., methotrexate, cytarabine, antimetabolites such as 5-fluorouracil). This incidence escalates to over 90% in patients receiving both chemotherapy and radiation therapy [7]. Mucositis affects nearly half of the 1.8 million cancer patients. To avoid compromising optimal cancer treatment, many individuals whose OM from chemotherapy (CT) reaches severe levels require

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opioid analgesics and supplemental nutrition to prevent substantial dietary changes and weight loss. Furthermore, chemotherapy-induced mucositis elevates the risk of bacteremia and sepsis when superinfection occurs. Compared to individuals without OM, those afflicted with this condition are more susceptible to unfavorable treatment outcomes, diminished quality of life, and increased medical expenditures. It exerts a substantial impact on the quality of life for cancer patients, and currently, there is no established method for preventing or treating this pathology [8].

Following hospital discharge after receiving treatment, cancer patients undergoing concurrent chemotherapy often face challenges at home, including pain from mucositis and nutritional difficulties. Patients may endure silent suffering and distress while awaiting symptom resolution, as they often lack the knowledge and skills to manage these symptoms effectively. Unfortunately, the patient's medical team may not be readily available to respond to these concerns, which can lead to prolonged suffering and compromise nutritional status. Addressing this clinical challenge requires ensuring that patients receive adequate education and resources prior to hospital discharge to empower them with the necessary self-care strategies [9].

Oral health education plays a crucial role in mitigating OM by promoting self-management and actively engaging patients in their own well-being care [10]. Oral mucositis causes significant pain, leading to difficulties with eating, drinking, and speaking, severely impacting a patient's quality of life. Severe cases may necessitate modifications or interruptions in cancer treatment, potentially affecting overall treatment outcomes. The ulcerations in the mouth can also serve as an entry point for bacteria, increasing the risk of systemic infections, particularly in immunocompromised patients. These factors underscore the need to investigate the effectiveness of interventions that could assist patients in reducing the negative effects of oral mucositis [6].

Study Aim and Objectives

The aim of this study was to determine the effectiveness of educational guidelines on the severity of mucositis and quality of life among patients undergoing chemotherapy. This was achieved through the following specific objectives:

1. Investigate the degree of oral mucositis in cancer patients undergoing chemotherapy.
2. Identify the adverse events of chemotherapy in cancer patients undergoing chemotherapy.

Research hypothesis.

Participants receiving educational guidelines would experience significantly reduced severity of OM and higher QoL.

Materials and Methods

Method

Research Design

The research design employed a quasi-experimental study to achieve the study's aim.

Research Setting

The study was conducted in the oncology inpatient department and outpatient clinics at Elmabra Hospital Health Care hospitals in Port Said governorate, and the oncology institute in Damietta City, Egypt, from August 2023 to February 2024.

Subjects

Participants were selected using a purposive sampling method, aiming to include a subset representing 10% of total admissions over a six-month period at outpatient clinics and inpatient settings. Eligible participants met the following criteria:

- a. Diagnosed with hematological or non-hematological malignancies
- b. Aged 18 or above
- c. Receiving chemotherapy for the first time
- d. Had not previously received education about oral mucositis (OM)
- e. Physically and mentally capable of completing study forms

Exclusions included patients with metastatic cancer and those with severe comorbidities that could interfere with participation or affect study outcomes.

Following identification of eligible participants, they were allocated to either the control or intervention group. Allocation was carried out through a non-randomized method based on hospitalization lines to ensure the absence of bias and maintain a balanced distribution of participants. Patients with odd hospitalization lines were assigned to the control group, while patients with double lines were assigned to the study group. This approach minimized potential sources of bias, as assignment was not influenced by subjective factors or researcher discretion.

The study included 108 participants, with 54 allocated to each group. This sample size was determined to provide sufficient statistical power to assess the impact of the educational intervention on the severity of oral mucositis and quality of life for oncology patients undergoing chemotherapy. The meticulous selection process and allocation method helped ensure that participants were representative of the target population while minimizing potential confounding factors.

Tools of Data Collection

Data were gathered using a structured interview questionnaire comprising four distinct sections:

Section 1: Sociodemographic Variables

- Age
- Gender
- Educational attainment
- Marital status
- Income
- Diagnosis

Section 2: Medical Variables

- Type of treatment
- Tumor stage at diagnosis
- Adverse effects of chemotherapy experienced [11]

Section 3: Quality of Life Patient/Cancer Survivor Arabic Version (QOL-CSV)

- 41 items on a Likert scale (0-10)
- Assesses physical, psychological, and spiritual domains
- Scoring: 0 = lowest possible result; 10 = highest possible result [12,13]

Section 4: Mucositis Severity Assessment (World Health Organization)

- Classification criteria to assess oral mucosal disorder
- Assessment scale categorizes mucosa into four classes:
 - * 1: Mouth pain and erythema
 - * 2: Oral erythema and ulcers with solid diet tolerated
 - * 3: Oral ulcers with liquid diet alone
 - * 4: Inability to eat [14]

The preparatory Phase: Prior to data collection, an extensive literature review was conducted to inform the development of the data collection instruments. This included:

- Reviewing scholarly journals, online databases, and other relevant sources
- Conducting thorough research to identify topics for inclusion in the questionnaire
- Creating a preliminary questionnaire and obtaining expert feedback to ensure its validity and reliability

Validity

Seven experts from the medical-surgical nursing division evaluated the face and content validity of the recommended instruments. The tools were assessed by the jury for their clarity, relevance, comprehensiveness, and simplicity before the final forms were created. The experts shared their thoughts and recommendations to enhance the question's content and clarity. No changes were made to the structure or content of the data collection tools based on the feedback.

Reliability

The internal consistency of the two instruments utilized in the current study was assessed using the Alpha Chronbach test as follows:

- First tool: Severity of mucositis: $\alpha = 0.8$ [15]
- Second tool: Quality of Life-Chemotherapy-Associated Oral Mucositis Scale (QOL-CSV): $\alpha = 0.825$ [13]

A pilot study was conducted with 10 patients to verify that the tools were understandable and practical and to calculate the time needed to complete them.

Field Work

Phase of planning

• Patients who met the inclusion criteria were selected. After outlining the purpose of the study, the researcher obtained the patients' written informed consent agreement to participate. The patient's interview questionnaire served as the starting point for data collection. The previously described tools were filled out based on the study group's patients' health and awareness before the educational

guidelines were implemented. All data acquired using data-gathering instruments were analyzed to determine each participant's unique learning needs. The researcher created a lesson plan that addressed each goal.

Phase of Implementation

Before any data was collected, patients received information regarding the confidentiality of the subject data, the nature of the study, their ability to withdraw, and the privacy of their personal information. The study was carried out three days a week from 9 a.m. to 2 p.m. The time required to complete the study instruments was approximately 25-30 minutes for clinical data, chemotherapeutic adverse effects, Quality of Life scale, and severity of mucositis scale before conducting educational guidelines and routine care for both groups. The patients were divided into small groups (6-10 patients per session) to conduct the teaching sessions. Each group utilized identical handouts and methods of guidelines to ensure that they understood the same program content. There were five groups and three teaching sessions for each group of patients to cover the material included in the educational guidelines.

Educational Guidelines

Session One: Introduction to Chemotherapy and Side Effects

- Understanding Chemotherapy: Overview and Purpose
- Common Side Effects: Overview and Management Strategies

Duration: 60 minutes

Frequency: Three sessions for each group

Session Two: Understanding Oral Mucositis: Causes and Symptoms

- Defining Oral Mucositis: What it is and Why it Occurs
- Recognizing Symptoms: Signs and Symptoms of Oral Mucositis

Duration: 60 minutes

Frequency: Three sessions for each group

Session Three: Pathophysiology and Contributing Factors of Oral Mucositis

- Pathophysiology of Oral Mucositis: How it Develops in the Body
- Contributing Factors: Understanding what Triggers Oral Mucositis

Duration: 60 minutes

Frequency: Three sessions for each group

Session Four: Prevention Strategies and Oral Hygiene Practices

- Preventing Oral Mucositis: Strategies for Minimizing Risk
- Optimal Oral Hygiene: Practices to Maintain Oral Health during Treatment

Duration: 60 minutes

Frequency: Three sessions for each group

Session Five: Nutritional Guidelines During Chemotherapy

- Importance of Nutrition: Understanding its Role in Treatment

- Nutritional Guidelines: Dietary Recommendations for Managing Oral Mucositis
Duration: 60 minutes
Frequency: Three sessions for each group

Evaluation Phase

The study and control groups were subjected to this phase. The effect of the educational guidelines was assessed. This study was carried out using a pre-test, post-test one (one month following the introduction of educational guidelines), and post-test two (three months following the introduction of educational guidelines for the study group and usual care for the control group) design to ascertain its impact on the patient’s QoL, the degree of OM, and the adverse effects of chemotherapy. Pre-educational guidelines, post-test 1 (one month), and post-test 2 (three months) were conducted for the control and study groups to evaluate quality of life, chemo side effects, severity of OM, socioeconomic characteristics, and clinical data sheet.

Ethical Considerations

Ethical approval was acquired from the Research Ethics Committee at the Faculty of Nursing at Port Said University NUR (6-8-2023)/(28). Each patient was informed about the aim and values of the research at the start of the interview.

Statistical analysis

The data analysis for this study employed a variety of statistical tests to comprehensively analyze the collected data. Initially, the normality of the quantitative data distribution was confirmed using the Kolmogorov-Smirnov test. Descriptive statistics, such as mean and standard deviation, were then calculated to characterize the quantitative variables. For assessing the significance of associations between categorical variables, Chi-square tests were utilized. To address situations where more than

20% of the cells had an expected count of less than 5 in contingency tables, the Chi-square test was corrected using the Monte Carlo method. When comparing means between two groups for normally distributed quantitative variables, Student’s t-test was employed. For comparing means across more than two categories, the F-test (ANOVA) was used. Lastly, Spearman’s coefficient was utilized to examine the correlation between two variables that may not have a normal distribution. By utilizing this array of statistical tests, the study ensured a thorough analysis of the data, allowing for robust conclusions to be drawn regarding the impact of educational guidelines on oral mucositis and quality of life for oncology patients undergoing chemotherapy.

Results

A total of 108 samples’ worth of baseline data was analyzed. The participants’ mean age was 50.94 ± 9.25 in the study group and 48.70 ± 11.37 in the control. Female patients were higher than males, and 57.4% of patients were married in the study and control, while 63.9% of the studied patients didn’t have any health education related to oral care. The statistical tests revealed no significant differences between the two groups, indicating the statistical uniformity of the subjects in the intervention and control groups ($p > 0.05$). There was no statistical significance in clinical history between the two groups. Less than half of the patients were non-smokers, and two-thirds of patients had cancer and were in the early stages. Less than half of patients had cancer from one to two years with 2-3 CT sessions (Table 1).

Table 2 shows that there was a statistically significant difference between the study and control groups in the degree of OM on post-test-1 ($p < 0.001$) and post-test-2 ($p < 0.001$) of educational guidelines.

Figure 1 shows that the highest percentage in the two groups was in grade 3 (40.7%) in the study group

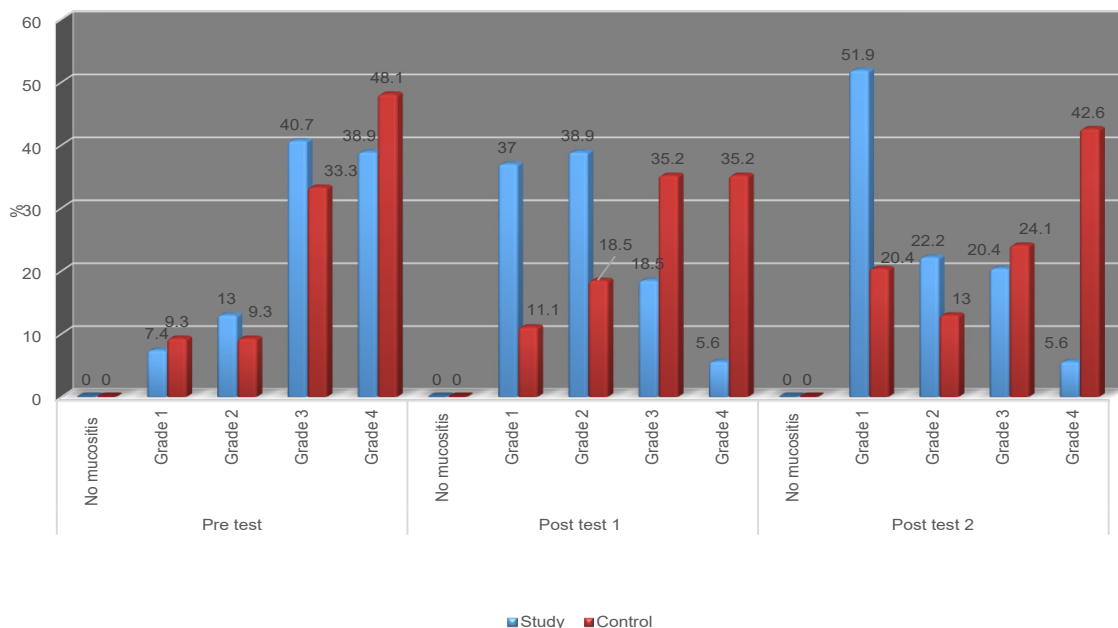


Figure 1. Percentage of Severity of Oral Mucositis during Study Period between the Two Studied Groups

Table 1. Comparison between the Two Studied Groups according to Socio-Demographic Characteristics

Socio-demographic characteristics	Study (n=54)		Control (n=54)		Test of Sig.	p
	No.	%	No.	%		
Gender						
Male	22	40.7	27	50	$\chi^2=0.934$	0.334
Female	32	59.3	27	50		
Age						
Less than 30 years	2	3.7	5	9.3	$\chi^2=5.602$	0.231
> 30 – 40 years	4	7.4	8	14.8		
> 40 – 50 years	19	35.2	11	20.4		
> 50 – 60 years	17	31.5	21	38.9		
More than 60 years	12	22.2	9	16.7		
Mean \pm SD.	50.94 \pm 9.25		48.70 \pm 11.37		t=1.123	0.264
Marital status						
Single	5	9.3	6	11.1	$\chi^2=6.746$	0.08
Married	31	57.4	41	75.9		
Divorced	10	18.5	5	9.3		
Widowed	8	14.8	2	3.7		
Level of education						
Illiterate	12	22.2	3	5.6	$\chi^2=8.625$	0.071
Primary & Preparatory	14	25.9	10	18.5		
Secondary education	11	20.4	15	27.8		
Technical education	13	24.1	19	35.2		
Higher education	4	7.4	7	13		
Your job						
Sick leave	11	20.4	9	16.7	$\chi^2=1.531$	0.675
Not work	12	22.2	17	31.5		
Worked	21	38.9	17	31.5		
Retired	10	18.5	11	20.4		
Do you have any health education related to mouth care?						
No	34	63	35	64.8	$\chi^2=0.040$	0.841
Yes	20	37	19	35.2		
Smoking						
No	25	46.3	23	42.6	0.15	0.699
Yes	29	53.7	31	57.4		
How many years of smoking						
No	25	46.3	23	42.6	2.689	MCp=0.467
Yes (Less than 1 year)	12	22.2	11	20.4		
Yes (1-5 years)	16	29.6	15	27.8		
Yes (More than 5 years)	1	1.9	5	9.3		
How many times of smoking daily						
No	25	46.3	23	42.6	1.204	0.752
Yes (Less than 5 cigarettes)	7	13	10	18.5		
Yes (5-10 cigarette)	13	24.1	10	18.5		
Yes (More than 10 cegrate)	9	16.7	11	20.4		
Cancer type						
Malignant	30	55.6	34	63	0.614	0.433
Benign	24	44.4	20	37		
Cancer stage						
Early	35	64.8	37	68.5	0.167	0.683
Late	19	35.2	17	31.5		

Table 1. Continued

Socio-demographic characteristics	Study (n=54)		Control (n=54)		Test of Sig.	p
	No.	%	No.	%		
Extent of disease						
Less than 1 year	19	35.2	16	29.6	2.31	0.315
1-2 year	24	44.4	20	37		
More than 2 years	11	20.4	18	33.3		
CT sessions						
1	20	37	20	37	1.826	0.401
2-5	22	40.7	27	50		
More than 3 times	12	22.2	7	13		

SD:Standard deviation; t, Student t-test; χ^2 , Chi-square test; MC, Monte Carlo; p, p-value for comparing between the two studied groups

and 48.1% in grade 4 for the control group before the educational program. However, the severity of OM decreased to grade 3 with 18.5% and 5% in grade 4 in the study group compared to the control group after one month post-implementation of educational guidelines. Additionally, the severity of OM improved in the post-3 months compared to the control group. This indicates that educational guidelines improved the severity of OM in the study group.

Table 3 shows a statistical significance between the study and control groups with a lower percentage of adverse effects such as mouth sores ($p = 0.035$), diarrhea ($p = 0.034$), and fatigue ($p = 0.016$) post-test one after one month of implementing educational guidelines. Moreover, there was a lower percentage of fatigue in the study group compared to the control group in post-test 2 after three months of guidelines. Table 4 revealed statistical significance between the two groups after one month and after three months of implementing educational guidelines in the overall mean score of quality of life with an improving mean score in the study group (218.2 ± 19.36 , 205.4 ± 20.30) compared to the mean score of the control (174.7 ± 15.99 , 166.6 ± 18.39). It was demonstrated that the Physical Well-Being score of patients in the study group was 30.67 ± 7.58 , and the mean score in the control group was 25.80 ± 7.74 on the pre-intervention. It was also noticed that the mean score of Physical Well-Being in the control group was lower than that in the study group after one month and 3-months ($p < 0.001$).

Regarding social concerns, there was an improvement

in mean score through stages of intervention in the study group with only a statistically significant difference in phase after one month of implementing educational guidelines. In addition, there was statistical significance between the two groups with improved mean scores of posttest-1 (36.41 ± 7.74) and after 3-months (37.02 ± 8.18) educational guidelines of the study for Spiritual Well-Being.

Table 5 shows a strong negative significant correlation between OM and quality of life posttest-1 after one month of educational guidelines in the study group ($r = 0.007$, $p < 0.001$). Also, there was a moderate negative significant correlation between OM and quality of life in the study group after three months of educational guidelines ($r = -0.361$, $p = 0.007$).

Discussion

One of the most severe side effects of chemotherapy and radiation therapy is mucositis, which can be so severe that 11% of patients may have to stop their treatment altogether [16]. Based on prior research findings, chemotherapy-induced mucosal oxidative damage typically occurs in the first and second weeks of treatment and disappears in the third or fourth week. Mucositis can also result in a lower QoL, a greater financial burden, or even hospitalization for the affected patient [1]. In this study, the findings displayed statistically significant improvement between the three stages of educational guidelines within the study and control groups

Table 2. Comparison between the Two Studied Groups According to Mucositis Severity based on the World Health Organization Oral Mucositis Index

Degree of oral mucositis	Pre-intervention				Posttest one				Posttest 2			
	Study (n=54)		Control (n=54)		Study (n=54)		Control (n=54)		Study (n=54)		Control (n=54)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
No oral mucositis (grade-0)	0	0	0	0	0	0	0	0	0	0	0	0
Grade-1	4	7.4	5	9.3	20	37	6	11.1	28	51.9	11	20.4
Grade-2	7	13	5	9.3	21	38.9	10	18.5	12	22.2	7	13
Grade-3	22	40.7	18	33.3	10	18.5	19	35.2	11	20.4	13	24.1
Grade-4	21	38.9	26	48.1	3	5.6	19	35.2	3	5.6	23	42.6
$\chi^2(p)$	1.436 (^{MC} $p=0.752$)				25.871*(<0.001*)				24.277*(<0.001*)			

χ^2 , Chi-square test; MC, Monte Carlo ; p, p-value for comparing between the two studied groups in each other group; *, Statistically significant at $p \leq 0.05$

Table 3. Comparison of Chemotherapy Adverse Events in Cancer Patients Undergoing Chemotherapy in the Control and Intervention Group.

(Adverse events)	Study (n=54)						Control (n=54)						$\chi^2(p_1)$	$\chi^2(p_2)$	$\chi^2(p_3)$
	Pre- intervention		Posttest-1		Posttest-2		Pre- intervention		Posttest-1		Posttest-2				
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%			
Mouth sores	34	63	16	29.6	11	20.4	29	53.7	24	44.4	21	38.9	0.952 (0.329)	2.541 (0.111)	4.441* (0.035*)
Decreased appetite	36	66.7	20	37	17	31.5	30	55.6	27	50	24	44.4	1.403 (0.236)	1.846 (0.174)	1.926 (0.165)
Diarrhea	31	57.4	24	44.4	20	37	31	57.4	32	59.3	31	57.4	0.000 (1.000)	2.374 (0.123)	4.495* (0.034*)
Constipation	39	72.2	14	25.9	18	33.3	41	75.9	16	29.6	18	33.3	0.193 (0.661)	0.185 (0.667)	0.000 (1.000)
Nausea and vomiting	33	61.1	24	44.4	21	38.9	31	57.4	26	48.1	24	44.4	0.153 (0.695)	0.149 (0.700)	0.343 (0.558)
Changes in food taste and smells	39	72.2	16	29.6	18	33.3	40	74.1	18	33.3	16	29.6	0.047 (0.828)	0.172 (0.679)	0.172 (0.679)
Anxiety	35	64.8	24	44.4	21	38.9	34	63	25	46.3	16	29.6	0.040 (0.841)	0.037 (0.847)	1.028 (0.311)
Skin irritation	36	66.7	20	37	17	31.5	34	63	28	51.9	22	40.7	0.162 (0.687)	2.400 (0.121)	1.003 (0.317)
Hair loss	30	55.6	17	31.5	12	22.2	28	51.9	20	37	19	35.2	0.149 (0.700)	0.370 (0.543)	2.217 (0.136)
Fatigue	36	66.7	15	27.8	13	24.1	33	61.1	27	50	25	46.3	0.361 (0.548)	5.610* (0.018*)	5.847* (0.016*)
Gum bleeding	37	68.5	20	37	21	38.9	34	63	17	31.5	26	48.1	0.370 (0.543)	0.370 (0.543)	0.942 (0.332)

χ^2 , Chi-square test; p_1 , p-value for comparing between the two studied groups in Pre-intervention; p_2 , p-value for comparing the two studied groups in post-test 1 after one month; p_3 , p-value for comparing between the two studied groups in post-test 2 after three months; *, Statistically significant at $p \leq 0.05$

regarding all mucositis degrees. As a result of the mucous membrane's integrity being compromised, OM is regarded as one of the most frequent consequences of CT scans. This will lead to a wide range of adverse effects, including

Table 4. Comparison between the Two Studied Groups According to Scores for Quality of Life Scale

Quality of Life Scale	Pre-intervention		Post-test 1		Post-test 2	
	Study (n=54)	Control (n=54)	Study (n=54)	Control (n=54)	Study (n=54)	Control (n=54)
	Mean±SD.	Mean±SD.	Mean±SD.	Mean±SD.	Mean±SD.	Mean±SD.
Physical Well Being						
Total score (0–80)	30.67±7.58	25.80±7.74	47.02±7.73	27.04±7.92	40.87±8.40	22.93±5.53
Average score (0–10)	3.83±0.95	3.22±0.97	5.88±0.97	3.38±0.99	5.11±1.05	2.87±0.69
t (p)	3.302 (0.001*)		13.266 (>0.001*)		13.110 (0.022*)	
Psychological Well Being						
Total score (0–180)	60.39±9.19	67.09±10.03	98.72±10.48	83.61±10.03	90.70±12.02	81.11±11.87
Average score (0–10)	3.35±0.51	3.73±0.56	5.48±0.58	4.65±0.56	5.04±0.67	4.51±0.66
t (p)	3.621 (>0.001*)		7.654 (>0.001*)		4.173 (>0.001*)	
Social Concerns						
Total score (0–80)	27.54±6.98	26.98±5.83	36.06±6.93	33.89±8.54	36.80±7.33	30.80±8.92
Average score (0–10)	3.44±0.87	3.37±0.73	4.51±0.87	4.24±1.07	4.60±0.92	3.85±1.11
t (p)	0.449 (0.654)		1.447 (0.151)		3.820 (>0.001*)	
Spiritual Well Being						
Total score (0–70)	34.93±7.60	32.09±7.34	36.41±7.74	30.19±7.78	37.02±8.18	31.81±5.62
Average score (0–10)	4.99±1.09	4.58±1.05	5.20±1.11	4.31±1.11	5.29±1.17	4.54±0.80
t (p)	1.970 (0.051)		4.168 (>0.001*)		3.853 (>0.001*)	
Overall						
Total score (0–410)	153.5±13.99	152.0±16.31	218.2±19.36	174.7±15.99	205.4±20.30	166.6±18.39
Average score (0–10)	3.74±0.34	3.71±0.40	5.32±0.47	4.26±0.39	5.01±0.50	4.06±0.45
t (p)	0.532 (0.596)		12.727 (>0.001*)		10.393 (>0.001*)	

SD, Standard deviation; t, Student t-test; p, p-value for comparing between the two studied groups in each other group; *, Statistically significant at $p \leq 0.05$

Table 5. Correlation between Oral Mucositis and Quality of Life Scale

Quality of Life Scale	Oral Mucositis			
	Study (n= 54)		Control (n= 54)	
	r_s	p	r_s	p
Pre-test	0.024	0.863	-0.034	0.808
Posttest(1)	-0.643*	<0.001*	-0.124	0.373
Posttest(2)	-0.361*	0.007*	-0.224	0.104

r_s , Spearman coefficient; *, Statistically significant at $p \leq 0.05$

discomfort, excruciating pain, trouble swallowing, malnourishment, weight loss, and dehydration. Several interventional procedures have been created for the management and prevention of OM [17]. This study's findings are in line with [18] who found that on the seventh day of chemotherapy, the intervention groups' OM ratings and severity were lower than those of the control group. This finding corroborates other research showing that using mobile apps helps prevent adverse effects from getting worse while receiving therapy. In addition, the mobile application evaluated in this research offers dietary guidance customized for varying degrees of OM severity. This helps patients make an informed diet choice and may improve their ability to manage their OM and select the best course of treatment [19, 20].

It has been hypothesized that the education group's OM was less common and that their mucosal healing occurred more quickly than that of the control group due to the education group's regular provision of oral health care and education related to oral health prevention [21]. Also, the occurrence of symptoms such as pain in the oral mucosa associated with OM, decreased saliva, and trouble swallowing was observed to be higher in the control group, which has been attributed to the provision of regular education related to oral health care. Furthermore, the study's findings are consistent with previous research which found that children who received education had less severe OM on the fifth, seventh, and tenth day of chemotherapy. Thus, it can be concluded that teaching children about oral hygiene is a useful strategy for preventing and lessening the severity of OM in pediatric cancer patients [22].

The results demonstrated a decrease in the severity of mucositis in cancer patients undergoing chemotherapy in the study groups at two time points (one month and three months after educational guidelines) compared to the control group. Oral mucositis can interfere with cancer treatment plans. For instance, some patients might need to delay their chemotherapy sessions if they have active oral lesions. Delays in treatment can prolong the disease course and worsen outcomes. Therefore, it can be asserted that educational guidelines can lower mucositis severity in cancer patients undergoing chemotherapy.

This result is in line with findings that showed there were statistically significant variations in the two groups' mucositis severity at each of the three-time points among leukemia patients having stem cell transplantation. Thus, it can be said that among leukemia patients receiving stem cell transplantation, self-care teaching using smartphone applications lessens the severity of mucositis [23].

Congruent with our data, a study reported that OM was seen in the majority of patients, and self-care intervention was the only factor that was significant in preventing mucositis. In this regard, patients should receive the appropriate guidance and instruction, as post-transplant complications may have an impact on them for as long as eight weeks [24].

The present study found that there was statistical significance between the study and control groups with a lower percentage of adverse effects such as mouth sores, diarrhea, and fatigue. Moreover, a lower percentage of the study group than the control group experienced fatigue post-test 2 after three months of guidelines. This might be attributed to the influence of educational guidelines on enhancing patient symptoms related to diarrhea, fatigue, and mouth soreness. This study is in contrast to the current research, which found that anxiety was high in both groups, side effects of fatigue, nausea, vomiting, and taste changes were the most common, and that women who received training through voice tapes experienced a reduction in chemotherapy-related side effects [25]. These studies supported the current study's findings about the usefulness of training on the side effects of chemotherapy (vomiting and nausea), but they were different from it in that they only looked at a small subset of side effects [26].

Edited Part

Another researcher demonstrated statistically significant differences in the occurrence of chemotherapy side effects, such as nausea and vomiting, mucositis, and diarrhea, during the final doses of chemotherapy between the study and control groups. The study group exhibited higher post-test mean self-management scores related to elimination, mucositis, nausea and vomiting, and oral care practices compared to the control group. Post-test knowledge scores pertaining to chemotherapy, unpleasant effects, and balanced diet were also significantly higher in the study group [27].

These findings suggest that the study group's enhanced self-efficacy in managing chemotherapy side effects, as well as decreased psychological distress, can be attributed to interventions that facilitated open discussion and access to information regarding side effects self-care. These interventions ultimately resulted in improved side effects management. Consequently, this study offers hope for elderly female breast cancer patients undergoing chemotherapy by demonstrating that a mobile educational program can effectively enhance self-efficacy, reduce psychological distress, and mitigate chemotherapy side effects [28].

Furthermore, it was observed that patients with lower QoL experienced higher levels of fatigue. Fatigue is commonly associated with cancer and its treatment, particularly in older individuals and those of lower socioeconomic status [22, 29]. Prolonged chemotherapy has been linked to increased fatigue, which may persist for multiple years following completion of treatment. Notably, many fatigued individuals do not receive adequate professional assistance to alleviate their symptoms [30].

Chemotherapy commonly causes adverse effects such as nausea, vomiting, diarrhea, and hair loss. Additionally,

prolonged hospital stays are often necessary during extensive treatment regimens. Insufficient management of these adverse conditions can significantly compromise QoL and disrupt daily functioning [31]. Prior studies have demonstrated positive outcomes following the implementation of educational interventions. For instance, a study reported that 81.4% of patients without mucositis prior to receiving educational guidance experienced an improvement to 88.6% after implementing the guidance [32]. This improvement is attributed to the implementation of educational protocols that contribute to improved oral health outcomes.

Our study identified statistically significant differences in QoL between the study and control groups in the posttest one and three-month follow-up assessments. These differences were observed in the domains of physical well-being, psychological well-being, spiritual well-being, and total QoL. The lower QoL in the control group compared to the study group can be explained by the regular oral health education provided to the study group. This education led to a decrease in the incidence of oral manifestations, including mucositis, oral mucosal pain, reduced saliva production, difficulty swallowing, nausea, vomiting, and poor appetite. This outcome aligns with previous research demonstrating that health education initiatives can significantly enhance QoL in cancer survivors [33].

A prior study demonstrated that less than 20% of patients were physically, socially, emotionally, and functionally well. However, this percentage improved to over 50% following the implementation of self-management guidelines ($P < 0.045$) [34]. This improvement can be attributed to the effectiveness of self-management recommendations in mitigating fatigue-related symptoms and their impact on functional, social, emotional, and physical well-being. This is supported by another study which showed that a self-care instruction program can enhance patients' motivation levels, psychological well-being, and medication-related concerns during chemotherapy [28]. Conversely, a subsequent study highlighted the positive effects of internet-based meditation on patients' quality of life, but conflicting results were found regarding their self-efficacy [35].

Our study identified a strong negative significant correlation between OM and QoL at posttest-1 in the study group. Additionally, a moderate negative significant correlation was observed between OM and QoL in the study group. This relationship can be explained by the severe pain and discomfort caused by oral mucositis. These symptoms can lead to malnutrition due to decreased food intake, further weakening the patient's immune system and exacerbating their overall health condition. The sores caused by oral mucositis also increase the risk of infection, including secondary bacterial or fungal infections, resulting in increased pain, fever, and potential complications. In severe cases, oral mucositis can impair speech, making communication challenging and potentially leading to isolation and emotional distress.

This finding aligns with previous research indicating that problems related to OM, such as dysphagia, discomfort, nausea, vomiting, diarrhea, constipation, and

eating difficulties, can occur in patients undergoing cancer treatment [36]. These issues can impair patients' immune response and treatment tolerance, increase their anxiety and despair, and deteriorate their self-care capacity and staff performance, ultimately leading to a decline in quality of life. OM is undoubtedly the most common side effect of cytotoxic treatment, particularly chemotherapy. The difficulties with swallowing, eating, and drinking caused by OM can significantly impact patients' QoL, potentially requiring hospitalization [33].

Moreover, consistent with our study findings, mucositis can significantly impact every major QoL dimension. Its associated pain and swallowing difficulties can impair a person's physical well-being. This can lead to functional limitations that affect a person's social well-being by hindering nutrition and communication. Complex oral hygiene practices may also be perceived as a functional disability. These consequences can have a significant impact on emotional well-being due to social interaction loss and isolation. Multiple studies have found statistically significant decreases in QoL in one or more of the four previously mentioned categories across various subscales.

Nurses play a crucial role in the prevention and management of OM [32]. Patient education is a critical component of these interventions, which are based on collaboration between the patient's needs and the healthcare team. Studies have shown that patient education regarding OM can improve QoL while reducing the condition's severity [21].

In conclusion, in light of the current research findings, it can be concluded that educational guidelines have a statistically significant positive effect on reducing chemotherapy-induced OM in patients and improving their quality of life during chemotherapy. This supports the study hypothesis that participants receiving educational guidelines would experience significantly reduced severity of OM and higher QoL. Furthermore, the study's findings suggest that chemotherapy-induced OM can be prevented in cancer patients by adhering to educational guidelines, which also help to mitigate the condition's severity. Therefore, we recommend that cancer patients receive education on oral care and OM to prevent and reduce its severity and enhance their QoL from the time of hospitalization onward. Nurses should also conduct daily assessments of patients' oral health.

Implications for nursing practice

The study's findings provide valuable insights for oncology nurses to enhance patient care during chemotherapy treatment. Nurses should prioritize educating patients about oral mucositis, its causes, and preventive measures, utilizing accessible materials and clear communication. Routine assessment and monitoring of mucositis symptoms are crucial, enabling early intervention and tailored care plans. Nurses can collaborate with interdisciplinary teams to develop individualized approaches, considering patients' unique needs and risk factors. Providing ongoing support, counseling, and follow-up appointments can help patients manage mucositis-related challenges effectively. Continued professional development ensures nurses remain updated

on evidence-based practices, fostering optimal patient outcomes. By incorporating these recommendations into clinical practice, nurses can mitigate mucositis's impact and improve patients' quality of life during chemotherapy treatment.

Recommendations

The study's recommendations for future research highlight crucial avenues for further exploration to advance the understanding and management of chemotherapy-induced OM and its impact on patients' QoL. Specific suggestions for future studies include:

Enhanced Educational Interventions

Future research should investigate the effectiveness of enhanced educational guidelines in improving patient outcomes related to OM and QoL during chemotherapy. Studies could develop and test tailored educational interventions that incorporate interactive elements, multimedia resources, and personalized approaches to address patients' diverse needs and preferences.

Psychosocial Support Interventions

There is a need for research focusing on psychosocial support interventions aimed at mitigating the psychological burden associated with OM during chemotherapy. Studies could explore the effectiveness of interventions such as cognitive-behavioral therapy, mindfulness-based stress reduction, or psychoeducational programs in reducing anxiety, depression, and distress among patients experiencing OM.

Optimal Oral Care Practices

Further investigation is warranted to determine the optimal frequency, timing, and components of oral care practices for preventing and managing OM. Comparative studies could evaluate different oral care regimens, including variations in tooth-brushing techniques, mouthwash formulations, and moisturizing agents, to identify the most effective strategies for reducing OM severity and improving patient comfort.

Longitudinal Studies

Longitudinal studies are needed to assess the long-term effects and sustainability of interventions aimed at managing OM and improving QoL in patients undergoing chemotherapy. Research could investigate the durability of intervention effects over time, as well as factors that contribute to sustained behavior change and adherence to recommended oral care practices.

Limitation of the study

The study had several limitations that should be considered when interpreting the findings and generalizing the results.

Allocation Method

The study's allocation method, based on hospitalization lines, while practical, may introduce limitations regarding its potential to adequately control for confounding variables. Although efforts were made to ensure a balanced distribution of participants between the study

and control groups, factors such as disease severity or treatment regimens could still vary between the groups, potentially confounding the results. Additionally, the non-randomized allocation method could introduce selection bias, as patients were not randomly assigned to groups, potentially affecting the generalizability of the findings.

Sample Size

The study's sample size of 108 participants, while representing 10% of total admissions over six months, may not be sufficient to detect smaller, yet clinically significant, differences between the study and control groups. A larger sample size could have provided greater statistical power and enhanced the study's ability to detect meaningful differences in outcomes.

Generalizability

The study's generalizability may be limited due to the specific inclusion and exclusion criteria applied. Patients included in the study were those receiving chemotherapy for the first time and who had not previously received education about oral mucositis. This criteria may restrict the applicability of the study findings to a broader population of oncology patients undergoing chemotherapy, particularly those with prior treatment experience or differing disease characteristics.

Educational Intervention Delivery

While efforts were made to standardize the educational intervention, variations in the delivery of educational content by the researcher or differences in patient adherence to the guidelines could have influenced the outcomes. Additionally, the reliance on patient-reported outcomes, such as self-reported adherence to oral hygiene practices or the severity of oral mucositis symptoms, may introduce subjectivity and potential measurement bias.

Overall, while the study provides valuable insights into the impact of educational guidelines on oral mucositis in oncology patients undergoing chemotherapy, these limitations should be acknowledged when interpreting the findings and considering their broader implications for clinical practice. Further research addressing these limitations could help to strengthen the evidence base and enhance the understanding of effective interventions for managing oral mucositis in this population.

Author Contribution Statement

All authors contributed equally in this study.

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References

1. Roayaei M, Andalib Z, Akhavan A. The effect of oral zinc sulfate on prevention of chemotherapy-induced oral mucositis in breast cancer patients treated with adriamycin

- and cyclophosphamide; a double-blind randomized clinical trial. *J Nephropharmacol.* 2022;12:e10533. <https://doi.org/10.34172/npj.2022.10533>.
2. Wu X, Peng Y, Duan X, Yang L, Lan J, Wang F. Homologous gold nanoparticles and nanoclusters composites with enhanced surface raman scattering and metal fluorescence for cancer imaging. *Nanomaterials (Basel).* 2018;8(10). <https://doi.org/10.3390/nano8100819>.
 3. Das S, Shukla N, Singh SS, Kushwaha S, Shrivastava R. Mechanism of interaction between autophagy and apoptosis in cancer. *Apoptosis.* 2021;26(9-10):512-33. <https://doi.org/10.1007/s10495-021-01687-9>.
 4. Goldvaser H, Barnes TA, Šeruga B, Cescon DW, Ocaña A, Ribnikar D, et al. Toxicity of extended adjuvant therapy with aromatase inhibitors in early breast cancer: A systematic review and meta-analysis. *J Natl Cancer Inst.* 2018;110(1). <https://doi.org/10.1093/jnci/djx141>.
 5. Mizuno H, Miyai H, Yokoi A, Kobayashi T, Inabu C, Maruyama T, et al. Relationship between renal dysfunction and oral mucositis in patients undergoing concurrent chemoradiotherapy for pharyngeal cancer: A retrospective cohort study. *In Vivo.* 2019;33(1):183-9. <https://doi.org/10.21873/invivo.11457>.
 6. Lohakare T, Kumari D, Wanjari MB, Maurya A, Kurian B, Meshram KM. Effectiveness of application of oral regimen, practicing oral health, health education, observation (apho) nursing intervention in preventing and managing oral mucositis in children undergoing chemotherapy: An interventional study in central india. *Cureus.* 2023;15(6):e40902. <https://doi.org/10.7759/cureus.40902>.
 7. Pulito C, Cristaudo A, Porta C, Zapperi S, Blandino G, Morrone A, et al. Oral mucositis: The hidden side of cancer therapy. *J Exp Clin Cancer Res.* 2020;39(1):210. <https://doi.org/10.1186/s13046-020-01715-7>.
 8. Di Fede O, Canepa F, Maniscalco L, Tozzo P, Matranga D, Giuliana G. Prevention and the treatment of oral mucositis: The efficacy of sodium bicarbonate vs other agents: A systematic review. *BMC Oral Health.* 2023;23(1):4. <https://doi.org/10.1186/s12903-022-02586-4>.
 9. Lin TH, Wang YM, Huang CY. Effects of a mobile oral care app on oral mucositis, pain, nutritional status, and quality of life in patients with head and neck cancer: A quasi-experimental study. *Int J Nurs Pract.* 2022;28(4):e13042. <https://doi.org/10.1111/ijn.13042>.
 10. Bezerra PMM, Vieira TI, Dos Santos FG, Ribeiro ILA, de Sousa SA, Valença AMG. The impact of oral health education on the incidence and severity of oral mucositis in pediatric cancer patients: A systematic review and meta-analysis. *Support Care Cancer.* 2022;30(11):8819-29. <https://doi.org/10.1007/s00520-022-07296-9>.
 11. Williams SA, Schreier AM. The role of education in managing fatigue, anxiety, and sleep disorders in women undergoing chemotherapy for breast cancer. *Appl Nurs Res.* 2005;18(3):138-47. <https://doi.org/10.1016/j.apnr.2004.08.005>.
 12. Ferrell BR, Dow KH, Grant M. Measurement of the quality of life in cancer survivors. *Qual Life Res.* 1995;4(6):523-31. <https://doi.org/10.1007/bf00634747>.
 13. Farag E, Elshamaa E, Mohamed H, Ahmed MNE. Effect of self-care guidelines on quality of life for leukemic patients undergoing chemotherapy. *Egypt J Health Care.* 2019;10:138-58. <https://doi.org/10.21608/ejhc.2019.54386>.
 14. Hajisalem t, mashayekhi so, shokri j. Affect of achillea millefolium in prophylaxis of oral mucositis induced by chemotherapy in aml patients. *Int J Nurs Pract.* 2016; 352(10): 236-241.
 15. Salah Hassan M, Shehata Mohamed H, Abd-Elgawad Elfeky SFH. Effect of self-management guidelines on chemotherapy associated symptoms among non-hodgkin lymphoma patients. *Egypt J Health Care.* 2019;10(3):173-92. <https://doi.org/10.21608/ejhc.2019.58677>.
 16. Shah D, Gupta A, Meena JP, Kumar Gupta A, Velpandian T, Pandey RM, et al. Efficacy and safety of zinc in the prevention of oral mucositis in children with cancer receiving intensified chemotherapy: A randomized double-blind placebo-controlled trial. *Pediatr Blood Cancer.* 2023;70(7):e30309. <https://doi.org/10.1002/pbc.30309>.
 17. Abd ressen o, mahmood fm. The effect of using clove oil on oral mucositis healing among patients undergoing chemotherapy: A randomized control trial. *J genet environ resour conserv.* 2023;11(1):44-52.
 18. Kostak M. Effects of oral health care education on the severity of oral mucositis in pediatric oncology patients. *Turk J Oncol.* 2020;35. <https://doi.org/10.5505/tjo.2020.2366>.
 19. Langius-Eklöf A, Crafoord MT, Christiansen M, Fjell M, Sundberg K. Effects of an interactive mhealth innovation for early detection of patient-reported symptom distress with focus on participatory care: Protocol for a study based on prospective, randomised, controlled trials in patients with prostate and breast cancer. *BMC Cancer.* 2017;17(1):466. <https://doi.org/10.1186/s12885-017-3450-y>.
 20. Sundberg K, Wengström Y, Blomberg K, Hälleberg-Nyman M, Frank C, Langius-Eklöf A. Early detection and management of symptoms using an interactive smartphone application (interaktor) during radiotherapy for prostate cancer. *Support Care Cancer.* 2017;25(7):2195-204. <https://doi.org/10.1007/s00520-017-3625-8>.
 21. Yüce U, Yurtsever S. Effect of education about oral mucositis given to the cancer patients having chemotherapy on life quality. *J Cancer Educ.* 2019;34(1):35-40. <https://doi.org/10.1007/s13187-017-1262-z>.
 22. AlJaffar MA, Enani SS, Almadani AH, Albuqami FH, Alsaleh KA, Alosaimi FD. Determinants of quality of life of cancer patients at a tertiary care medical city in riyadh, saudi arabia. *Front Psychiatry.* 2023;14:1098176. <https://doi.org/10.3389/fpsy.2023.1098176>.
 23. Jalal R, Shahrzad G, Roya A, Masoumeh ZM. The effect of self-care education with smart phone applications on the severity of nausea and vomiting after stem cell transplantation in leukemia patients. *Hematol Transfus Cell Ther.* <https://doi.org/10.1016/j.htct.2024.02.029>.
 24. Azizollah A, Khamar M, Sasanpour P, Kiani F. The effect of self-care training on the severity of oral mucositis in breast cancer patients undergoing chemotherapy. *Med Surg Nurs J.* 2022;10. <https://doi.org/10.5812/msnj.123386>.
 25. Chan CWH, Law BMH, Wong MMH, Chan DNS, Ng MSN, So WKW, et al. Oral mucositis among chinese cancer patients receiving chemotherapy: Effects and management strategies. *Asia Pac J Clin Oncol.* 2021;17(2):e10-e7. <https://doi.org/10.1111/ajco.13349>.
 26. Heydarzadeh L, Alilu L, Habibzadeh H, Rasouli J. The effect of peer education on knowledge, comprehension, and knowledge application of patients regarding chemotherapy complications. *Iran J Nurs Midwifery Res.* 2020;25(1):40-6. https://doi.org/10.4103/ijnmr.IJNMR_69_19.
 27. Meissner VH, Olze L, Schiele S, Ankerst DP, Jahnen M, Gschwend JE, et al. Fear of cancer recurrence and disease progression in long-term prostate cancer survivors after radical prostatectomy: A longitudinal study. *Cancer.* 2021;127(22):4287-95. <https://doi.org/10.1002/cncr.33836>.
 28. Gu W, Xu YM, Zhong BL. Health-related quality of life in chinese inpatients with lung cancer treated in large general hospitals: A cross-sectional study. *BMJ Open.* 2018;8(4):e019873. <https://doi.org/10.1136>

bmjopen-2017-019873.

29. Shin J, Shin DW, Lee J, Hwang J, Lee JE, Cho B, et al. Exploring socio-demographic, physical, psychological, and quality of life-related factors related with fear of cancer recurrence in stomach cancer survivors: A cross-sectional study. *BMC Cancer*. 2022;22(1):414. <https://doi.org/10.1186/s12885-022-09507-2>.
30. Lima TU, Moura ECR, Oliveira CMB, Leal R, Nogueira Neto J, Pereira EC, et al. Impact of a music intervention on quality of life in breast cancer patients undergoing chemotherapy: A randomized clinical trial. *Integr Cancer Ther*. 2020;19:1534735420938430. <https://doi.org/10.1177/1534735420938430>.
31. Uppu p, manickavasagam m, jagadeesh ns, babu kr. Efficacy of mobile phone technology for managing side effects associated with chemotherapy among cancer patients: A systematic review and meta-analysis. *Indian J Med Paediatr Oncol*. 2021;42(06):518–527. .
32. Chang YL, Tsai YF, Hsu CL, Chao YK, Hsu CC, Lin KC. The effectiveness of a nurse-led exercise and health education informatics program on exercise capacity and quality of life among cancer survivors after esophagectomy: A randomized controlled trial. *Int J Nurs Stud*. 2020;101:103418. <https://doi.org/10.1016/j.ijnurstu.2019.103418>.
33. Mohamed Ali S, Halim Z, El-malky M, Zaki M. The effect of psycho educational nursing program on coping and quality of life of patients undergoing chemotherapy. *Egypt J Health Care*. 2017;8:261-75. <https://doi.org/10.21608/ejhc.2017.47313>.
34. Huang Y, Li Q, Zhou F, Song J. Effectiveness of internet-based support interventions on patients with breast cancer: A systematic review and narrative synthesis. *BMJ Open*. 2022;12(5):e057664. <https://doi.org/10.1136/bmjopen-2021-057664>.
35. Choi S, Ryu E. Effects of symptom clusters and depression on the quality of life in patients with advanced lung cancer. *Eur J Cancer Care (Engl)*. 2018;27(1). <https://doi.org/10.1111/ecc.12508>.
36. Carlos E, Borgato J, Garbuio D. Evaluation of the quality of life of cancer patients undergoing chemotherapy. *Rev Rene*. 2022;23:e71133. <https://doi.org/10.15253/2175-6783.20222371133>.



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