Research Paper

Effectiveness of a PRECEDE-PROCEED Model-based Educational Program on Health-Related Quality of Life and Preventive Behaviors in Patients with Breast Cancer Undergoing Chemotherapy

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ABSTRACT

Background: Cancer is a chronic disease that affects different aspects of Quality of Life (QoL), including physical, financial, social, and emotional aspects. The PRECEDE-PROCEED model is a comprehensive method for assessing patients' needs, and designing, implementing, and evaluating health promotion programs to meet their needs. This study aims to determine the effect of an educational program based on the PRECEDE-PROCEED model on Health-Related Quality of Life (HRQOL) and preventive behaviors in patients with breast cancer undergoing chemotherapy.

Methods: This quasi-experimental impact evaluation study was performed on 90 outpatients with breast cancer (stages I and II) undergoing chemotherapy in Shahid Beheshti Hospital, Kashan, Iran from September 2018 to December 2019. The participants were randomly assigned into two groups of training (n=45) and control (n=45). The training group, in addition to routine care, received the educational program based on the PRECEDE-PROCEED model at eight two-hour group sessions for one month. The control group received routine care for cancer patients only. The participants completed the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30 (EORTC QLQ-C30) and a researcher-made questionnaire based on the PRECEDE-PROCEED model (assessing predisposing, enabling, and reinforcing factors) before the study, immediately after, and two months after the intervention.

Results: In the training group, the total Mean±SD of HRQOL before, immediately after, and two months after the intervention were 52.65±17.14, 64.79±15.66, and 63.95±18.63, respectively. Their total score of HRQOL and its dimensions (physical functioning, role functioning, emotional functioning, and symptoms) increased significantly over time (P<0.01). In this group, the scores of predisposing and enabling factors also increased immediately after and two months after the intervention (P<0.05); however, the score of reinforcing factors (social support) showed no significant increase (P>0.05).

Conclusion: The educational program based on the PRECEDE-PROCEED model can improve the HRQOL and preventive behaviors in terms of predisposing factors (knowledge, attitude), and enabling factors (family support) in patients with breast cancer undergoing chemotherapy. We recommend this educational program for improving these patients' QoL.

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Highlights

● Chemotherapy has tremendous side effects on cancer survivors and reduces their quality of life.

● The Precede-Proceed model is a good approach to assess the needs of patients and designing, implementing, and evaluating health promotion plans to meet their needs.

● The educational program based on the PRECEDE-PROCEED model improved HRQOL in patients with cancer undergoing chemotherapy.

Plain Language Summary

Side effects of chemotherapy can reduce the patients' well-being and quality of life. In order to control and prevent these side effects, patients' knowledge and attitude should be improved and they should have supporting resources. The positive effects of the PRECEDE–PROCEED model have been well documented. The results of this study showed that eight weeks of educational program based on this model improved the health-related quality of life and the preventive behaviors in terms of predisposing factors (knowledge, attitude), and enabling factors (family support) in patients undergoing chemotherapy.

1. Introduction

After cardiovascular diseases, the second leading cause of death in the world is cancer (Schmidt et al. 2018). In Iran, after cardiovascular diseases and road accidents, cancer is the third leading cause of death (Rahimzadeh et al., 2021). There are several methods for cancer treatment, including radiation therapy, chemotherapy, surgery and hormone therapy. However, these treatments, especially chemotherapy, have side effects on the patients (Genç, Can, & Aydiner, 2013). The side effects of chemotherapy include nausea, vomiting, anorexia, diarrhea, stomatitis, hair loss, bone marrow suppression, and depression which can decrease the patients' well-being and Quality of Life (QOL) (Schmidt et al. 2018). To improve their QOL and general health, the complications of chemotherapy and radiotherapy should be controlled and reduced. To do so, patients' awareness and attitude should be improved and they should receive support and resources (Schmidt et al., 2018; Motaghi Nejad et al., 2017).

The World Health Organization defines QOL as the individuals' perception of position in life within the culture and value system in relation to their specific objectives, expectations, and standards (Winkler et al., 2006). Since cancer and its treatments reduce the patients' QOL, it is important to find innovative strategies to help improve their QOL. Educational interventions are effective approaches for enhancing the QOL of patients under chemotherapy. Furthermore, patient education

can be effective in improving patients' awareness and attitudes towards healthy behaviors (Xie et al., 2020). For designing an educational program, choosing a proper educational model based on patients' unmet needs is necessary (Rahemi et al., 2018). Green and Kreuter (2005) introduced PRECEDE-PROCEED model for designing educational interventions to improve QOL and healthy behaviors. The PRECEDE-PROCEED model is a comprehensive method to assess patients' heath needs for designing, implementing, and evaluating health promotion programs to meet the patients' needs (Green, & Kreuter, 2005). This model includes two main stages (PRECEDE and PROCEED) and nine phases. The PRECEDE stands for Predisposing, Reinforcing, and Enabling Constructs in Educational Diagnosis and Evaluation. It is the diagnostic part of the model. It starts with the idea that the focus of change should be on the desirable outcome, and that action should be taken in such a way that interventions lead to the desirable outcome. It involves social assessment, epidemiological assessment, ecological assessment, identifying administrative and policy factors that affect performance, and implementing appropriate interventions for desirable and expected change. The PROCEED stands for Policy, Regulatory, and Organizational Constructs in Educational and Environmental Development. This includes identifying the desired outcome and implementing the program (Green, & Kreuter, 2005). In the PRECEDE stage, the predisposing factors include attitudes, beliefs, knowledge, personal preferences, and self-efficacy to desirably change the behavior. The reinforcing factors are factors that reward or reinforce the desirable change in behavior,

including economic rewards, social support and change of social norms. The enabling factors are physical factors, such as the accessibility of resources or services that facilitate the motivation to change behavior (Crosby, & Noar, 2011). Behaviors are usually influenced by these three types of factors. The PRECEDE model is based these factors. The next stage, the PROCEED, includes the phases of implementation, evaluation, assessment, and outcome evaluation (Green, & Kreuter 2005; Crosby, & Noar, 2011) (Figure 1).

Due to the complications associated with chemotherapy, especially its negative effects on QOL, there is a need to design new interventions for the management of these side effects. Therefore, the purpose of the present study is to determine the effect of an educational program based on the PRECEDE-PROCEED model on Health-Related Quality of Life (HRQOL) and preventive behaviors in patients with breast cancer undergoing chemotherapy.

2. Materials and Methods

Participants

This is a quasi-experimental impact evaluation study that was conducted on 90 patients with breast cancer undergoing chemotherapy referred to Shahid Beheshti Hospital in Kashan, Iran, from October 2018 to November 2019. To calculate the sample size, the mean difference between the two groups was assessed. According to Moradi et al. (2017), the Mean±SD QOL in the training and control groups after the intervention was 50.75±8.34 and 58.22±8.41, respectively. Considering an alpha value of 0.05 and a beta value of 0.05, the sample size was calculated 33 for each group; with a dropout probability of 15% in each evaluation stage, the sample size was set as 45 for each group.

Participation of the subjects was voluntarily. A total of 162 patients with breast cancer undergoing chemotherapy were first evaluated for eligibility. From these patients, 59 did not meet the inclusion criteria and 13 refused to participate in the study. Finally, 90 patients were randomly assigned into two groups of training (n=45) and control (n=45) using block randomization method in Sealed Envelope website. The inclusion criteria were: age 18 years and older, reading and writing literacy, ability to communicate verbally, outpatients with definitive diagnosis of breast cancer (stages I, II) according to a cancer specialist, patient's awareness of breast cancer diagnosis and chemotherapy, and having a medical record at the cancer center. Exclusion criteria were absence from more than two intervention sessions.

During the study, four patients in the control group and two patients in the training group were excluded from the study (Figure 2).

Instruments

In this study, data collection was performed using three instruments. The first instrument was a sociodemographic form to survey age, gender, marital status, occupational status, education, underlying diseases, cancer metastasis, and family history of cancer. The second tool was the European Organization for Research and Treatment of Cancer Quality Of Life Questionnaire Core 30 (EORTC QLQ-C30). It measures HRQOL in cancer patients. This instrument consists of five functional subscales (physical, role, cognitive, emotional, and social functioning), a global health status/QOL scale, three symptoms subscale (fatigue, pain, and nausea/vomiting), five items to evaluate other symptoms (dyspnea, insomnia, appetite loss, constipation, and diarrhea), and an item evaluating the perceived financial difficulties. It has 30 items rated on a 4-point Likert scale (1= not at all, 2= a little, 3= quite a bit, and 4= very much). Two items that related to the global health status/ QOL scale are rated from 1 (very poor) to 7 (excellent). The total score ranges from 0 to 100 where higher scores indicates better functioning. The validity and reliability of this instrument in different languages have been approved (Chie et al., 2004; Zhao, & Kanda, 2004). Montazeri et al. (1999) verified the validity and reliability of the Persian version of this instrument in Iran. In their study, Cronbach's alpha varied from 0.48 to 0.96. In the present study, the reliability of this questionnaire was also evaluated. The Cronbach's alpha value for each aspect was from 0.75 to 0.86.

The third instrument was a researcher-made questionnaire developed based on the PRECEDE-PROCEED model to measure preventive behaviors in patients undergoing chemotherapy. This instrument has predisposing, enabling, and reinforcing subscales. It was developed after interviews with nine patients with breast cancer underwent chemotherapy and based on the review of literature about patients with breast cancer and their needs. The items are rated a 5-point Likert scale from 1 (1=not at all) to 5 (very high). The instrument contains 20 items; 10 items are related to the predisposing factors. For example, "How much do you know about the side effects of chemotherapy (nausea, vomiting, hair loss, etc.)?" or "How much does chemotherapy affect your daily living activities (bathing, eating, etc.)?". The total score of the predisposing subscale ranges from 10 to 50. Five items are related to the enabling factors. For example, "Do you have difficulty paying treatment and chemo-
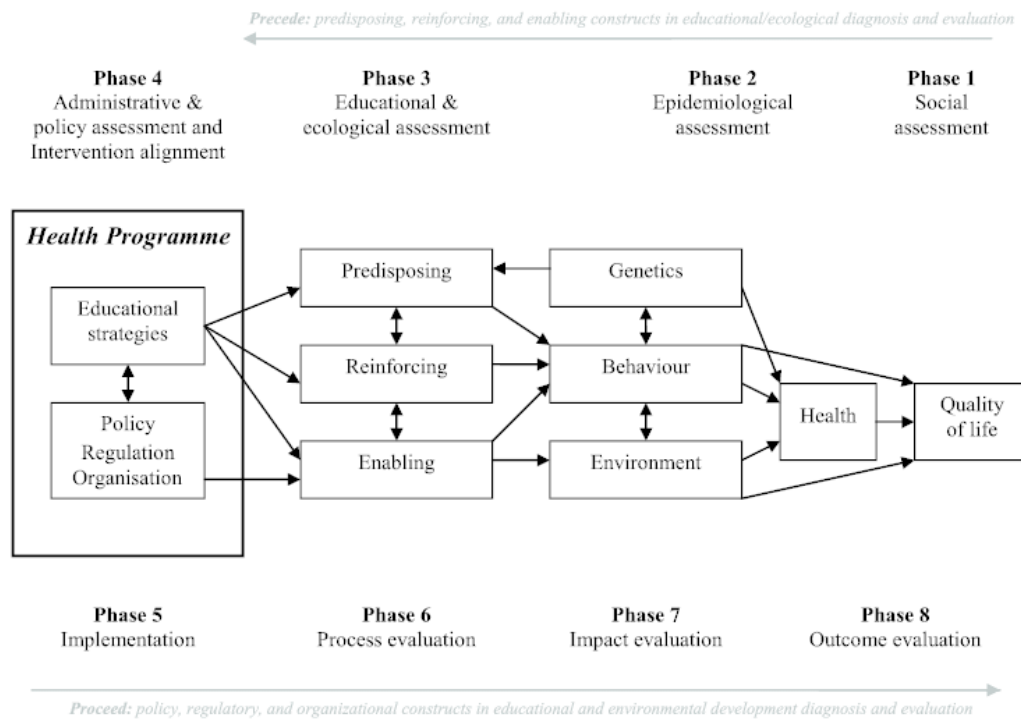
Figure 1. The PRECEDE-PROCEED planning model (Green et al., 2005).

therapy costs?" or "Have you received empowerment interventions (training to change behavior and increase knowledge) from the chemotherapy center?". The total score of the enabling subscale ranges from 5 to 25. Five items are related to the reinforcing factors. For example, "How much support do you receive from your family?", "How much you have relationship with your family and friends?". The total score of the reinforcing subscale also ranges from 5 to 25. The higher scores indicate better level of functioning. The instrument was sent to ten experts in instrument development and cancer nursing for determining its content validity based on their comments. The instrument's content validity index was 0.86 and its content validity ratio was 0.90. The Cronbach's alpha for the overall instrument was obtained 0.85 and for its subscales ranged from 0.83 to 0.65. To evaluate the instrument's test-retest reliability, 20 people who hadn't participate in the present research completed the instrument over a two-week interval. The correlation coefficient was obtained as r = 0.993 (P< .001). The questionnaires were completed by the participants at baseline, immediately and two months after the end of the educational intervention.

Educational program

The participants in the two groups received routine care for chemotherapy and breast cancer. The training group received both educational program and routine care. This program was presented at eight two-hour educational sessions, two sessions per week in the morning for one month in groups of 5 people. The researcher informed the patients by phone one week before and one day before the beginning of the program. The program was run at the scheduled time in the chemotherapy classroom with sufficient lighting, temperature, and ventilation. A family member of each patient was present during sessions. The education was presented face-to-face and in group discussions using questions & answers sessions by the researcher (first author). PowerPoint slideshows, videos, and pamphlets were used to facilitate the education. The content of the educational sessions was developed based on three components of the PRECEDE-PROCEED model. The first session focused on predisposing factors including patients' knowledge and attitudes towards cancer and chemotherapy, the definition of cancer and chemotherapy, and the side effects of chemotherapy. In the second session, the need to prevent disease and related strategies, skin changes and hair loss, the ways to protect the skin and hair, and strategies to reduce fatigue and depression were taught by the researcher. In the third session, the patient received education about increasing physical activity, regular use of medications, misconceptions about the disease, improving self-efficacy, and overcoming hopelessness. In the fourth session, the reinforcing factors were taught as

Table 1. The protocol of educational program based on the PRECEDE-PROCEED model

Sessions		Contents
1-3	Predisposing factors	Increasing patients' knowledge and attitude towards cancer and chemotherapy, definition of cancer, chemotherapy and its side effects; how to control the side effects of chemotherapy, proper diet for patients under chemotherapy to reduce nausea/vomiting and appetite loss, improving taste and dry mouth, improving constipation, how to prevent infection, protect skin and hair methods, and reduce fatigue and depression; physical activity, regular use of medications, self-efficacy, overcoming hopelessness
4, 5	Reinforcing factors	Defining primary care specialty as internal medicine, and general practice/family medicine and clinic practice as general medicine; discussing financial problems and introducing charity centers
6, 7	Enabling factors	Giving educational pamphlets to family members of patients for increasing their knowledge of chemotherapy, how to enhance family support and help patients control their disease, participation of family members in patient care
8		Discussion of previous sessions, questions and answers, summary of the sessions

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well as the review of social and economic factors (financial problems, living conditions, supporting resources). In the fifth session, breast cancer survivors were invited to share their experiences of how they managed the complications of chemotherapy. They also expressed their positive and negative experiences in preventing the complications of chemotherapy. The contents of sixth and seventh sessions included: Giving educational pamphlets to the patients' family members to increase their knowledge of chemotherapy, and improving the quality of family support. There was also a group discussion

about improving the quality of family support and the participation of family members in patient care. In the last session, the content of the previous sessions was discussed and the patients' questions were answered (Table 1). The first author (an oncology ward nurse) telephone called the patients in the training group twice a week to answer their questions and remind them to apply the educational materials in their daily activities and self-care. The researcher's telephone number was also given to the patients. The researcher asked patients to contact if they had any questions during the study.
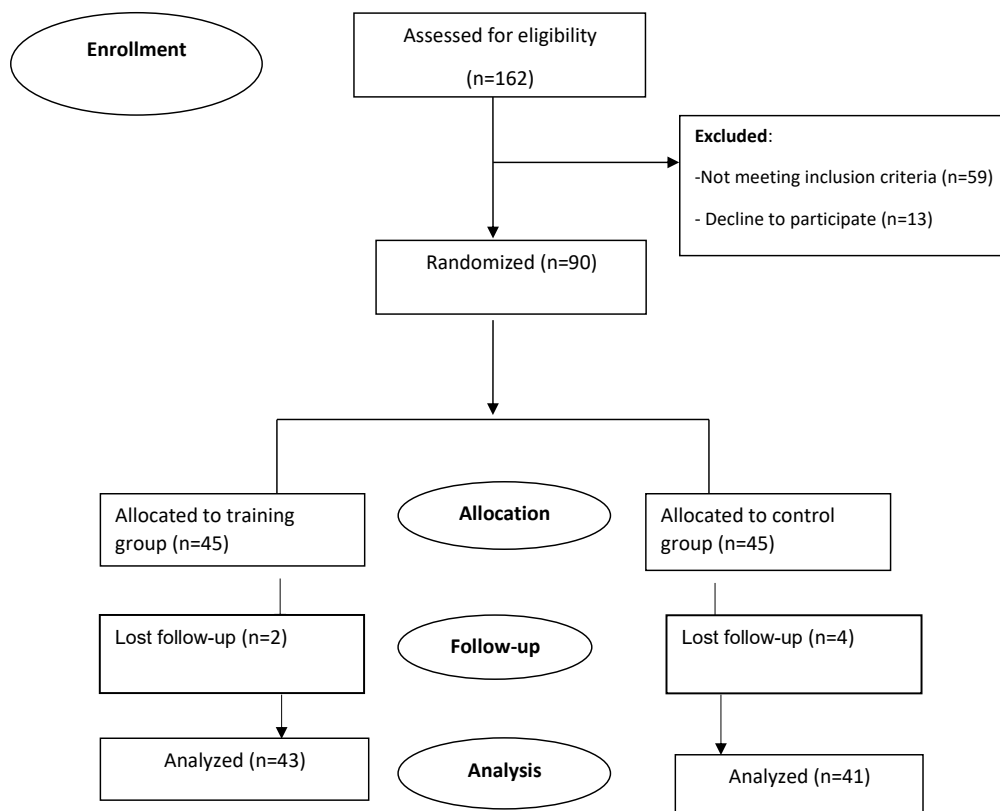

Figure 2. The flowchart of sampling and allocation

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Data analysis

Kolmogorov-Smirnov test was used to assess the normal distribution of the data. Demographic variables such as age were described by Mean±SD, frequency, and percentage. Comparison of sociodemographic characteristics between the training and control groups was conducted by Chi-square test and independent samples t-test at baseline. To compare the mean scores of the HRQOL and preventive behaviors in three time periods (before, immediately after, and two months after the intervention) between the two groups, repeated measures ANOVA was used. Statistical analyses were performed in SPSS software v. 16 (SPSS Inc., Chicago, IL, USA). The significance level was set at 0.05.

3. Results

Table 2 shows the demographic characteristics of patients in the training and control groups. Based on results, there was no significant difference between the two groups in terms of demographic characteristics (P>0.05). Regarding the HRQOL and preventive behaviors, no

significant difference at baseline was found between the two groups (P>0.05).

Immediately after and two months after the intervention, the total score of HRQOL and its three physical, role and emotional subscales improved in the training group and the scores of subscales related to symptoms decreased significantly (P<0.001) (Table 3). Moreover, the results showed that the scores of predisposing and enabling subscales of the preventive behaviors increased significantly in the training group immediately after and two months after the intervention (P<0.001). There was no significant difference in the scores of reinforcing subscale immediately and two months after the intervention (P>0.05). The interaction effect of group and time for predisposing and enabling factors was significant in the training group according to the results of repeated measures ANOVA test (P<0.001) (Table 4).

4. Discussion

The results of the current study showed that the educational program based on the PRECEDE-PROCEED

Table 2. Demographic characteristics of the training and control groups

Variables		No. (%)/Mean±SD		P
		Training(n=43)	Control(n=41)	
Gender	Male	22(51.28)	22(53.70)	0.81*
	Female	21(48.82)	19(46.30)	
Educational level	Less than high school	38(88.41)	34(82.91)	0.58*
	High-school diploma and higher	5(11.6)	7(17.19)	
Marital status	Single	6(14)	6(14)	1*
	Married	37(86)	37(86)	
Occupational status	Employed	25(58.2)	17(41.5)	0.63*
	Unemployed	18(41.8)	24(58.5)	
Underlying diseases	Yes	24(55.80)	21(51.20)	0.67*
	No	19(44.20)	20(48.80)	
Metastasis	Yes	10(23.25)	14(34.14)	0.58*
	No	33(76.74)	27(65.85)	
Family history of cancer	Yes	24(55.81)	20(48.78)	0.60*
	No	19(44.18)	21(51.21)	
Age		42.63±10.56	44.78±11.61	0.24¥

* Chi-square test; ¥ Independent t-test.

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Table 3. Comparing the mean scores of HRQOL at pretest, posttest, and follow-up phases

HRQOL Dimensions	Study	Mean±SD			P*		
		Pretest	Posttest	Follow-up	Time	Tim×Group	Group
Physical functioning	Training	42.79±16.34	54.72±15.70	57.72±11.03			
	Control	45.85±17.39	46.01±15.62	43.10±15.08	<0.001	<0.001	<0.001
	P¥	0.40	0.01	0.01			
Role functioning	Training	52.71± 14.05	61.01± 15.13	61.62 ± 13.38			
	Control	54.79±13.29	53.98±14.55	50.73±16.40	<0.001	<0.001	<0.001
	P¥	0.48	0.01	0.01			
Social functioning	Training	41.47±23.39	47.28±21.18	43.79±21.52			
	Control	36.58±19.79	38.61±12.04	36.99±10.87	>0.05	>0.05	>0.05
	P¥	0.30	0. 2	0.07			
Emotional functioning	Training	41.08±14.70	55.62±15.18	56.78±16.08			
	Control	44.51±15.09	48.17±14.00	47.76±13.31	<0.001	<0.001	<0.001
	P value¥	0.29	0.02	0.007			
Cognitive functioning	Training	63.17±13.87	70.15±13.87	70.93±15.47			
	Control	65.04±11.66	67.07±10.85	66.26±14.18	>0.05	>0.05	>0.05
	P¥	0.50	0.26	0.15			
Symptoms	Training	38.60±8.81	30.54±7.93	28.25±7.10			
	Control	37.57±7.48	38.04±8.44	37.81±7.45	<0.001	<0.001	<0.001
	P¥	0.56	0.00	0.00			
Total	Training	52.65±17.14	64.79±15.66	63.95±18.63			
	Control	56.09±17.46	53.62±16.50	54.18±14.37	<0.001	<0.001	<0.001
	P¥	0.36	0.002	0.009			

* Repeated measures ANOVA; ¥ Independent t-test.

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model could improve HRQOL in patients with breast cancer undergoing chemotherapy. Their physical, role, and emotional functioning related to HRQOL increased and their symptoms decreased significantly. However, there was no significant change in their cognitive and social functioning after the intervention.

Azar et al. (2017) reported that eight weeks of education based on the PRECEDE-PROCEED model increased QOL in diabetic patients. The positive effect lasted for one and three months later. This is consistent with our study. Cereda et al. (2020) found that an educational program based on the PRECEDE-PROCEED model could improve various factors related to disease control and prevention, including predisposing, reinforcing, and enabling factors, as well as patients' QOL. This indicates the effectiveness of scheduled and model-based educational interventions in improving physical and functional domains of the patients.

Our study showed that the educational program based on the PRECEDE-PROCEED model improved the physical aspect of HRQOL in the patients. Calano et al. (2019) also reported that education based this model once a week for two months improved physical symptoms and treatment adherence in hypertensive patients. Bammann et al. (2021) in a mixed methods study investigated the effect of education based on the PRECEDE-

Table 4. Comparing the mean scores of preventive behaviors (PRECEDE-PROCEED model components) at pretest, posttest, and follow-up phases

Variables	Study	Mean±SD			P*		
		Pre-test	Post-test	Follow-up	Time	Tim×Group	Group
Reinforcing factors	Training	56.27±15.96	51.95±23.52	50.74±20.18			
	Control	56.58±15.83	57.07±17.47	58.43±14.82	>0.05	>0.05	>0.05
	P¥	0.93	0.26	0.06			
Enabling factors	Training	69.06±16.79	52.27±19.87	50.97±13.60			
	Control	68.97±16.82	64.68±20.13	65.95±21.14	<0.001	<0.001	<0.001
	P¥	0.98	0.006	0.01			
Predisposing factors	Training	62.46±20.73	48.32±17.42	46.90±14.26			
	Control	61.56±16.41	56.39±18.24	58.48±14.72	<0.001	<0.001	<0.001
	P¥	0.84	0.04	0.01			
Total	Training	52.65±17.14	64.79±15.66	63.95±18.63			
	Control	56.09±17.46	53.62±16.50	54.18±14.37	<0.001	<0.001	<0.001
	P¥	0.36	0.002	0.009			

* Repeated measures ANOVA; ¥ Independent t-test

PROCEED model on older adults' physical activity. The results showed that after this educational intervention, their physical symptoms decreased. Despite the differences in study samples and intervention methods, their results are consistent with the results of present study. Pramuka et al. (2007) reported that education based this model could enhance physical and emotional aspects of HRQOL in patients with epilepsy. However, they reported no significant improvement in the total score of HRQOL, which is not consistent with our results. This discrepancy may be related to the difference in disease and educational contents.

In the present study, the educational intervention based on the PRECEDE-PROCEED model improved the preventive behaviors in terms of predisposing factors (knowledge and attitude towards chemotherapy) and enabling factors (accessibility of resources and health services, policies, family support, and functional skills). Another study used educational program based on this model and reported the improved enabling and predisposing factors (knowledge and attitude) in patients with chronic heart failure (Wang et al., 2017). A study on hypertensive patients using educational program based this model also indicated that the predisposing factors (knowledge and attitude) improved in the intervention group (Hosseini et al., 2014). Yates et al. (2004) also ap-

plied an educational program based this model to assess its effect on the pain management of patients with cancer. The results reported their increased knowledge and attitude. Although these studies were different in terms of methodology and disease, the educational program presented based on the Precede-Proceed model was effective in improving the knowledge and attitude of patients. These studies also showed that improved knowledge and attitudes changed the patients' preventive behaviors. However, Bidi et al. (2013) reported that an educational program based on the PRECEDE-PROCEED model could not increase the knowledge of diabetic patients. Matin et al. (2014) examined the effect an educational program based on the PRECEDE-PROCEED model in older adults' HRQOL, but they found no significant improvement in predisposing factors (knowledge and attitude); however, they reported a significant improvement in HRQOL.

In our study, the education program had no significant effect on the reinforcing factors (social support and financial resources). Zigheimat et al. (2009) investigated the effect of an educational program based on the PRECEDE-PROCEED model on Epileptic patients' knowledge, attitude, and self-care behaviors. They found no significant changes in the scores of reinforcing factors after the intervention. Supporting groups can help

enhance self-care of patients under chemotherapy. In the present study, one of the enabling factors was the involvement of family members as a supporting group which led to improvement in HRQOL and preventive behaviors. Moshki, Dehnoalian, and Alami (2017) and Pourhaji et al. (2020) highlighted the significant role of supporting groups, including family and community, in changing the behaviors among patients.

Future studies are recommended to assess the effects of educational programs based on the PRECEDE-PRO-CEED model on other aspects of health and disease. This study was conducted on patients with breast cancer undergoing chemotherapy. Therefore, the results cannot be generalized to other patients.

5. Conclusion

The educational program based on the Precede-Proceed model can improve the HRQOL of patients with breast cancer undergoing chemotherapy. It can also improve their preventive behaviors in terms of predisposing factors (knowledge, attitude), and enabling factors (family support). We recommend the use of this model in developing educational programs for patients with breast cancer under chemotherapy. Further studies are needed to verify the findings of this study.

Ethical Considerations

Compliance with ethical guidelines

This study obtained ethical approval from the ethics committee of Kashan University of Medical Sciences (Code: IR.KAUMS.NUEPM.REC.1397.21). The study objectives were explained to the patients and their written informed consent was obtained. They were free to participate or leave the study at any time.

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Authors' contributions

All authors contributed equally to preparing this article.

Conflict of interest

The authors declare no conflict of interest.

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