

Education Program to Promote Skin Integrity and Reduce Pain for Patients Receiving External Beam Radiotherapy

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Abstract:

Back ground: Radiation dermatitis is one of the most common side effects for the majority of breast cancer patients receiving external beam radiation therapy. **Aim:** To evaluate the effect of education program to promote skin integrity and reduce pain for patients receiving external beam radiotherapy. **Subjects and Methods:** Quasi experimental research design. **Setting:** Oncology department and radiotherapy outpatient clinic at Sohag University Hospital. **Sample:** Non-probability purposeful sample of (80) female patients (40 cases and 40 control) that has breast cancer and will receive external beam radiotherapy. **Tools: Tool (I): Part (1):** Patients' personal data, **Part (2):** Patient's medical history, **Tool (II):** Educational program to promote skin integrity before and after receiving radiation therapy. **Tool (III): Part (I):** Radiation Therapy Oncology Group assessment tool and **Part (2):** Patient-reported symptoms post radiotherapy tool. **Results:** Highly statistical significance difference between study and control group as regarding to Radiation Therapy Oncology Group, patient-reported symptoms after treatment <0.001**. **Conclusion:** Education of patient about skin care measures was more effective in reducing radio dermatitis and pain for breast cancer patient receiving external beam radiotherapy. The current study recommended that; further researches on larger probability sample from different geographical areas to help for generalization of the results.

Keywords: Educational program, Promote Skin integrity, Breast Cancer, External beam & Radiotherapy

Introduction

Radiation Therapy (RT) is uses high-energy rays to kill cancer cells. It affects cells only in the part of the body that is treated with the radiation. Breast cancer RT may be used to destroy any remaining mutated cells that remain in the breast or armpit area after surgery. Most RT is administered by a radiation oncologist at a radiation center and usually begins three to four weeks after surgery. RT is used to destroy undetectable cancer cells and reduce the risk of cancer recurring in the affected breast (McMenamin et al, 2014).

There are three main types of breast cancer RT. External whole-breast radiation, internal radiation and intra-operative radiation. External radiation is the most common type of radiation typically given after lumpectomy and sometimes mastectomy, internal radiation (brachytherapy) a radioactive source is put inside the body for a short time. Another relatively new type of radiation to treat breast cancer is Intra-Operative Radiation Therapy (IORT). IORT is given during lumpectomy surgery after the cancer has been removed (Di Franco et al, 2013).

After the first session of RT, a substantial percentage of basal layer cells are damaged. The remaining

healthy cells become weakened and thus, are easily removed from the skin. Consequently, this will result in an imbalance between the normal production of the cells at the basal layer and the damage of the cells at the superficial layer of the skin. As a reaction to the radiation damage, erythema, edema and changes in skin pigmentation begin. The severity of the reaction depends on the total radiation dose, the dose per fraction, the overall treatment time, beam type and its energy, and lastly, the field of radiation treatment (Huang et al, 2015 & American Society of Clinical Oncology, 2018).

After two weeks of administering 1.8 to 2 gray (Gy) of radiation therapy daily to the patient, the RD will appear. Host factors also may play a role in the development of RD they may include genetic factors, personal factors (e.g., areas of skin friction), existing skin integrity issues, comorbid conditions, nutritional status, age, race and ethnicity, medications, sun exposure, smoking, and mobility. RD may range from mild erythema to confluent moist desquamation and occasionally ulceration. The effects of RD can impact a patient's life causing pain and discomfort, limit activities and delay treatment. Also, may cause interruption in or cessation of treatment, depending on the severity of RD (Hassan, 2016)

The establishment of a skin care management protocol for RD is a challenge that needs a concerted effort of the multidisciplinary team in the Radiation Oncology Department and community health nursing. Nurses from all specialties are playing a pivotal role in the management of one of the major side effects of radiation therapy that affects the patients' life. Implementing pertinent skin care measures that illustrate evidence-based intervention guide the nurses in their practice. For breast cancer patients, the pain, itching, infection and bleeding can compromise their daily activities and sense of well-being. By applying a standardized care for patients, their life will be better maintained (Kole et al, 2017).

Significance of the study:

All patients with breast cancer receiving external beam radiotherapy are at potential risk of developing skin reaction within the treatment field with approximately 85 – 87% of these patients experiencing a moderate to severe skin reaction of which 10-15% will progress to moist desquamation. Applying skin care measures for these patients minimizing RD (Hornsby et al, 2005). During the year 2019, 500 female patients admitted to oncology department and referred to RT and oncology outpatient clinic at Sohag University Hospital, according to RT and oncology outpatient clinic records at Sohag University Hospital (Sohag University Hospital Records, 2020).

Aim of the study:

The aim of the study was to evaluate the effect of education program to promote skin integrity and reduce pain for patients receiving external beam radiotherapy.

Hypothesis:

Null Hypothesis:

Skin integrity and reported pain doesn't improve after education program about nursing care measures among breast cancer patients receiving external beam radiotherapy.

Alternative Hypothesis (H1):

Skin integrity and reported pain improves after education program about nursing care measures among breast cancer patients receiving external beam radiotherapy.

Subjects and Methods:

Research design: Quasi-experiment research design.

Setting:

The study conducted in oncology department and radiotherapy out patients' clinic at Sohag University Hospital, it was selected because it serves more than 5 million residents people.

Sampling technique:

A purposeful sampling technique was used. Sampling size was calculated based on Roasoft calculation program with the assumption of 50% response rate and 95% Confidence Interval (CI) and error margin 5%. Therefore, based on the population, (80) female patients (40 cases and 40 controls) with breast cancer started radiation therapy at the first session, were above the age of 18 years, able to communicate, free from cognitive or psychological problems, hadn't previous history of radiation therapy and referred to radiotherapy and oncology out patients' clinic within the last six months were selected (**Sample Size Calculator by Roasoft, Inc, 2004**).

Tools of the study: It included three tools:

Tool (I): Interview questionnaire: It designed by the researcher based on the current national and international literature and it consisted of two parts: **Part (1):** Personal data of patients such as: Age, marital status, educational qualifications, occupation, extensive sun exposure and presence of chronic diseases. **Part (2):** Assessment of patient's medical history (from patients' medical record); it included medical diagnosis, dose of radiotherapy, number of doses, duration of radiotherapy, affected side, chemotherapy, extent of surgery, pathology, treatment technique and treatment set-up.

Tool II: Educational program to promote skin integrity:

The educational program had been developed by the researchers based on the relevant literature. This program aimed to promote patients' skin condition before and after receiving the radiation therapy, this partition included the following: Skin washing by water, moisturize skin, avoid using of irritating substances, suitable cloths and precautions when dealing with redness of the skin.

Tool III: Part (1): The Radiation Therapy Oncology Group (RTOG): This tool was used to assess skin reaction to radiotherapy treatment, developed through The Radiation Therapy Oncology Group (RTOG) to evaluate the Radiation Morbidity Scoring Criteria to classify radiotherapy effects (Evans & Carleen, 2012).

RTOG score classified into six degrees based on severity of radiation effect, degree 0 (no reaction), 1 (faint erythema, dry desquamation, epilation, diminished sweating), 2 (moderate, brisk erythema, exudative dermatitis in plaques and moderate edema), 2.5 (Patchy moist desquamation. Yellow/pale green exudate. Soreness with edema), 3 (exudative dermatitis, besides cutaneous folds and intense edema) and 4 (ulceration, hemorrhage, necrosis) (Evans & Carleen, 2012).

Part (2): Patient-reported symptoms after receiving radiotherapy:

It was used to rating the most important and common seven symptoms that appear on the patient's skin after radiotherapy; these symptoms are: burning, itching, pulling, tenderness, erythema, edema and desquamation. Likert scale from 0-5 was used to assess severity of the symptom of each categories; where 0 meant that the symptom didn't appear while 5 meant that the symptom appeared in a sever way (Lee et al, 2017).

Validity & reliability of the questionnaire: It established by a panel of five experts from Medical Surgical, Community Nursing staff and radiotherapy staff who reviewed the tool for clarity, relevance, understanding and applicability. Minor modifications were required.

Test reliability of the proposed tools was ascertained with Cronbach's alpha =0.82.

Methods:

Educational program applied in four phases for the case group as the following:

Assessment phase: The researchers assessed the patient's medical diagnosis, dose of radiotherapy, number of doses, skin condition...etc.

Planning phase: This phase included the arrangement for the conduction of the program such as: Teaching place, sessions, audiovisual aids, handout, etc. The study sample was divided into 8 groups in a variety of numbers ranged between 4-5 patients in each session.

Teaching place: The program was conducted at oncology department and radiotherapy outpatient clinic.

Teaching Time: The time of the program decided according to the working time of the oncology department and radiotherapy outpatient clinic.

Teaching methods and materials: The researchers used simple teaching methods such as: Lecture, discussion, demonstration, re-demonstration and role play. The used media was included power point presentation, video and handouts regarding skin care measures prepared by the researchers and distributed to every patient at the end of the program.

Sessions: The contents of the program divided into two sessions: **The first session included:** Introduction about effect of radiotherapy on the skin, skin care measures as skin washing by water, moisturize skin, avoid using of irritating substances, suitable cloths. **The second session included:** precautions when dealing with redness of the skin.

Implementation phase: The educational program was conducted in four months; every group (4-5 patients) took two sessions for two days to complete the program contents.

Evaluation stage: During this phase the patients' skin integrity and severity of pain was assessed after two

months of receiving the educational program to evaluate the skin conditions in the case group compared with the control group.

Control groups:

The control group was receiving the routine hospital instructions.

Field work: In the first session; the researchers introduced themselves to patients, explain the purpose of the study and provide introduction about effect of radiotherapy on the skin. The second session included: Nursing skin care measure done before and after receiving of radiation therapy to promote patients' skin integrity with reducing of pain severity such as: Skin washing by water, moisturize skin, avoid using of irritating substances, suitable cloths. Finally, the researchers evaluated the impact of the teaching measures on patients' skin integrity. This program conducted in the period from the beginning of August, 2019 to November, 2019.

Procedure:

Administrative phase: An official permission was taken from the Dean of the Faculty of Nursing to Sohag University Hospital's manager to collect the data after clarifying the study purpose.

Pilot study:

It was conducted before starting of data collection on 10% (4 patients) of patients which were included in the total study sample because there weren't modifications in the questionnaire; the aim of this study was to assess clarity and feasibility of the used tool.

Ethical considerations: The study affirmed by the Faculty of Nursing Ethics Committee and the hospital authorities of Radiotherapy units; a composed endorsement was gotten from the enlisted patients to take part within the study after clarifying the nature and reason of the study. The researcher explained that participation was voluntary. The patients were allowed to refuse to take part in the research and can withdraw at any time. Confidentiality of the patient's data was ascertained.

Statistical design: The collected data were tabulated and statistically analyzed to evaluate the differences between the groups under the study as regards the various variables (frequencies and percentages, mean and standard deviation) by using computer program (SPSS) version (26). Independent sample T-test, Chi-square tests, One-way ANOVA test and Pearson correlation test used in the relationship between both groups. It is considered significant when P. value less than (0.05), $P > 0.05 =$ Non-significant and $P < 0.05 =$ Significant.

Results:**Table (1): Personal and medical data of cases versus control groups among patients receiving external beam radiotherapy**

Items	Case group(n=40)		Control group (n=40)		Pvalue
	No	%	No	%	
Age group (years):					
18-> 30 year	7	17.5	5	12.5	0.734
30-40 year	27	67.5	27	67.5	
40 &more	6	15.0	8	20.0	
Mean \pmSD(range):	46.55 \pm 4.8 (33-55)		47.23 \pm 4.89 (27-53)		0.535
Marital status:					
Single	3	7.5	5	12.5	0.269
Married	30	75.0	33	82.5	
Divorced	5	12.5	2	5.0	
Widow	2	5.0	-	-	
Level of education:					
High	13	32.5	9	22.5	0.290
Secondary	21	52.5	24	60.0	
Read	4	10.0	7	17.5	
Illiterate	2	5.0	-	-	
Occupation:					
Employee	13	32.5	12	30.0	0.809
House wife	27	67.5	28	70.0	
Extensive sun exposure:					
Yes	19	47.5	16	40.0	0.499
No	21	52.5	24	60.0	
Chronic diseases:					
Diabetes mellitus	8	20.0	11	27.5	0.721
Hypertension	10	25.0	10	25.0	
Cardiovascular disease	10	25.0	9	22.5	
Pulmonary disease	9	22.5	5	12.5	
None	3	7.5	3	2.5	

- Chi-square test

Table (2): Breast cancer data of cases versus control groups among patients receiving external beam radiotherapy

Items	Case group(n=40)		Control group (n=40)		P value
	No	%	No	%	
Affected side:					
Left	14	35.0	25	62.5	0.024*
Right	16	40.0	12	30.0	
Both	10	25.0	3	7.5	
Chemotherapy:					
Yes	19	47.5	11	27.5	0.065
No	21	52.5	29	72.5	
Extent of surgery:					
Mastectomy	32	80.0	32	80.0	1.000
Lumpectomy	8	20.0	8	20.0	
Pathology:					
In suit	35	87.5	36	90.0	0.723
Invasive	5	12.5	4	10.0	

Items	Case group(n=40)		Control group (n=40)		P value
	No	%	No	%	
Treatment technique:					
Two folds	2	5.0	3	7.5	0.898
Three folds	35	87.5	34	85.0	
Four folds	3	7.5	3	7.5	
Treatment set-up:					
Active breathing	25	62.5	26	65.0	0.936
Lateral decubitus	11	27.5	9	22.5	
Prone	2	5.0	3	7.5	
Supine	2	5.0	2	5.0	
Duration of treatment (months):					
3.00	7	17.5	4	10.0	0.123
4.00	8	20.0	3	7.5	
5.00	25	62.5	33	82.5	

- Chi-square test

*Significant difference at p. value<0.05

Table (3): The Radiation Therapy Oncology Group (RTOG) related to case versus control group after receiving the education program

Items	Case group (n=40)		Control group (n=40)		P value
	No	%	No	%	
RTOG					
RTOG 0 (no reaction)	4	10.0	-	-	<0.001**
RTOG 1 (faint erythema, dry desquamation, epilation, diminished sweating),	28	70.0	3	7.5	
RTOG 2 (moderate, brisk erythema, exudative dermatitis in plaques and moderate edema	6	15.0	21	52.5	
RTOG 2.5(Patchy moist desquamation. Yellow/pale green exudate. Soreness with edema)	1	2.5	14	35.0	
RTOG3 (exudative dermatitis, besides cutaneous folds and intense edema)	1	2.5	2	5.0	

- Chi-square test

**Significant difference at p value<0.01

Table (4): Patient-reported symptoms after treatment among case versus control group after receiving the education program

Patient-reported symptoms	Symptoms rated on Likert Scale												P-value	
	0		1		2		3		4		5			
	No	%	No	%	No	%	No	%	No	%	No	%		
Burning														
Case (40)	2	0.0	19	47.5	19	47.5	-	-	-	-	-	-	-	<0.001**
Control (40)	-	-	1	2.5	2	5.0	19	47.5	16	40.0	2	5.0		
Itching														
Case (40)	2	5.0	19	47.5	18	45.0	1	2.5	-	-	-	-	<0.001**	
Control (40)	-	-	-	-	2	5.0	10	25.0	24	60.0	4	10.0		
Pulling														
Case (40)	8	20.0	29	72.5	3	7.5	-	-	-	-	-	-	<0.001**	
Control (40)	1	2.5	-	-	16	40.0	23	57.5	-	-	-	-		
Tenderness														
Case (40)	1	2.5	18	45.0	19	47.5	2	5.0	-	-	-	-	<0.001**	
Control (40)	-	-	-	-	4	10.0	7	17.5	23	57.5	6	15.0		

Patient-reported symptoms	Symptoms rated on Likert Scale												P-value	
	0		1		2		3		4		5			
	No	%	No	%	No	%	No	%	No	%	No	%		
Erythema														
Case (40)	5	12.5	17	42.5	18	45.0	-	-	-	-	-	-	-	<0.001**
Control(40)	1	2.5	-	-	-	-	10	25.0	20	50.0	9	22.5		
Edema														
Case(40)	12	30.0	19	47.5	9	22.5	-	-	-	-	-	-	-	<0.001**
Control(40)	-	-	1	2.5	4	10.0	20	50.0	13	32.5	2	5.0		
Desquamation														
Case(40)	9	22.5	22	55.0	9	22.5	-	-	-	-	-	-	-	<0.001**
Control(40)	-	-	-	-	-	-	-	-	20	50.0	20	50.0		

- Chi-square test **Significant difference at p. value<0.01

Table (5): Correlation Co-efficient between RTOG Scale and personal data among patients receiving external beam radiotherapy

Correlations	RTOG			
	Case group (n=40)		Control group (n=40)	
	R	P	R	P
Age	0.016	0.923	-0.287	0.072
Marital status	0.231	0.151	-0.191	0.237
Level of education	-0.096	0.556	.353*	0.026*
Occupation	-0.072	0.661	-0.142	0.384
Extensive sun exposure	-0.032	0.844	-0.118	0.469
Chronic diseases	0.017	0.918	-0.244	0.130

*Statistically Significant Correlation at P value <0.05

Table (6): Correlation Co-efficient between RTOG scale and breast cancer data related to both case and control group

Correlations	RTOG			
	Case group (n=40)		Control group(n=40)	
	R	P	R	P
Dose of treatment	0.133	0.412	0.040	0.807
Laterality	-0.026	0.876	0.001	0.995
Chemotherapy	-0.180	0.267	0.202	0.212
Extent of surgery	0.074	0.651	0.472**	0.002**
Pathology	0.332*	0.036*	0.340*	0.032*
Treatment technique	-0.016	0.921	0.425**	0.006**
Number of doses of treatment	0.145	0.371	-0.041	0.801
Treatment set-up	0.291	0.069	0.164	0.311
Duration of treatment	0.511**	0.001**	0.023	0.890

*Statistically Significant Correlation at P value <0.05 ** Statistically Significant Correlation at P value <0.01

Table (7): Correlation Co-efficient between RTOG Scale and patient-reported symptoms after treatment case versus control group

Correlations	RTOG			
	Case group(n=40)		Control group(n=40)	
	R	P	R	P
Burning	0.041	0.802	0.203	0.209
Itching	-0.090	0.581	0.195	0.228
Pulling	0.083	0.610	-0.013	0.939
Tenderness	-.479**	0.002**	0.077	0.637
Erythema	-0.124	0.448	-0.195	0.228
Edema	-0.062	0.706	0.199	0.219

** Statistically Significant Correlation at P value <0.01

Table (1): Shows that 67.5% in both groups (case and control) were from 30–40 years, 75%- 82.5% of case and control group were married respectively, 52.5% , 60.0% of the case and control group were had secondary education. As regard chronic diseases, it was found that 25% of both groups had hypertension.

Table (2): Presents that 40.0 % , 48.8 % of patients in case group had right side of breast affected while in the left side of breast were affected in the control group. Moreover, 52.5%, 72.5 % of patient not received chemotherapy in both case and control group, 80.0% of patient had mastectomy surgery in both group and had pathology in situ. Regarding treatment technique 87.5%, 85.0% of patients had three folds in case and control group respectively.

Table (3): Reveals that highly statistical significance differences between case and control group as regarding to RTOG.

Table (4): Illustrates that highly statistical significance difference was observed between case and control group patient-reported symptoms after treatment.

Table (5): Refers to that highly statistical significance differences were found between RTOG Scale and patients' level of education.

Table (6): Clarifies that there was positive correlation between RTOG Scale pathology, duration of treatment in case group with highly statistical significance difference and extent of surgery, pathology and treatment technique in control group.

Table (7): Represents that there was highly statistical significance difference between RTOG Scale and tenderness in case group.

Discussion:

RD is one of the most common side effects of RT. Acute reactions may range from erythema and sale to moist desquamation with pain, weeping of serous fluid and the formation of bullae. Chronic skin changes that may develop and which can persist include fibrosis, telangiectasias and skin atrophy. While the acute side effects of irradiation typically resolve within 2 to 4 weeks of RT completion, the dermatologic reactions can be uncomfortable and even painful, carry the risk of infection, and may negatively impact a patient's life (Kole et al, 2017). The present study aimed to evaluate the effect of education program to promote skin integrity and reduce pain among patients receiving external beam radiotherapy.

Regarding to age of the current study showed that more than half of patients in both groups (case and control) were from 30–40 years, majority of patients were married and more than half of patient were secondary educated and housewives. In the same line Atik & Irfan, (2019) stated that the mean age

of the participants was (34.69 ± 6.76) years. Also Elsayed & Abd El Sattar, (2012) showed that about one third of the studied patients were less than 45years old. This result contradicted the results by David et al , (2019) found that one third of the study group their age were more than fifty years, also Sri et al, (2018) revealed that mean age were (51.7±9.9) in study group,(49±9.7) in control group. As regard chronic disease; the study found that more than one fifth of both groups had hypertension. This agreed with Elsayed & Abd El Sattar, (2012) who revealed that the majority of patients were hypertensive.

According to the current study; more than half of patients were secondary educated and housewives. This agreed with Weiwei et al, (2017) who stated that most of patient were married , not employee and third of patient were had high school education ; in the same line Atik & Irfan, (2019) who found that the majority of patients were married, uneducated and house wives. As regard marital status, it was found that about three quarters were married. From researcher opinion Egyptian cultures which encourage early marriage especially among rural areas.

In referral to the affected side; it recorded that more than half of patients in case group had right side of breast affected while in the left side of breast were affected control group (40.0 % - 48.8 %).In the same way Claudia et al, (2017) observed that most affected side was right, also Atik & Irfan, (2019) demonstrated that about half of participants underwent right mastectomy. The research result disagreed with Sri et al, (2019) who found that the affected side was left in both group.

Considering the RT Oncology Group the study and Patient-reported symptoms showed that highly statistical significance difference between case and control group (DiFranco et al, 2013) mentioned that early skin assessment and application of a skin moisturizer before the start of radiation sessions play an important role in decreasing the severity of skin reaction. Furthermore, Chan et al, (2014) in their review, identified that skin care measures that might contribute to the prevention of RD as washing with water and/or mild soap decreased the symptoms, itching and pain significantly. A set of clinical guidelines was proposed recently in February, 2015 by the Society and College of Radiographers (SCoR) to guide the radiographers, radiotherapy nurses and other health care providers while caring for patients receiving external beam radiation. The group focused on the education of patients and the health care team on how to prevent RD by reducing the friction and the irritation.

Moreover, the society recommended the use of a standardized skin assessment tool, documentation of the patient acceptability of and compliance with the skin care instruction provided by the institution was also strongly advised. Finally, the team proposed the use of a suitable dressing on a broken skin to reduce further injury (McMenamin et al, 2014). After reviewing the current literature, we conclude that keeping the skin well hydrated with moisturizers can reduce or delay the onset of RD. On the other hand, early prevention, such as avoidance of sun exposure, skin irritant products and the abrasion of the affected skin, is essential to optimize the treatment outcomes. The results of the current study confirmed on the achievement of the study hypothesis that skin integrity and reported pain improves after education program about nursing care measures among breast cancer patients receiving external beam radiotherapy.

Conclusion:

With increasing the frequency rate of breast cancer, more and more patients are being treated with radiotherapy. Many of the patients develop a radiation-induced skin reaction during radiotherapy treatment and therefore skincare management is an essential consideration. Up on the results of the current study it can be concluded that; education of patient about skin nursing care measures were more effective in reducing radiation dermatitis and pain for breast cancer patient receiving external beam radiotherapy.

Recommendations:

1. Continuing education program about the importance of secondary prevention of radiation dermatitis through the early diagnosis of the various dermatological conditions induced by radiation to establish an adequate therapy, reduce their evolution and improve patients' quality of life.
2. Providing oncology out patients' clinics with brochures and posters about skin care measures before and after radiotherapy.
3. Further researches on larger probability sample from different geographical areas to help for generalization of the results.

Acknowledgement:

The researchers express their thanks to the studied patients who share in this research and health care personnel.

Conflicting of interests: Non

Funding: No

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