Effect of Educational Nursing Guidelines on Minimizing Side Effects for Cancer Patients Undergoing Radiotherapy

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Abstract:
Background: *Cancer patients undergoing radiotherapy experience a variety of physical and psychosocial side effects.* **Aim of the study**: *To evaluate the effect of educational nursing guidelines on minimizing side effects for cancer patients undergoing radiotherapy.* **Patients and Methods:** *Research design: A quiz–experimental (pre-test / post-test) research design was utilized. Setting: The study was conducted in Clinical Oncology Department at Assiut University Hospital. Sample: A convenience sample of sixty male and female adult cancer patients undergoing radiotherapy. Tool: Interview questionnaire sheet which included Patient assessment and memorial symptom assessment scale.* **Results:** *Statistical significant differences were found between pre and post applying of the educational nursing guidelines as regard physical symptom subscale score, psychological symptom subscale score, global distress index score, and total memorial symptom assessment scale score. (p<0.01).* **Conclusion:** *The educational nursing guidelines had a statistical significant positive effect on minimizing the side effects for cancer patients undergoing radiotherapy.* **Recommendation:** *Each cancer patient undergoing radiotherapy should be given an educational booklet including guidelines to minimize side effects of radiotherapy.*
Key Words: *Educational guidelines, Side effects, Radiotherapy.*

I. Introduction

Radiotherapy is a cancer treatment that uses high doses of radiation to kill cancer cells and shrink tumors. Radiotherapy kills cancer cells by damaging their DNA (the molecules inside cells that carry genetic information and pass it from one generation to next), it can either damage DNA directly or create charged particles within the cells that can in turn damage the DNA **(Connell and Hellman, 2009)**.

Radiotherapy is sometimes given with curative intent with the hope that the treatment will cure a cancer, either by eliminating a tumor, preventing cancer recurrence, or both. Radiotherapy may also be given with palliative intent to relieve symptoms and reduce the suffering caused by cancer. In such cases, radiotherapy may be used alone or in combination with surgery, chemotherapy, or both **(Noda et al., 2009)**.

Radiotherapy treats many types of cancer effectively. But like other treatments, it often causes side effects. These side effects are different for each person. They depend on the type of cancer, its location, dose, and patient general health **(American Society of Clinical Oncology, 2016)**.

Side effects can happen any time during, immediately after, or a few days or weeks after radiotherapy. Most side effects in general go away within a few weeks to 2 months of finishing treatment. Late side effects may continue after treatment is completed because it takes time for healthy cells to recover from the effects of radiotherapy. It can happen months or years after treatment. If doses of radiation are high enough, some cells may not be able to repair themselves. As a result, some side effects may take a long time or be permanent **(Canadian Cancer Society, 2018)**.

General side effects of radiotherapy include fatigue, skin problems, sore mouth, dry mouth, taste changes, difficulty swallowing, hair loss, loss of appetite, nausea and vomiting, anemia, sexual problems, cough, and low blood cell counts. Late side effects include heart and lung problems (if patient had radiotherapy to the chest), fertility problems (if patient had radiotherapy to the pelvis), mental or emotional problems (if patient had radiotherapy to the head and neck or brain), osteoporosis, and changes in skin color **(American Society of Clinical Oncology, 2016)**.

Teaching is a primary responsibility of nurses caring for cancer patients undergoing radiotherapy. Patients and families must know what to expect, get a chance to ask questions, and have those questions answered to their satisfaction. In some facilities, patients and families can visit the radiation department on chosen days to become familiar with the facility and learn about the treatment process. Helping patients and

families to manage side effects is a key nursing responsibility, so nurse should ensure that patient receives an explanation of the treatment and its potential side effects **(American Cancer Society, 2010)**.

Nurses encounter patients receiving radiotherapy are keys for assessing the impact of side effects on patients' lives and providing needed education and recommendations for self-management. Nurses can identify patients at high risk for developing side effects, reinforce the recommended interventions for them, and evaluate the effect of those interventions. Management the side effects of radiotherapy not only improve quality of life, but also improve treatment outcomes and overall survival **(Poirier, 2013)**.

Significance of the study

According to Assiut University Hospital records, 751 patients received radiotherapy in 2016. Also, from the researchers' experiences, it was noted that patients' knowledge about management of side effects of radiotherapy are inadequate. Therefore this study was conducted to find out the effectiveness of educational nursing guidelines as a main part of nursing care for those patients to minimize the side effects of radiotherapy. In addition hopefully this study will direct nurses to consider the important of patient education about side effects of radiotherapy and the relieving measures.

Aim of the study: To evaluate the effect of educational nursing guidelines on minimizing side effects for cancer patients undergoing radiotherapy.

Research question: are educational nursing guidelines can minimize side effects for cancer patients undergoing radiotherapy?

II. Patients and methods:

Research design:
A quiz – experimental (pre-test / post-test) research design was utilized to conduct this study.

Study variables: The independent variable in this study was the educational nursing guidelines. While the dependent variable was the side effects of radiotherapy.

Setting:
The study was conducted in Clinical Oncology Department at Assiut University Hospital.

Study sample:
A convenience sample of 60 adult cancer patients, male and female, their age ranged from 18 – 65 years, undergoing radiotherapy, and agree to participate in the study. Patients with visual, hearing, cognitive impairment or patients getting chemotherapy along with radiotherapy were excluded from the study.

Tool of the study:
Interview Questionnaire Sheet: It included two parts:

Part I: Patient assessment: It included (demographic data, medical history, and medical diagnosis).

Part II: Memorial Symptom Assessment Scale (MSAS): It is a new patient-rated instrument; it was developed by **Portenoy et al. (1994)** to provide multidimensional information about common symptoms that occur as a result of cancer or cancer treatment. It is described as one of the few instruments covering the most prevalent symptoms. Its purpose is to measure the frequency, severity, and distress associated with 32 separate, multidimensional symptoms experienced by patients during the previous week. 24 symptoms are evaluated with respect to frequency, intensity, and distress, and 8 symptoms are evaluated in terms of severity and distress. MSAS has 32 symptoms and three dimensions of frequency, severity, and distress rated on a 5 point Likert-type scale. (Severity: 0 = absent to 4 = very severe, frequency: 0 = absent to 4 = almost constantly, and distress: 0 = not present to 4 = very much). The responses order indicates a higher score meaning a worse clinical feature. This scale was adopted by the researchers in this study to evaluate the side effects experienced by patients during radiotherapy. It was utilized pre/post application of the educational nursing guidelines.

Scoring system:
The first step in the scoring system is to calculate a score for each symptom. If a symptom is not experienced by the patient, every dimension is scored as zero, and the score for that symptom is zero. If a symptom is experienced by the patient, the score for that symptom is calculated as the average of the scores on the severity, frequency and distress dimensions.

The scoring of the MSAS yields four validated subscale scores:
- **Physical Symptom Subscale:** Is the average of the frequency, severity and distress associated with 12 prevalent physical symptoms: Lack of appetite, lack of energy, pain, feeling drowsy, constipation, dry mouth, nausea, vomiting, change in taste, weight loss, feeling bloated, and dizziness.
- **Psychological Symptom Subscale:** Is the average of the frequency, severity and distress associated with 6 prevalent psychological symptoms: Worrying, feeling sad, feeling nervous, difficulty sleeping, feeling irritable, and difficulty concentrating.
- **Global Distress Index:** Is considered to be a measure of overall symptom distress. The GDI is the average of the frequency of 4 prevalent psychological symptoms (feeling sad, worrying, feeling irritable, and feeling nervous) and the distress associated with 6 prevalent physical symptoms (lack of appetite, lack of energy, pain, feeling drowsy, constipation, and dry mouth).
- **Total MSAS score:** Is the average of the symptom scores of all 32 symptoms in the MSAS instrument.

Ethical consideration:
Permission to conduct the study was obtained from the ethical committee of the Faculty of Nursing - Assiut University and from the hospital authorities of Clinical Oncology Department at Assiut University Hospital. An oral agreement for participation was obtained from the patients and the nature and purpose of the study was explained. The researchers initially introduced themselves to the patients and assured them that the collected data would be absolutely confidential. Patients were informed that participation is voluntary and that they can withdraw at any time of the study.

Content validity:
The study tool was tested for content validity by 5 experts of academic Oncology and Medical Surgical Nursing staff at Assiut University. The tool was tested for reliability by using Cronbach's test, the tool proved to be reliable (0.74).

Pilot study: A pilot study was conducted on 10% of sample (6 patients) in the selected setting to evaluate the applicability and clarity of the tool. No changes were done to the tool, so these patients were included in the actual study sample.

Educational nursing guidelines for patients undergoing radiotherapy:
The researchers developed the educational nursing guidelines (booklet) according to literature review, available resources, and patient assessment needs. It included two parts: Part (1): Information about definition, indications, and side effects of radiotherapy. Part (2): Nursing guidelines to manage side effects of radiotherapy such as: lack of appetite, lack of energy, pain, feeling drowsy, constipation, dry mouth, nausea, vomiting, change in taste, weight loss, feeling bloated, dizziness, hair loss, difficulty sleeping, cough , diarrhea, feeling sad, worrying, feeling irritable, and feeling nervous. Experts in fields of nursing and oncology checked the content of nursing guidelines for comprehensiveness, clarity, and applicability and corrections were carried out accordingly.

Data collection:
Data collection was done through the following phases:

1. Assessment phase:
The researchers interviewed the selected patients in Clinical Oncology Department at Assiut University Hospital. Usually cancer patients receive radiotherapy for 4 to 5 weeks - 5 days /week. Each patient was met individually after two weeks from the starting of radiotherapy (At mid-radiotherapy). Base line data were obtained using interview questionnaire sheet.

2. Implementation phase:
- The educational nursing guidelines were given to the studied patients by the researchers.
- Each patient was met for one session in the morning shift. Each session took about 40 - 50 minutes. After each session there was 5-10 minutes for discussion and feedback. Reinforcement was performed according to patients' needs to ensure their understanding.
- The educational nursing guidelines were given to the patients individually. One family member was present in the session for patient support.
- Each patient obtained a copy of the booklet in clear Arabic language; also the researcher used pictures to enhance patients' knowledge and help them to retain the learned material.
- The educational nursing guidelines were carried out throughout a period of 2 weeks by the studied patients.

- The researcher arranged with the patients the time and place for follow up which were after 2 weeks in Clinical Oncology Department at Assiut University Hospital.
- Data were collected through the period from November 2017 to March 2018.

3. Evaluation phase:
- Patients were reassessed after 2 weeks from the first assessment. Evaluation was done by the researchers using the same tool (Interview Questionnaire Sheet-part II) to evaluate the effect of the educational nursing guidelines. All studied patients attended the follow-up sessions in the Clinical Oncology Department at Assiut University Hospital. The session took approximately 10 minutes.

Statistical design: Data collected and analyzed by computer program SPSS "ver. 20" Chicago, USA. Data expressed as mean, standard deviation, number, and percentage. T test was used to determine significant for numeric variable. Chi square was used to determine significant for non-parametric variable.

III. Results
Figure (1): Frequency distribution of demographic characteristics of the studied sample (n=60)
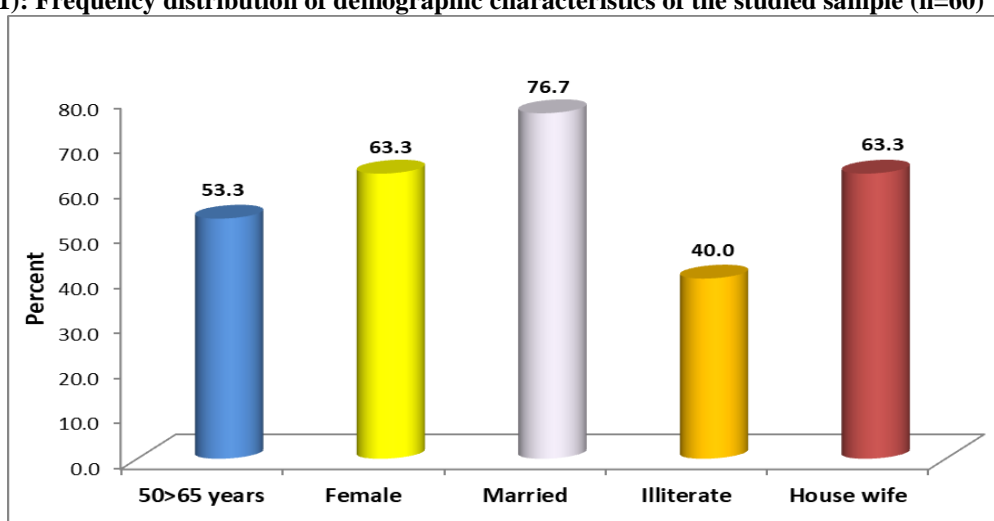

Figure 1 shows that more than half of the studied patients were females (63.3%) and their ages ranged between 50 to less than 65 years old (53.3%). The highest percentages of these patients were married (76.7%), illiterate (40%), and housewives (63.3%).

Table (1): Medical data of the studied patients (n=60)

Variable	N.	%
Medical history		
Diabetes mellitus	20	33.3
Hypertension	22	36.7
Renal disease	0	0.0
Liver disease	0	0.0
Chronic obstructive pulmonary disease	0	0.0
Medical diagnosis		
Bone tumor	2	3.3
Brain tumor	6	10.0
Breast cancer	24	40.0
Cancer pancreas	6	10.0
Lung cancer	16	26.7
Prostate cancer	2	3.3
Uterine cancer	4	6.7

Table 1 clarifies that regarding patients' medical history, about one third of the studied patients had a history of hypertension (36.7%) and diabetes mellitus (33.3%). In relation to medical diagnosis, the highest percent of the patients (40%) had breast cancer.

Table (2): Comparing the memorial symptom assessment scale in pre-test and post-test among the studied patients (n=60).

Variable	Pre-test		Post-test		P-value
	N.	%	N.	%	
1. Difficulty concentrating	40	65.0	38	63.3	0.752
2. Pain	48	80.0	34	56.7	0.001**
3. Lack of energy	60	100.0	46	76.7	0.001**
4. Cough	52	86.7	40	66.7	0.010*
5. Feeling nervous	58	96.7	54	90.0	0.143
6. Dry mouth	54	90.0	38	63.3	0.001**
7. Nausea	34	56.7	24	40.0	0.068
8. Feeling drowsy	50	83.3	36	60.0	0.005**
9. Numbness/tingling in hands/feet	30	50.0	24	40.0	0.271
10. Difficulty sleeping	54	90.0	46	76.7	0.050
11. Feeling bloated	40	66.7	24	40.0	0.003**
12. Problems with urination	20	33.3	16	26.7	0.426
13. Vomiting	24	40.0	10	16.7	0.005**
14. Shortness of breath	30	50.0	26	43.3	0.464
15. Diarrhea	30	50.0	20	33.3	0.064
16. Feeling sad	56	93.3	56	93.3	1.000
17. Sweats	34	56.7	34	56.7	1.000
18. Worrying	60	100.0	54	90.0	0.012
19. Problems with sexual interest or activity	34	56.7	34	56.7	1.000
20. Itching	26	43.3	22	36.7	0.456
21. Lack of appetite	54	90.0	44	73.3	0.018*
22. Dizziness	54	90.0	44	73.3	0.018*
23. Difficulty swallowing	50	83.3	30	50.0	0.001**
24. Feeling irritable	54	90.0	38	63.3	0.001**
25. Mouth sores	36	60.0	28	46.7	0.143
26. Change in the way food tastes	16	26.7	12	20.0	0.445
27. Weight loss	42	70.0	36	60.0	0.251
28. Hair loss	24	40.0	20	33.3	0.449
29. Constipation	30	50.0	26	43.3	0.464
30. Swelling of arms or legs	18	30.0	16	26.7	0.685
31. I don't look like myself	54	90.0	42	70.0	0.006**
32. Changes in skin	24	40.0	18	30.0	0.251

* Significant difference at p<0.05   ** Significant difference at p <0.01

Table 2 reveals that significant statistical differences were found between pre-test and post-test among the studied patients regarding pain, lack of energy, cough, dry mouth, feeling drowsy, feeling bloated, vomiting, lack of appetite, dizziness, difficulty swallowing, feeling irritable, I don't look like myself.

Table (3): The mean scores of the subscales of the memorial symptom assessment scale in pre-test and post-test among the studied patients (n=60).

Variable	Pre-test Mean ± SD	Post-test Mean ± SD	P-value
Physical symptom subscale score	46.25±19.78	23.95±14.01	0.001**
Psychological symptom subscale score	37.4±10.79	20.29±8.62	0.001**
Global distress index score	57.29±16.03	29.47±12.92	0.001**
Total MSAS score	122.51±42.07	65.52±31.22	0.001**

- Independent t-test   ** Significant difference at p <0.01

Table 3 shows that significant statistical differences were found between pre-test and post-test among the studied patients regarding physical symptom subscale score, psychological symptom subscale score, global distress index score, and total MSAS score. Overall, there was a statistically significant decrease in the side effects of radiotherapy after application of the educational nursing guidelines (p<0.01).

Table (4): Relationship between the demographic characteristics of the studied patients and the memorial symptom assessment scale in pre-test and post-test.

Variable	Memorial symptom assessment scale	
	Pre-test	Post-test
	Mean±SD	Mean±SD
Age		
18>30	123.27±44.1	61.6±26.26
30>40	77.35±11.03	40±12.93
40>49	133.88±54.3	76.29±43.49
50>65	121.61±32.97	63.39±23.06
P. value	**0.112**	**0.167**
Sex		
Male	133.07±45.64	74.91±35.88
Female	116.39±39.18	60.08±27.22
P. value	**0.140**	**0.102**
Single	90.63±12.74	45.5±14.13
Married	128.62±39.88	68.9±30.71
Divorced	93.8±0	40.8±0
Widowed	130.3±81.64	79.1±51.62
P. value	**0.081**	**0.117**
Educational level		
Illiterate	136.29±40.87	74.37±28.72
Reading and writing	112.96±15.12	52.92±14.59
Primary school	154.73±80.18	90.33±64.51
Preparatory school	112.93±35.06	58.13±27.44
Secondary School	95.08±17.81	49.83±12.13
University	101.4±0	64.2±0
P. value	**0.021***	**0.049***
Occupation		
House wife	116.39±39.18	60.08±27.22
Farmer	145.03±53.74	81.73±45.76
Skilled worker	123.05±32.63	67.35±19.84
Others	101.4±0	64.2±0
P. value	**0.192**	**0.222**

 - Independent t-test   - Anova – test   * Significant difference at p<0.05

Table 4 reveals that no statistical significant differences were found between the demographic characteristics of the studied patients and the MSAS in pre-test and post-test except in educational level (p<0.05).

Table (5): Relationship between medical diagnosis of the studied patients and the memorial symptom assessment scale in pre-test and post-test.

Medical diagnosis	Memorial symptom assessment scale	
	Pre -test	Post-test
	Mean±SD	Mean±SD
Bone tumor	170±0.0	92±0.0
Brain tumor	140.27±24.58	76.47±14.63
Breast cancer	106.22±42.12	56.37±30.29
Cancer pancreases	161.53±76.86	101.47±60.05
Lung cancer	116.08±22.7	62.08±17.61
Prostate cancer	138.4±0.0	55.6±0.0
Uterine cancer	129.1±5.2	55.6±0.0
P. value	0.032*	0.034*

 - Independent t-test   - Anova – test   * Significant difference at p<0.05

Table 5 reveals that statistical significant differences were found between medical diagnosis of the studied patients and the MSAS (p<0.05) in pre-test and post-test.

IV. Discussion

Cancer remains the second leading cause of death globally. It was responsible for 8.8 million deaths in 2015. Globally, about 1 in every 6 deaths is due to cancer. Approximately 70% of cancer deaths occur in countries with low and middle income (**WHO, 2018**).

When undergoing cancer treatment, especially radiotherapy and chemotherapy, there are a number of symptoms or side effects that patient may experience. The patient should be informed with any side effects which he or she comes across and the nurse plays the vital role in helping patient in managing these side effects (**Banu, 2009**).

Regarding demographic characteristics, the findings of the present study showed that more than half of the studied patients were females (This may be contributed to the highest percentage of breast cancer among the studied patients which is more common in female than male) and their ages ranged between 50 to less than 65 years old. The highest percentages of these patients were married, illiterate, and housewives.

Sobeh and Hafez (2016) agreed with these findings as they mentioned that "The study findings indicate that half of patients receiving radiotherapy in both study and control groups were at age group of 50 years, females, housewives, and the majority of them were married". But, they disagreed with the present study findings regarding the patients' educational level as they mentioned that "more than one third of the patients had secondary school education".

In conversely with the current study Gaines et al. (2016) found that patients who completed radiotherapy screening forms their ages ranged from 23 to 93 years old with a median of 67 years and the highest percentage of them were male.

Concerning medical diagnosis, more than one-third of the patients in the present study diagnosed with breast cancer. These findings congruent with Finnish Cancer Registry (2012) as it reported that in 2012, there were 30,132 new cancer cases. Almost half of them treated with radiotherapy often combined with surgery and chemotherapy, among them breast cancer patients were the most common patient group. Also, American Cancer Society (2011) mentioned that incidence of breast cancer and gastrointestinal cancer was higher in the Egyptian population. These findings supported by Shebl et al. (2014) who found that more than one third of the patients had breast cancer in their study about impact of oral care protocol on stomatitis induced by radiotherapy.

Regarding side effects of radiotherapy, the majority of patients in the current study before the application of the educational nursing guidelines (At mid-radiotherapy) were complaining from pain, lack of energy, cough, feeling nervous, dry mouth, feeling drowsy, difficulty sleeping, feeling sad, worrying, lack of appetite, dizziness, difficult swallowing, feeling irritable, and not resembling oneself. So, nurses and other health care professionals should take in consideration that the presence of these symptoms may have an adverse effect on the disease prognosis or treatment.

In this regard Kırca and Kutlutürkan (2017) were in accordance with the current research results in their study entitled symptoms of patients with head and neck cancers undergoing radiotherapy, as they found that at mid-radiotherapy; the symptoms experienced at the highest rates were loss of energy, difficulty sleeping, not resembling oneself, changes in the taste of food, dry mouth, pain, worrying and feeling sad, difficulty in concentrating and difficulty in swallowing.

Similarly, Andersen and Tewfik (2009) studied the psychological reactions to radiation therapy; the results revealed that significant increases in fatigue, appetite loss, pain, and radiation therapy side effects were found among the studied patients. Also, Nemcová (2008) reported that sleep disorders are a common problem in cancer patients and added that on the psychological symptoms subscale, the studied patients showed the highest rate of restless sleep and nervousness which may be caused by mental problems such as anxiety, fear, and loneliness.

Kurucová1 et al. (2015) were in the same line with all of the above, as they mentioned that in terms of frequency, severity and the degree of distress, the pain was identified as the most significant symptom of patients with cancer within the global distress index subscale.

As regard the effect of the educational nursing guidelines, the present study showed a significant decrease in the side effects of radiotherapy after application of the educational nursing guidelines. Where, significant statistical differences were found between pre-test and post-test among the studied patients regarding physical symptom subscale score, psychological symptom subscale score, global distress index score, and total MSAS score. From the researchers' point of view this finding indicated that although these patients experienced a high number of side effects, they were able to manage the symptoms accordingly, which is probably due to the knowledge given by the researchers to the patients about the side-effects of radiotherapy and the nursing measures that helped in managing and controlling of these side effects.

This result was in line with Shebl et al. (2014) who concluded that incidence and severity of GIT symptoms significantly decreased after implementation of nursing management protocol which included knowledge related to side effects of radiotherapy. Moreover, they recommended that cancer patients should be given a written instruction about radiotherapy, the onset and duration of possible side effects, and self-management measures to radiotherapy. Also, Johnson and Blumberg (2008) stressed that, lack of education of cancer patient may lead to increased severity of side effects, anxiety, distress, and may influence negatively on the patient's satisfaction and treatment outcomes.

Similarly Mock et al. (2011) reported that cancer patients who have an educational session with oncology nurses before initiation of treatment will learn how to reduce the risk of and manage side effects and maximize wellbeing.

In this regard, Mackenzie et al. (2013) stated that radiotherapy has many physical and psychosocial side effects, so it is important to ensure that the quality of care which is correlated with better patient knowledge about radiotherapy is experienced as positively as possible.

Contrary to the current study findings Traeger et al. (2015) found that nursing guidance did not appear to decrease side effects compared with standard care, in their study about proactive telephone- based nursing guidance for patients starting chemotherapy to reduce the side effects.

The current study revealed that no statistical significant differences were found between demographic characteristics of the studied patients and MSAS except in educational level. While, statistical significant differences were found between medical diagnosis of the studied patients and the MSAS in pre-test and post-test which could be attributed to that side effects of radiotherapy depend on the type and location of the cancer.

Similarly, Homsi et al. (2006) found that no significance effect of gender of the studied patients on MSAS in palliative medicine. Also, Özalp, et al. (2017) agreed with the present result as they reported that there was no statistically significant difference between the mean scores of the MSAS and the age of the Turkish cancer patients. But, they disagreed with the present study findings regarding the gender and medical diagnosis as they found that gender was found to be effective on the MSAS, while type and stage of cancer have no effect.

V. Conclusion

The educational nursing guidelines had a statistical significant positive effect on minimizing the side effects for cancer patients undergoing radiotherapy.

VI. Recommendation

- Each cancer patient undergoing radiotherapy should be given an educational booklet including guidelines to minimize side effects of radiotherapy.
- Undertaking new patient education interventions to improve quality of care is essential.
- Further researches on larger sample from different geographical areas in Egypt.

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