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Chemotherapy-Associated Febrile Neutropenia in Cancer Patients: Effect of Educational Protocol on Self-Efficacy

Esmat Sayed Abd-Elmaged
Lecturer of Medical Surgical Nursing, Faculty of Nursing, Assiut University.
Corresponding Author: Esmat Sayed Abd-Elmaged

Abstract: *Febrile neutropenia (FN) is responsible for considerable morbidity and mortality in cancer patients.* ***Aim of the study:*** *the aim was to evaluate the effect of educational protocol for cancer patients with chemotherapy-associated FN on self-efficacy.* ***Patients and Methods:*** *Research design: Pre and post-test design was utilized. Setting: Oncology Department and Outpatient Oncology Clinics at Assiut University Hospital. Sample: A purposive sample of 120 male and female adult cancer patients with chemotherapy-associated FN. Tools: Tool I- Interview questionnaire sheet. Tool II: Patient activation measure.* ***Results:*** *Highly statistical significant differences were found between pre-test and post-test among the studied patients regarding the four stages of patient activation measure, total patient activation measure, and self-efficacy assessment, (P<0.001).* ***Conclusion:*** *The educational protocol had a statistical significant positive effect on the self-efficacy of cancer patients with chemotherapy-associated FN.* ***Recommendations:*** *Simple educational booklets for cancer patients with chemotherapy-associated FN should be available in all Oncology Units and Outpatient Oncology Clinics. Further studies on larger sample from different geographical areas in Egypt to generalize the results and collect in depth knowledge about FN.*

Key Words: *Febrile Neutropenia, Educational Protocol, and Self-Efficacy.*

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I. Introduction

Cancer patients experience a decrease in the elements of the immune systems due to the type and intensity of treatment received and other risk factors. The development of multi-chemotherapy protocols in the treatment of cancer patients enhances the chances of survival. However, many patients are faced with treatment-associated symptoms; they become more exposed to various infections. In the latter condition the body is not able to fight the causative agents effectively and can lead to a decision to reduce or delay chemotherapy doses, which can have effects on patients' outcomes **(Rasmy et al., 2016).**

Neutrophils which constitute the first line of the body defense against diseases, their number commonly decrease during cancer. The risk of infection increases if the absolute neutrophil count (ANC) falls to (<500 cells/mm3). The decline in the neutrophils number associated with fever is known as febrile neutropenia (FN). High temperature of 38ºC or more, flu-like symptoms, shivering, dizziness, confusion, fainting, and other signs of infection are the common presenting symptoms of FN **(Acobson & Berliner, 2014 and Gutierrez et al., 2014)**.

The appearance of fever during FN is related to the presence of serious bacterial, fungal, and viral infections, which always generate serious complications and death. The infections may be superficial, and or they may be systemic with life-threatening septicemia. Although, improved broad-spectrum antibiotics combined with improved supportive care have improved the prognosis of FN, but it is still responsible for considerable morbidity and mortality as 20%-30% of patients require hospitalization, with an overall mortality rate about 10% **(Rasmy et al., 2017).**

Education of patients and their families is an important factor that can help in the prevention of FN, it can enhance their awareness about the activities that should be done or avoided. Patients with FN should be instructed to avoid exposure to patients with respiratory tract infections, avoid overcrowded areas, if their ANC is less than 1000/µL they should wear a facemask in public places, and they should be educated about the importance of frequent CBC testing **(Jansen et al., 2013)**.

Self-management for cancer patients is a necessary part of treatment. It can empower the patients, increase their confidence to manage problems associated with the disease and the treatment, and improve quality of life through acquiring the necessary knowledge, skill, and confidence. Self-efficacy or confidence as it is commonly known is the optimistic belief or chances of successfully accomplishing a task and producing a positive outcome, it affects each area of human endeavor. Expectations of self-efficacy detect whether an

individual will be able to cope and how long effort will be sustained in the face of problems **(Barlow et al., 2005 and Trine & Svenn, 2013)**.

Cancer diagnosis and treatment could challenge the coping capacity of the patients. Self-efficacy can be considered a barrier between cancer and poor health outcomes. Patients with high self-efficacy demonstrate great persistence in trying to achieve desired psychosocial (e.g., better adjustment, less depression, and high quality of life) and medical outcomes (e.g., less intense symptoms and side effects). In cancer patients, high self-efficacy is associated with increased self-management and decreased physical and psychological symptoms. Therefore, it becomes the target of many self-management interventions. (**Heitzmann et al., 2010 and Foster et al., 2015)**.

Significance of the study

According to records of Clinical Pharmacy Unit (2016) about 2760 cancer patients received chemotherapy in Chemotherapy Clinic at Assiut University Hospital, but the incidence of FN was not accessible. In Middle Eastern cancer patients receiving chemotherapy incidence of FN was 8.4% (Ahmad et al., 2017). Furthermore, researches show that persons who possess high self-efficacy are able to manage stressor because of knowledge gained. Therefore this study was conducted to find out the effect of educational protocol for febrile neutropenic patients to improve their self-efficacy. Also, study results may be useful for nurses to take in account the important of equipping the patients with necessary information to return them to previous state of independence and improve their self-efficacy.

Aim of the study: The aim was to evaluate the effect of educational protocol for cancer patients with chemotherapy-associated FN on self-efficacy.

Hypotheses:

The educational protocol can positively influence self-efficacy for cancer patients with chemotherapy-associated FN.

II. Patients and methods

Research design: Pre and post-test design was used.

Study variables: The independent variable was the educational protocol, while the dependent variable was the self-efficacy.

Setting: Oncology Department and Outpatient Oncology Clinics at Assiut University Hospital.

Sample

A convenience sample of 120 male and female adult cancer patients with chemotherapy-associated FN, their age ranged between 18 to 65 years.

Exclusion criteria:

Patients suffering from mental health problems, visual or hearing problems, patients who are uncooperative or refuse to participate in the study.

Tools of data collection

Tool I- An interview questionnaire sheet: It was developed by the researcher to collect the base line data (patients' demographic and medical data), it included two parts:

Part 1- Patients' demographic data: Age, sex, marital status, educational level (illiterate, basic education, …), occupation (employee, skilled worker,…), residence (urban, rural), and smoking.

Part 2- Medical data: Medical diagnosis (type of cancer).

Tool II- Patient activation measure: It is one of the cancer specific and self-management self-efficacy outcome assessment measures. It was developed by **Hibbard et al. (2004)**. It reflects the degree to which the patients are ready, willing and able to engage in managing their health conditions through assessing of patient knowledge, skills, and confidence for self-management of one's condition. It comprises 22 items and involves four stages ranging from believing that an active role is important (2 items), via having confidence and knowledge to take action (10 items), then patient's readiness to take action (6 items), and lastly maintaining those actions even under stress (4 items). This tool was used prior to implement the educational protocol (pre-test) and after one month (post-test). It was adopted by the researcher to assess self-efficacy of cancer patients with chemotherapy-associated FN.

Scoring system: The patients rated their responses on a four-point Likert scale. (Strongly Disagree= 1, Disagree= 2, Agree= 3, and Strongly Agree= 4). The total score was calculated by adding up all of the responses to the 22 questions. Patients' whose scores are in the upper half (more than 50%) are beginning to gain confidence in their ability to take on self-management behaviors and make lifestyle changes, at this stage they will likely build a sense of self-efficacy, so they were considered having high self-efficacy. While, patients scoring in the bottom half of the measure (less than 50%) need to work on self-awareness of their role in the management process and in gaining the needed knowledge about their conditions, so they were considered having low self-efficacy.

Ethical consideration:

Permission to conduct the study was obtained from the ethical committee of the Faculty of Nursing and from the hospital authorities of Oncology Department and Outpatient Oncology Clinics at Assiut University Hospital. Prior to the initial interview, the researcher introduced herself to patients who met the inclusion criteria. The researcher emphasized that participation in the study is entirely voluntary; anonymity and confidentiality were assured through coding the data. The patients had the right to refuse to participate in the study and can withdraw at any time.

Content validity:

It was established by a panel of five experts in the Medical-Surgical Nursing field and the Oncology field. Reliability of Patient activation measure was ascertained (the coefficient of Cronbach's alpha = 0.882).

Pilot Study:

A pilot study was carried out on 10 % of patients to test the feasibility and clarity of the used tools; No modifications were done to the tools, so those patients were included in the main study.

The educational protocol: It was developed by the researcher through review of related literature and research results regarding FN. An educational booklet was prepared; it was divided into two portions; The first portion under the title of "Introduction" included information about the FN in the subtitles of "What is FN?", "What is the function of white blood cells?", "How to know if white blood cell count is low?", "What are the symptoms of FN?, "What to do if white blood cell count is low?" and "What *NOT* to do if white blood cell is low?". The second portion in the booklet under the title of "Preventive measures" included information about preventive measures to decrease the risk of infection in the subtitles of "Diet", "Mouth care", "Hand washing" and "Restrictions regarding flowers, animals, overcrowding, and contact with individuals with an infectious disease". Experts in fields of nursing and oncology checked the content for comprehensiveness, clarity, and applicability and corrections were done accordingly.

Procedure:

The current study was conducted through using the following three phases:

I- Assessment phase:

The researcher met the studied sample; each patient was fully informed with the purpose and nature of the study, and then an informed consent was obtained from patients who accepted to participate in the study. Base line data were collected using tool I and tool II.

II- Implementation phase:

- The educational protocol was carried out throughout a period of one month for the studied patients. It was given to the groups of 2 or 3 patients for two sessions in the morning and in the afternoon shift.
- During the first session, questions about patients' experiences with their disease were directed, so they participated actively in the session, then the researcher cover the information included in the first portion of the educational booklet (Introduction).
- During the second session the researcher cover the second portion of the educational booklet (Preventive measures), then a general review was done. Feedback was received from the patients to assess their understanding, and then the researcher explained any not understood points.
- Researcher used teaching aids (e.g., pictures and handouts). Each patient received a copy of the prepared educational booklet in clear Arabic language. Each session took approximately 30 to 45 minutes.
- Before discharge the researcher arranged with the patients the time and place for follow up which were after one month in the Outpatient Oncology Clinics at Assiut University Hospital.
- The researcher assessed the patients' commitment of the educational protocol weekly by telephone. Data were collected through the period from the beginning of February 2017 to the end of October 2017.

III- Evaluation phase

In this phase, patients were reassessed after one month from the first assessment using tool II. All patients attended the follow-up sessions in the Outpatient Oncology Clinics at Assiut University Hospital to evaluate the effectiveness of the educational protocol. The session took approximately 10 to 15 minutes.

Statistical analysis:

Date entry and data analysis were done using SPSS version 19 (Statistical Package for Social Science). Data were presented as number, percentage, mean, and standard deviation. Chi-square test was used to compare between qualitative variables. Mann-Whitney test and Kruskal Wallis Test were used to compare quantitative variables in case of non-parametric data. Wilcoxon Signed Rank Test was done to compare quantitative variables between before and after program. P-value considered statistically significant when $P < 0.05$.

III. Results

Table (1): Demographic characteristics of the studied patients (n= 120).

Characteristics	N.	%
Age: (years)		
< 40	55	45.8
40 - 50	25	20.8
> 50	40	33.3
Mean ± SD	41.84 ± 13.55	
Gender:		
Male	44	36.7
Female	76	63.3
Marital status:		
Single	32	26.7
Married	68	56.7
Divorced	5	4.2
Widow/er	15	12.5
Occupation:		
Employee	18	15.0
Farmer	26	21.7
Housewife	50	41.7
Student	10	8.3
Skilled worker	16	13.3
Educational level:		
Illiterate	33	27.5
Primary	10	8.3
Secondary	55	45.8
Bachelor	22	18.3
Residence:		
Rural	92	76.7
Urban	28	23.3
Smoking:		
Non-smoker	101	84.2
Smoker	19	15.8

Table (1): Reveals that the mean age of the studied patients was (41.84 ± 13.55). The highest percentages of them were female, married, housewife, had secondary education, and from rural area (63.3% and 56.7%, 41.7% and 45.8%, and 76.7% respectively). Regarding smoking, the majority of the studied patients (84.2%) were non-smoker.

Figure (1): Medical diagnosis of the studied patients (n= 120).

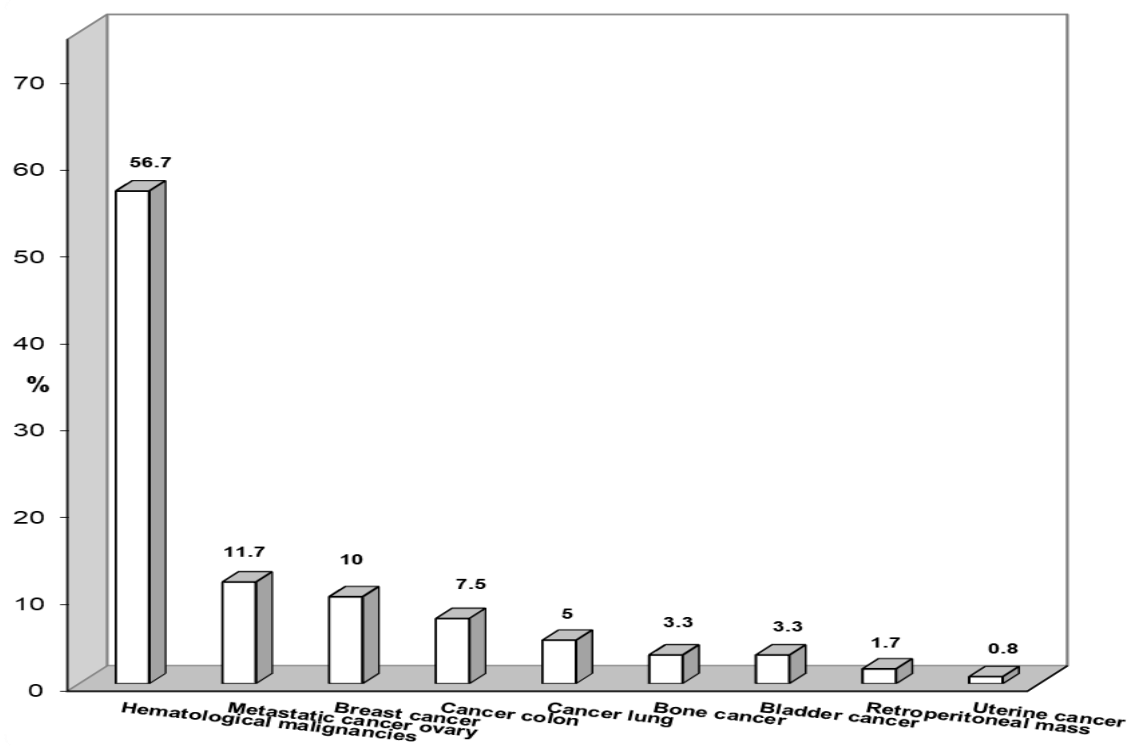

Figure (1): Shows that hematological malignancies were the most common medical diagnosis of the studied patients (56.7%).

Table (2): Patient activation measure among studied patients in pre-test and post-test.

Patient activation measure	Pre-test	Post-test	P-value
	Mean ± SD	Mean ± SD	
Believes active role important.	5.63 ± 0.76	7.21 ± 0.77	0.0001***
Confidence and knowledge to take action.	28.23 ± 1.99	37.55 ± 2.07	0.0001***
Taking action.	16.77 ± 1.64	22.52 ± 1.37	0.0001***
Staying the course under stress.	6.87 ± 0.76	14.31 ± 0.90	0.0001***
Total patient activation measure.	57.50 ± 4.24	81.58 ± 3.53	0.0001***

*** Highly Significant P<0.001

Table (2): Reflects that highly statistical significance differences were found between pre-test and post-test among the studied patients regarding the four stages of patient activation measure and the total patient activation measure (P<0.001).

Table (3): Comparing the self-efficacy at baseline and one month follow-up interval among the studied patients.

Self-efficacy assessment	Pre-test (n= 120)		Post-test (n= 120)		P-value
	N.	%	N.	%	
High self-efficacy	67	55.8	120	100.0	0.0001***
Low self-efficacy	53	44.2	0	0.0	

*** Highly Significant P<0.001

Table (3): Demonstrates that a marked improvement in the self-efficacy was found among the studied patients after implementing the educational protocol, where in pre-test about half of the studied samples (55.8 %) had high self-efficacy, which became 100% during the follow-up period (after one month). Highly statistical significant difference was found between pre-test and post-test regarding self-efficacy assessment (P<0.001).

Table (4): Relationship between self-efficacy and demographic characteristics of the studied patients in pre-test and post-test.

Characteristics	Self-efficacy assessment			
	Pre-test (n = 120)	P-value	Post-test (n = 120)	P-value
	Mean ± SD		Mean ± SD	
Age: (years)				
< 40	57.02 ± 4.10	0.362	81.27 ± 4.13	0.135 NS
40 - 50	58.48 ± 4.44		82.84 ± 2.64	
> 50	57.55 ± 4.32		81.22 ± 2.98	
Gender:				
Male	56.66 ± 4.54	0.099	81.07 ± 3.87	0.226 NS
Female	57.99 ± 4.01		81.88 ± 3.31	
Marital status:				
Single	56.59 ± 4.65	0.055	81.16 ± 4.72	0.310 NS
Married	57.35 ± 3.91		81.47 ± 2.98	
Divorced/ Widow	59.45 ± 4.26		82.65 ± 2.98	
Occupation:				
Employee	56.11 ± 3.45	0.014*	81.33 ± 2.45	0.027*
Farmer	55.69 ± 4.95		80.81 ± 4.09	
Housewife	58.90 ± 3.82		82.62 ± 3.14	
Student	57.70 ± 3.23		82.00 ± 4.35	
Skilled worker	57.50 ± 4.47		79.63 ± 3.46	
Educational level:				
Illiterate	57.64 ± 4.40	0.570	81.67 ± 3.18	0.283 NS
Primary	56.90 ± 4.38		80.10 ± 2.33	
Secondary	57.11 ± 4.36		82.09 ± 3.86	
Bachelor	58.55 ± 3.71		80.86 ± 3.51	
Residence:				
Rural	57.67 ± 4.43	0.418	81.89 ± 3.61	0.083 NS
Urban	56.93 ± 3.60		80.57 ± 3.10	
Smoking:				
Non-smoker	58.04 ± 4.20	0.001**	81.96 ± 3.44	0.007**
Smoker	54.63 ± 3.25		79.58 ± 3.40	

NS: Not Significant P>0.05 * Significant P<0.05 ** Significant P<0.01

Table (4): Reveals that statistical significant differences were found between self-efficacy and occupation (P<0.05), and between self-efficacy and smoking (P<0.01) in pre-test and post-test.

IV. Discussion

Oncology nurses play a vital role in providing education to patients and their families about side-effects of chemotherapy. Patient education, health-care professional education, and the availability of clear protocols for patient management were the serious shortcomings in the care delivered to patients with FN who died within 30 days of chemotherapy. **(Munte, 2012 & NCEPOD, 2008).**

Regarding demographic characteristics, the current study revealed that the mean age of the studied patients was (41.84 ± 13.55) and the highest percentage of them was female.

These results confirmed by Schelenz et al. (2012) who investigated the epidemiology, management, and economic impact of FN in oncology patients, the results showed that more than half of the studied patients were female. While Günalp et al. (2014) disagreed with these results, they found that the mean age of the studied patients were 56.4±13.46 and the highest percentage of them were male, in their study about the independent factors for prediction of poor outcomes in patients with FN.

Regarding medical diagnosis, the current study showed that hematological malignancies were the most common medical diagnosis of the studied patients. In this regard Jacob et al. (2014) investigated FN in solid tumors and hematological malignancies, the results clarified that FN episodes were more frequent in hematological malignancies than in solid tumors. Also, Burutaran et al (2015) stated that FN was the most commonly recorded complication of chemotherapy for hematological oncology adult patients in a university hospital in Uruguay.

As regard to patient activation measure, the current study showed an obvious significant improvement in the patient activation measure after implementation of the educational protocol. This means that the patients believe they have an important role, they have the necessary knowledge to manage their health, they can handle problems on their own at home, they can maintain lifestyle changes when under stress, and they can keep their health problems from interfering with their life.

This result was in accordance to Do et al. (2015) who concluded that patients with higher activation levels tended to have more knowledge, more confidence in self-management, and more likely to engage in self-management behaviors in their study about relationships between activation level, knowledge, self-efficacy, and self-management behavior in heart failure. Also, Dixon et al. (2009) stated that patients at lower activation levels indicated a lack of knowledge and confidence as barriers for them to manage their health conditions.

Regarding self-efficacy, the current study revealed that the educational protocol had a marked effect on the improvement of the self-efficacy among the studied sample, with highly statistical significance difference between pre-test and post-test. According to the researcher point of view this may be due to patients' thinking that they could easily make daily activities; because of knowledge gained about FN and preventive measures, so they became more independent and more confident in their abilities, which helped in improvement of their self-efficacy.

Similarly, Teleb et al. (2016) studied the effect of nursing intervention protocol for chemotherapy induced neutropenia; they found that educational program is important for patients and their families through providing them with the necessary knowledge and practice for prevention and management of problems related to alteration in the immune system. Also, Khan et al. (2012) recommended that nurses have a great chance to apply guidelines to minimize the risk of chemotherapy-induced neutropenia, which help to make the use of full-doses of chemotherapy possible and decreasing the mortality rates.

Mak and Ching (2015) supported the current results in their study about effect of education program on prevention of FN among breast cancer patients; the outcomes included knowledge, self-efficacy, and competence. Regarding self-efficacy, their results showed that the education program had a positive effect on the self-efficacy, where self-efficacy in the intervention group had increased across time, whereas in the control group had increased initially then decreased across time.

Czajkowska et al. (2017) were in the same line in their study about the role of patient education and physician support in self-efficacy among patients with melanoma; they concluded that patient education and perceived physician support are associated with higher self-efficacy. Also, Rasheed (2013) investigated the effect of diabetes education on self-efficacy and readmission rates of diabetic patients, the results clarified a strong, positive correlation between diabetes education and improvements in self-efficacy and readmission rates.

Regarding relationship between self-efficacy and demographic characteristics, the present study showed that no statistical significant difference was found between self-efficacy and demographic characteristics of the studied patients except in the occupation. Contrary to this result Foster et al. (2015) investigated cancer survivors' self-efficacy in the year following primary treatment; they found that self-efficacy differs significantly by some socio-demographic variables**.**

Regarding relationship between self-efficacy and smoking, the current study revealed that a statistical significant difference was found between self-efficacy and smoking, where self-efficacy increased among non-smokers more than among smokers. In this regard Van Zundert et al. (2011) stated that several reports have illustrated significant relationship between self-efficacy and successful tobacco cessation interventions. Moreover, Lindberg et al (2015) found a significant relationship between lower nicotine dependence and higher self-efficacy scores in their study about individuals with chronic obstructive pulmonary disease.

V. Conclusion

The educational protocol had a statistical significant positive effect on the self-efficacy of cancer patients with chemotherapy-associated FN**.**

VI. Recommendations

1. Simple educational booklets for cancer patients with chemotherapy-associated FN should be available in all oncology units and Outpatient Oncology Clinics.
2. Further studies on larger sample from different geographical areas in Egypt to generalize the results and collect in depth knowledge about FN.
3. Finding ways to assess self-efficacy could detect strengths and weaknesses that need to be reinforced or modified to minimize the burdens of cancer or treatment related problems for patients.

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