



ORIGINAL ARTICLE

**The Impact of Educational Package on Nursing Students' Knowledge Towards Fertility Preservation, A Quasi-Experimental Study**

Nastaran Rafiei<sup>1</sup>, Simin Esmaeilpour Zanjani<sup>2</sup>, Kajal Khodamoradi<sup>1</sup>

<sup>1</sup> Master student, Faculty of nursing and midwifery, Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran

<sup>2</sup> Department of Nursing, Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran

\* Corresponding Author: Kajal Khodamoradi, Email: [k.khodamoradi@gmail.com](mailto:k.khodamoradi@gmail.com)

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ABSTRACT

**Introduction:** Recent advances in diagnosis and treatment of cancers have resulted in survival improvement in young patients with cancer. Given the side effects of cancer treatments on function of the reproductive system, health care providers need to be educated about the side effects of cancer treatment and fertility preservation. The aim of this study was to explore the effect of education on nursing students' knowledge towards fertility preservation methods in patients with cancer. **Materials and Methods:** This was a quasi-experimental one-group pre-test post-test research study that was carried out by the nursing faculty at Islamic Azad University of Tonekabon in 2018. Data was collected through two-part questionnaire, including demographic characteristics and 32 questions about the knowledge of fertility preservation in patients with cancer. The study intervention was an educational package which include 8 sessions of small group education, planning questions and a booklet. Students were asked to complete the questionnaire before starting an educational session and again two weeks after the last session. **Results:** The difference in mean score of the nursing students' knowledge before and after the educational package intervention was significant ( $P=0.0001$ ). Also, the knowledge rank of nursing students after the intervention was significantly better than before ( $P=0.0001$ ). There was a significant difference between the mean score of knowledge based on gender ( $0.0001$ ), marital status ( $0.0001$ ) and residency ( $0.0001$ ). **Conclusion:** In conclusion, educational intervention towards fertility preservation had positive effect on nursing students' knowledge. Therefore, the importance of considering this new approach to fertility preservation in patients with cancer should be considered in the nursing curriculum as they consider as the main resource of the medical information to the patients.

INTRODUCTION

Recent advances in the diagnosis and treatment of cancer have resulted in survival improvement in young patients. However, the treatment of cancer has side effects on the function of the reproductive system (1, 2). Cancer-related infertility rates in patients are related to several factors including age, sex, type of cancer, stage at diagnosis and type of treatment (3-6). Disruption of fertility after cancer treatments causes concerns in survivors of cancer about having children in the future. In addition, the psychosocial effects associated with the loss of fertility can disturb long-term quality of life in survivors of cancer. Many cancer survivors express their desire to have information about

fertility preservation consultations and services for patients with cancer (7). In the fertility preservation consultation process, patients with cancer must be aware of the side effects of cancer treatments on fertility, their available options for fertility preservation and existing treatments to improve the reproductive function and the ability to conceive (7).

Recent advances in assisted reproductive technologies have provided the opportunity for fertility preservation in patients with cancer. Sperm cryopreservation is an available and simple approach that can provide viable sperm for patients (8), while oocyte and embryo cryopreservation are considered for fertility preservation for women with cancer. Although testicular and ovarian tissue cryopreservation can

also be recommended in fertility preservation, these methods are not yet commonly available and further research is needed before clinical applications (9, 10). Therefore, the American Society of Clinical Oncology (ASCO) considers cryopreservation of sperm and embryo as standard fertility preservation methods for cancer patients with a maximum probability of success (8).

In spite of receiving information about fertility preservation, cancer patients face numerous barriers to access those methods. Cancer patients, both men and women, encounter personal, cultural, and religious barriers that force them to make hard decisions about fertility preservation (7).

Since oncologic therapy can lead to infertility due to the removal of gonads or long-lasting damage to gametogenesis, fertility preservation should be considered prior to the initiation of cancer treatment (11). Therefore, it is necessary that patients are informed about fertility preservation at the time of diagnosis of cancer and before the treatment initiation. The healthcare professionals, as providers caring for people with cancer, must be aware of the side effects of cancer treatment on fertility potential. Furthermore, they must be able to refer patients to a reproductive medicine' team for further a fertility preservation consultation in a timely manner (6, 12).

It is well-known that nurses have an important role in the care and education of patients with cancer, as well as in the knowing and following of patients' rights (13), especially patients' right to understanding their fertility preservation options. In addition, nurses have more communications with patients and their families compared to other healthcare providers (14). Recently, findings from past studies showed that from the physicians' point of view, discussion about options for fertility preservation is a nursing responsibility (15). However, Reebals et al. reported that lack of knowledge is an important reason why nurses do not discuss sperm cryopreservation as a fertility preservation method with cancer patients (16). According to the above-mentioned, this study aimed to explore the effect of education on nursing students' knowledge about fertility preservation.

## MATERIAL AND METHODS

### Design:

This study used a quasi-experimental one-group pre-test post-test design to determine whether the knowledge of nursing students about fertility preservation would show a higher score after an educational package intervention.

### Setting and participants

This study was carried out in the Nursing and Midwifery school of the Tonekabon branch of Islamic Azad University, Mazandaran, Iran. In 2018, all undergraduate nursing students attending in their first-year internship practice were invited to participate in the study ( $n=94$ ). The students were in their first or second semester of their fourth year of the baccalaureate degree in nursing education. The inclusion criteria included being a nursing student in his/her last year

of education who participated in all the educational sessions, while exclusion criteria included previous participation in the fertility preservation workshop, students' reluctance to continue their cooperation, and absenteeism in any educational sessions. 87 students had the criteria to participate and 80 students completely answered questionnaires both pre-and post-intervention.

### Intervention:

The study intervention was an educational package which include 8 sessions of small group education, planning questions and a booklet about the different methods of fertility preservation in cancer patients. The content of the sessions was the anatomy and physiology of the female reproductive system, the anatomy and physiology of the male reproductive system, cancer and fertility preservation concepts, oocyte and embryo cryopreservation, ovary tissue cryopreservation and surgical techniques, ovarian transposition, sperm cryopreservation and surgical sperm extraction with immature testicular tissue cryopreservation, and Gonadotropin-releasing Hormone Agonists respectively.

The students were divided into four equal groups to attend the educational sessions. The sessions were run twice a week and each session lasted 45 minutes, followed by 15 minutes asking planned questions. In the first session each student received a booklet about the sessions content in their native language (Persian). Before starting the first educational session, students were asked to complete the questionnaire. Two weeks after the last educational session, the participants completed the questionnaire again.

### Data collection:

Pre- and post-intervention data were collected using a two-part questionnaire in February and March 2018. The first part included the demographic characteristics of the nursing students, including age, gender, educational semester, marital status, children, and whether or not they were native residence of the city. The second part of the questionnaire included a researcher-made questionnaire to assess the knowledge level of the nursing students about fertility preservation. This questionnaire consisted of 32 questions which were planned based on the content of the educational package and took 20 minutes to complete. Each of the 32 true false knowledge level scale items were scored as correct (1) or incorrect (0). The overall score of the questionnaire was calculated out of 20. The scores were classified into six levels: excellent knowledge level: 18-20; very good knowledge level: 15-17; good knowledge level: 12-14; acceptable knowledge level: 9-11; poor knowledge level: 5-8; and very poor knowledge level: less than 5.

The questionnaire was designed based on recent text-books and articles regarding fertility preservation methods. Fotty five multiple-choice fertility preservation knowledge questions were initially developed and reviewed for content and face validity by 10 nursing professors, an oncology specialist, an embryologist, an obstetric/ gynecologist and the research council of the university. Each member

was asked to rank the questions from 1 to 4 (1 = not relevant, 2 = somewhat relevant, 3 = relevant, and 4 = very relevant). Questions deemed not relevant were eliminated from the survey, with 32 of the questions utilized in the final survey. After that we used face and content validity (17) for determining the validity of the questionnaire. The internal consistency (18) was used for reliability, and Cronbach's alpha coefficient for the reliability of the questionnaire was 0.71.

Our survey was approved by the Ethics Committee of Islamic Azad University, Tehran Medical Sciences (IR.IAU-.TMU.REC.1397.129). All participants have given written informed consent for their participations.

### Statistical analysis

The collected data was analyzed by SPSS Software 20. The paired sample t-test and Chi-Square test were used for statistical data analysis.  $p < 0.05$  was considered statistically significant.

## RESULTS

Of the 80 participants, 60 (75 %) were female and 68 (85 %) were native. Additionally, 65 (81.25 %) were single and 80 (100 %) were childless. All the participants 80 (100 %) were in age the range 23 -25; the average age of women and men were  $23.0 \pm 2.3$  and  $23.3 \pm 0.5$ , respectively. A large percent of the participants were attending their first semester of the internship program, which is the seventh semester of the four-year baccalaureate degree of nursing 42 (52.5 %). (Table 1)

The participants demonstrated a greater change awareness towards fertility preservation in questions 11, 16, 26 and 27. For example, for question 26 (Fertility preservation only used for people 20 -30 years old) only 4 students (5%) initially chose the correct answer, but after receiving the educational package that was increased to 100 %. Similarly, for questions 11, 16, 27 only 10% of the students chose the correct answer on the first questionnaire, but after the educational package all of them chose the correct answer. These changes indicate that the educational package had more impact on these questions. Conversely, the lowest change in score was related to question 7 (IVF increases the possibility of pregnancy even with low number of oocytes); the percentage of correct responses was 3.75% and 48.75% before and after the intervention, respectively, which indicates that the intervention had the least impact on this question. (Table 2) A paired sample T-test showed that the difference in mean score of the nursing students' knowledge before and after the educational package intervention was significant ( $P=0.0001$ ), with knowledge significantly higher in nursing students after intervention. This demonstrates that the educational intervention about fertility preservation had a positive effect on the nursing students' knowledge.

According to Table 3, a chi-squared test showed the knowledge rank of nursing students after the intervention was

**Table 1.** Descriptive statistics based on demographic characteristics of participants (N = 80).

Demographic characteristics	Number	Percentage (%)
Age (years)	23	73.75
	24	16.25
	25	10
Gender	Male	25
	Female	60
Residency	Native	85
	Nonnative	15
Marital status	Single	81.25
	married	18.75
Educational semester	Seventh semester	52.5
	Eighth semester	47.5

significantly better than before ( $P = 0.0001$ ). The greatest (93.75) knowledge rank of nursing students before the intervention was in the "very poor" level, but after the educational package intervention it increased to very good (56.25).

According to Table 4, a paired sample t-test showed that there was a significant difference between the mean score of knowledge based on gender (0.0001), marital status (0.0001) and residency (0.0001). The results showed that the mean scores of the knowledge questionnaire before intervention in both men and women were significantly lower than after intervention. The mean scores of the knowledge before the educational package in single, married, and both resident and nonresident students were significantly lower in comparison than the scores after education. This shows that the educational package intervention improved students' knowledge about fertility preservation.

An independent-Sample T-Test on gender, marital status and residency groups was done and the results are shown in Table 5. They show that knowledge level is not significantly different between varying gender, marital status and residency groups after intervention. This indicates that the knowledge level of women and men, single and married students, and native and non-native students before and after the intervention did not have significant differences and that the use of participants with the same level of knowledge was considered in the research.

## DISCUSSION

Since the treatment of cancer can pose a threat to fertility potential, patients with cancer should be aware of their possible reproduction issues in the future and their fertility preservation options before treatment initiation (19). Understanding infertility risk factors is important issue for protect fertility potential. Hence, it is necessary to take education initiatives to increase the knowledge of fertility preservation (20).

**Table 1.** Frequency and percentage of nursing student's answers to the fertility preservation questionnaire (N = 80).

Items	Before intervention		After intervention	
	True N (%)	False N (%)	True N (%)	False N (%)
1 Fertility preservation methods utilized to preserve reproductive capacity affected by cancer treatment.	1(1.25)	79(98.75)	67(83.75)	13(16.25)
2 In pretreatment consultation session for young couples in which one partner is diagnosed with cancer, should different methods of fertility preservation be more emphasized.	11(13.75)	69(86.25)	69(86.25)	11(13.75)
3 Do you think the dominant religion (shieaa) of Iran allows the use of fertility preservation methods?	26(32.50)	54(67.50)	54(67.50)	16(20.00)
4 Do you think the law in Iran allow the use of fertility preservation?	22(27.50)	58(72.50)	69(86.25)	11(13.75)
5 Cancer treatment leads to congenital abnormalities in the offspring.	10(12.50)	70(87.50)	69(86.25)	11(13.75)
6 Pregnancy after treatment of cancer in some conditions may leads to recurrence of the cancer..	7(8.75)	73(91.25)	69(86.25)	11(13.75)
7 IVF (In Vitro Fertilization) increases the possibility of pregnancy even with low number of oocytes.	3(3.75)	77(96.25)	39(48.75)	41(51.25)
8 In patients with family history of early menopause, chemotherapy and radiotherapy may lead to primary ovarian failure.	11(13.75)	69(86.25)	73(91.25)	7(8.75)
9 Healthy life style during cancer treatment helps to maintain ovarian reserve.	2(2.50)	78(97.50)	39(48.75)	41(51.25)
10 Treatment of some types of cancers can lead to infertility in the future.	22(27.50)	58(72.50)	65(81.25)	15(18.75)
11 The patient must be married to be candidate for fertility preservation methods.	8(10.00)	72(90.00)	80(100)	0(0.00)
12 Embryo cryopreservation is considered as a golden standard of fertility preservation.	3(3.75)	77(96.25)	75(93.75)	5(6.25)
13 In Iran public insurance covers fertility preservation methods.	17(21.25)	63(78.75)	66(82.50)	14(17.50)
14 Temporary ovary suppression with medication is used to maintain fertility to prevent premature ovarian failure caused by chemotherapy.	5(6.25)	75(93.75)	74(92.50)	6(7.50)
15 For fertility preservation in teenager and young girls ovarian surgery techniques should be used.	4(5.00)	76(95.00)	60(75.00)	20(25.00)
16 Oocyte cryopreservation is used to fertility preservation in teenagers and young single women.	8(10.00)	72(90.00)	80(100.00)	0(0.00)
17 Ovarian tissue cryopreservation is used to fertility preservation in girls before menarche.	1(1.25)	79(98.75)	67(83.75)	13(16.25)
18 Embryo cryopreservation is used only in woman who has a husband or a partner.	4(5.00)	76(95.00)	70(87.50)	10(12.50)

19 Uterine and ovarian transplantation are used to maintain fertility in woman whose uterus capacity to receive embryo has decreased due to the use of radiation therapy for the treatment of cancer.	7(8.75)	73(91.25)	80(100.00)	0(0.00)
20 Unilateral radical orchiectomy is used to maintain fertility in young men with unilateral testicular malignancies.	5(6.25)	75(93.75)	77(96.25)	3(3.75)
21 Electrical ejaculation is used to maintain fertility in men who are not able to provide enough semen samples with masturbation.	5(6.25)	75(93.75)	77(96.25)	3(3.75)
22 Semen cryopreservation is used only in adult men.	25(31.25)	55(68.75)	54(67.50)	26(32.50)
23 Electrical ejaculation is used in pre-pubertal young boys.	6(7.50)	74(92.50)	57(71.25)	23(28.75)
24 Sperm bank is used to fertility preservation only in adult men with cancer.	2(2.50)	78(97.50)	61(76.25)	19(23.75)
25 Suppression of the division of testicular germ cells using medications is used in prepubertal boys.	11(13.75)	69(86.25)	75(93.75)	5(6.25)
26 Fertility preservation is only used for people in 20 -30 years old.	4(5.00)	76(95.00)	80(100.00)	0(0.00)
27 Fertility ability begins to decrease in women's age 35 – 40.	4(5.00)	76(95.00)	80(100.00)	0(0.00)
28 Maximum number of oocytes in women is found at birth	13(16.25)	67(83.75)	79(98.75)	1(1.25)
29 Smoking leads to a decrease in fertility potency.	12(15.00)	68(85.00)	75(93.75)	5(6.250)
30 Ovarian reserve is different among women of the same age.	25(31.25)	55(68.75)	79(98.75)	1(1.25)
31 The risk of recurrence of cancer in people who use fertility preservation methods are not higher than others.	5(6.25)	75(96.25)	58(72.50)	22(27.50)
32 Oocyte cryopreservation does not guarantee pregnancy in the future.	3(3.75)	77(96.25)	53(66.25)	27(33.75)

**Table 3.** Frequency and percentage of the nursing student's knowledge rank towards fertility preservation before and after intervention (N = 80).

Results of knowledge level	Before education		After education		Total	
	Number	Percent	Number	Percent	Number	Percent
Excellent	0	0	27	33.75	27	33.75
Very good	0	0	45	56.25	45	56.25
Good	0	0	8	10	8	10
Acceptable	2	2.5	0	0	2	2.5
Poor	3	3.75	0	0	3	3.75
Very poor	75	93.75	0	0	75	93.75
Result of chi-squared test	P = 0.0001					



**Table 4.** Comparison of the mean scores (mean  $\pm$  standard deviation) of the nursing student's knowledge towards fertility preservation before intervention with after in terms of gender, marital status and residency.

		Before education	After education	Paired sample t- test result
Gender	Male	3.27 $\pm$ 1.12	17.019 $\pm$ 1.18	0.0001
	Female	3.35 $\pm$ 2.21	17.12 $\pm$ 1.15	0.0001
Marital Status	Single	3.12 $\pm$ 1.22	17.96 $\pm$ 1.18	0.0001
	Married	2.87 $\pm$ 1.45	17.52 $\pm$ 1.55	0.0001
Residency	Native	3.41 $\pm$ 1.54	17.42 $\pm$ 1.201	0.0001
	Nonnative	3.27 $\pm$ 1.11	17.65 $\pm$ 2.19	0.0001

**Table 4.** The knowledge questionnaire scores (mean  $\pm$  standard deviation) before and after intervention according to gender, marital status and, residency.

		Before education	After education
Gender	Male	3.27 $\pm$ 1.12	17.019 $\pm$ 1.18
	Female	3.35 $\pm$ 2.21	17.12 $\pm$ 1.15
	Independent-Sample T Test	P=0.321	P = 0.166
Marital Status	Single	3.12 $\pm$ 1.22	17.96 $\pm$ 1.18
	Married	2.87 $\pm$ 1.45	17.52 $\pm$ 1.55
	Independent-Sample T Test	P=0.253	P=0.344
Residency	Native	3.41 $\pm$ 1.54	17.42 $\pm$ 1.201
	Nonnative	3.27 $\pm$ 1.11	17.65 $\pm$ 2.19
	Independent-Sample T Test	P=0.331	P=0.102

SD: Standard Deviation

### Limitations:

Our study has some limitations including:  
The results are not representative of the nursing schools in general since only a small proportion of the nursing student population was investigated and all of them were in the last year of the baccalaureate degree curriculum.  
The fatigue and mental states of the students and their social and cultural differences may affect their response to the questionnaire.

### CONCLUSION

According to the results of this study, the knowledge level of nursing students about fertility preservation was poor before the educational intervention. After the educational package, their knowledge was increased significantly to a very good level. Therefore, the importance of considering this new approach to fertility preservation in patients with cancer should be considered in the nursing curriculum as they consider as the main resource of the medical information to the patients.

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### AUTHER CONTRIBUTIONS

All authors equally contributed in this study

### CONFLICT OF INTEREST

There is no conflict of interest regarding the publication of

### ETHICAL STANDARDS

None

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