Effect of Educational Program on Maternity Nurses' Knowledge and Attitude regarding Ova Cryopreservation Technology

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Abstract

Background: Ova cryopreservation is a novel method and defined as a process carried out to preserve women's eggs for use in subsequent reproductive treatments.**Aim:** the study aimed to investigate the effect of an educational program on maternity nurses' knowledge and attitude regarding ova cryopreservation technology.**Study design:**a Quasi-experimental (group) research design. **Study setting:** The current study was conducted in the outpatient clinic, department, and emergency department of Obstetrics and Gynecology at Benha University Hospitals. **Study sample:** A convenient sample of 100 maternity nurses were selected based on convenience and suitability to the study.**Tools of data collection:** Three tools were used: tool (I) self-administered questionnaire that contained two parts (General characteristics of maternity nurses and Maternity nurses' knowledge regarding ova cryopreservation, tool (II) maternity nurses' attitude regarding ova cryopreservation and tool (III) maternity nurses' satisfaction scale regarding educational program. **Results:** there was statistically significant improvement in all items of knowledge and attitude regarding ova cryopreservation after program implementation compared to before ($P \leq 0.001$). Also, there was a highly statistically significant positive correlation between total scores of knowledge and total scores of attitude before and after program implementation ($P \leq 0.001$).**Conclusion:** educational program has positive effect in improving maternity nurses' knowledge, attitude and satisfaction regarding ova cryopreservation technology.**Recommendation:**re-application of educational program regarding ova cryopreservation for all maternity nurses.

Keywords: Educational program, Maternity nurses' knowledge, Maternity nurses' attitude, Ova cryopreservation technology.

Introduction

The World Health Organization defines infertility as "a disease of the male or female reproductive system defined by the failure to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse. Based on the most recent study conducted by the World Health Organization, one in six people globally have experienced infertility ***(Duroseau., 2025).***

Fertility preservation has become a novel practice in reproductive medicine worldwide. Fertility preservation refers to several procedures used to increase the probability of a person's being able to have children, including assisted reproductive technology such as ovum , sperm, and uterine tissue preservation. Fertility preservation gives women a chance to have biological children in the future by preserving their eggs or reproductive tissue through techniques such as embryo cryopreservation, ova cryopreservation, gonadal shielding, and ovarian transposition ***(Lee., 2023).***

Ova cryopreservation has emerged as a vital reproductive technology, enabling women to preserve their fertility for personal, socio-economic, or health-related reasons. Initially developed for women facing fertility-compromising medical interventions, ova cryopreservation has lately become popular among healthy women seeking to postpone childbirth for career, personal ambitions, or the lack of a suitable partner. This transition not only indicates broader cultural trends in delayed parenthood but also brings about societal benefits, emphasizing the necessity of access to fertility preservation for women ***(Gonen., 2024).***

Ova cryopreservation is increasingly used for both medical and non-medical purposes. Medically, ova cryopreservation is indicated for women with BRCA) breast cancer gene A1, A2) mutations, planning prophylactic oophorectomy or delaying pregnancy. Ova cryopreservation is also recommended for women at risk of premature ovarian insufficiency, including Fragile X premutation carriers, Turner syndrome, and X-chromosome abnormalities. Additional indications include women with endometriosis undergoing surgery, women receiving gonadotoxic therapy, women with diminished ovarian reserve and individuals undergoing gender reassignment. Recently, ova cryopreservation use has expanded as a fertility preservation strategy in severe endometriosis ***(Pai et al., 2021).***

Elective egg freezing, otherwise known as ova cryopreservation for age-related fertility loss, has become a viable option for single women to preserve their fertility. Female fertility is known to decrease gradually, but significantly after the age of 32 and even more rapidly after age 37. As the ovaries age, reduction in oocyte quantity and increased aneuploidy rates due to poorer oocyte quality account for this decreased fecundity ***(Ong et al., 2024).***

Concerns exist around the safety of cryopreserved oocytes, in comparison to fresh oocytes with regard to pregnancy, fetal and childhood outcomes.there are no studies reporting long-term follow-up of children born following elective egg freezing to date. Reassuringly, existing literature show no significant differences in perinatal, genetic or neonatal outcomes when vitrified oocytes were compared to natural conception or following in vitro fertilization with fresh oocytes. Compared 1027 children born from vitrified oocytes with 1224 children born from fresh oocytes, and found no significant differences in obstetric outcomes, APGAR scores, birth weight, structural birth defects or perinatal mortality. In addition, aneuploidy rates in cryopreserved oocytes did not differ with time or when compared with fresh oocytes (**McClam and Xiao., 2022).**

According to current guidelines, fertility preservation counseling should be provided to all women diagnosed with cancer at reproductive age prior to the start of any cancer treatment and should include a discussion of oocyte/embryo cryopreservation, GnRH agonist therapy, and ovarian tissue cryopreservation ***(Razeti et al., 2023).*** Also, nurses, by being knowledgeable and experienced in the field, can significantly contribute to improved reproductive health outcomes and reduce the incidence of infertility ***(Shirazi et al., 2024).***

Beyond direct patient care and emotional support, nurses also have the opportunity to educate women about lifestyle factors that may influence fertility outcomes. They can provide guidance on nutrition, exercise, stress management, and the avoidance of harmful substances, all of which play a role in reproductive health. Also, maintaining a healthy weight through regular exercise can positively impact fertility. Nurses can provide guidance on suitable exercise regimens and how to balance activity

with rest, especially during demanding treatment cycles ***(Cox et al., 2022).***

Significance of research:

Infertility affects 8 to 12 % of reproductive-age couples worldwide, the infertility rates are much higher in some regions of the world; reaching 30% in Egypt. The incidence of infertility has been estimated to be 10.4% of married couples ***(Lahoti et al., 2023).*** Moreover, the age of marriage has been progressively rising over the past few decades. ***(Hasab Allah, et al, 2021)***This will result in less opportunity for the eggs to become fertilized as the female fertility window is narrower and gradually continues to decline ***(Varlas et al., 2021).***

So according to , (*The Society for Assisted Reproductive Technologies) (SART)* estimates a 15% increase in the use of elective egg freezing (EEF) services between the years 2015 and 2016 and a 25% increase between the years 2016 and 2017. The confluence of these events has led to a growing discourse regarding egg freezing as a treatment ***(Jaeger, 2020)***.

As a result, the research carried-out in Egypt about the influence of educational guidelines on nursing students' knowledge, beliefs, and attitudes towards oocyte cryopreservation by ***(Mohamed et al., 2023)*** revealed that only 25.6% of nursing students had a positive attitude towards egg freezing in the pretest, 56.8% in the posttest, with a statistically significant difference between two groups at pre and post-test. In the same line there were no studies about OCP carried out in obstetrics and gynecology department, so the researcher choose this area of study

Aim of research:

The study aimed to evaluate the effect of an educational program on maternity nurses' knowledge and attitude regarding ova cryopreservation technology.

Research Hypotheses:

H1: It is anticipated that the level of knowledge of maternity nurses regarding ova cryopreservation would increase following implementation of an educational program than before.

H2: It is anticipated that the attitude of maternity nurses regarding ova cryopreservation would be more positive following implementation of an educational program than before.

H3: It is anticipated that the maternity nurses would be satisfied about an educational program regarding ova cryopreservation following implementation of an educational program.

Subjects and Method:

Research design:

A quasi-experimental design one-group (pre & post)test was employed to achieve the aim of this study. The term 'quasi-experimental design' refers to a type of research design that lacks the element of random assignment ***(Christian et al., 2022).*** In this design, participants are measured both before (pretest) and after (posttest) the intervention. The effect of the intervention is inferred from the difference between the pretest and posttest results ***(Capili and Anastasi, 2024).***

Research setting:

This study was conducted in the outpatient clinic, department, and emergency department of Obstetrics and Gynecology at Benha University Hospitals.

Sampling:

Sample type: "A convenience sampling technique was used to select maternity nurses from the aforementioned study setting to achieve the study's aim. Participants were chosen based on their availability and suitability for the study."

Sample size: all maternity nurses working at (outpatient clinic, department, and emergency department of Obstetrics and Gynecology at the time of data collection). "100 nurses were recruited".

Tools of data collection:

Three tools were utilized for data collection:

Tool I: Self-administered questionnaire:

This questionnaire was developed by the researcher following an extensive review of relevant literatures ***(Miok et al., 2019, Tozzo et al, 2019, Pai, et al., 2021 & Platts, et al., 2021)*** the tool was written in Arabic language and consisted of close- ended questions it divided into two main parts:

Part 1: General characteristics of maternity nurses; to collect demographic & professional data concerning (name, age, level of education, marital status, residence, job description, years of experience, department, sources of information, previous training or /workshop about ova cryopreservation).

Part 2: Maternity nurses' knowledge regarding ova cryopreservation technology:

It composed of 25items divided into three sections;

Section I General knowledge regarding the Technique of ova Cryopreservation technology; included 7 items covering (definition of ova cryopreservation, types of ova cryopreservation, indications for medical ova cryopreservation indications for non-medical ova cryopreservation, islamic rulings governing the use of ova cryopreservation, legal procedures for ova cryopreservation and barriers of ova cryopreservation)

Section II Knowledge about the technical aspects and methods used in the process of ova cryopreservation; included 14 items covering (optimal age range for ova cryopreservation technology, minimum recommended number of cryopreserved ova for women under 30 year, minimum target number for ova cryopreservation in the 31-40 age cohorts , timeframe required for ultrasound-guided ova retrieval, maximum duration for clinical storage of cryopreserved ova, standardized temperature parameters for ova cryostorage , essential laboratory investigations for ova cryopreservation candidates, the primary stage of the ova cryopreservation clinical protocol , factors influencing the clinical outcomes of ova cryopreservation , symptoms and manifestations associated with the cryopreservation procedure)

Section III Knowledge about the role of the nurse regarding the technique of ova cryopreservation; included 4 items covering (primary role of the nurse in educating the woman before undergoing ova cryopreservation, psychological preparation of the woman before starting hormonal stimulation, role of the nurse during the ova retrieval procedure and role of the nurse after the completion of the ova cryopreservation process).

Scoring system: -

The response of each question was scored as (1) for a correct answer and (0) for incorrect answer or I don't know. The total score of knowledge was calculated by summation of the scores of all items with a possible range from 0 to 25. The total knowledge score was classified as follows:

Total knowledge score will classify as following:

Good knowledge: ≥75% of total score (19≤25)

Average knowledge: 50 - < 75% of total score. (13<19)

Poor knowledge: < 50% of total score (<13)

Tool II: Maternity nurses' attitude regarding ova cryopreservation technology:

The tool was developed by the researcher after an extensive review of related literature and guided by ***(Ikhena-Abel et al,2017; Fahmy et al., 2021 & Khattak, et al., 2022)*** the tool was written in Arabic language.

Also, the tool was used to assess maternity nurses' attitude regarding ova cryopreservation, which included 10 items covering (ova cryopreservation banks must be certified and have standards, believing that ova cryopreservation is a safe technique for women, ova cryopreservation is illegal and religiously prohibited, acquiring comprehensive knowledge about ova cryopreservation is essential for professional development in healthcare, ova cryopreservation is perceived as a vital tool for enhancing female reproductive autonomy and family planning flexibility)

Scoring system:

Each item was rated using a three-point Likert scale: (3) = agree, (2) = uncertain and (1) = disagree. The total attitude score was calculated by summing the scores of all items, with a possible range from 10 to 30. The level of total attitude score was classified as follows:

Total attitude score classification:

Positive attitude: ≥ 60% of total score (18≤30)

Negative attitude: <60% of total score (<18)

Tool III: Maternity nurses' satisfaction scale regarding educational program:

The tool was developed by the researcher after an extensive review of related literature and guided by ***(Mansour & Hassan., 2021 & Gouda Ahmed et al., 2025)*** the tool was written in Arabic language. ***Also,*** the tool was used to assess maternity nurses' to assess maternity nurses' satisfaction regarding provided educational program. the tool included 10 items covering (the information provided about ova cryopreservation was clear and easy to understand, visual aids such as power-Point presentations helped clarify the information and enhanced my understanding of the content, the content provided on ova cryopreservation included credible data and up-to-date scientific research)

Scoring system:

Each item was rated using a three-point Likert scale ranging from (3) strongly agree, (2) agree and (1) disagree. Strongly, agree means highly satisfied, agree means satisfied and disagree means dissatisfied. Total score of satisfaction was calculated by summation of all subscales, which was ranged from 10 to 30 .The level of total satisfaction score was classified as follows:

Total satisfaction scale score will classify as following:

Highly satisfied: ≥ 80% of total score (24≤30)

Satisfied: ≥60 to < 80% of total score (18<24)

Dissatisfied: < 60% of total score (<18)

Tools validity and Reliability

Tools of data collection were reviewed by three panel expertises of obstetrics and gynecology nursing to ascertain clarity, relevance, comprehensiveness and applicability of tools. Modifications were done in the light of the valuable comments such as adding, rephrasing, and modify some phrases which were unclear. For example (effective educational methods were utilized during the implementation of the program).Also, Nurses' knowledge regarding ova cryopreservation was categorized into three sections :(general knowledge, knowledge related to the technique and nurse's role regarding the technique) Cronbach's alpha coefficient test was calculated to assess the reliability that indicated that each of the three tools consisted of relatively homogenous items as indicated by the moderate to high reliability of each tool. The internal consistency of knowledge was 0.7900, the internal consistency of attitude was 0.935.and the internal consistency of satisfaction scale was 0.934.

Ethical considerations:

Ethical aspects were considered before starting the study as the following: Approval from the Scientific Research Ethics Committee in the faculty of nursing Benha University was obtained for the fulfillment of the study **(Code, REC-OBSN-P122).**An official permission from the selected study settings (Benha university hospital) was obtained for the fulfillment of the study.The aim of the study was explained to each nurse before applying the study to gain confidence

and trust. The researcher took oral consent from nurses to participate in the study and confidentialities would be assured. The data was collected and treated confidentially. Each nurse was free to withdraw at any time of data collection without obligation. Each nurse was informed about time throughout the study, Such as duration of pretest, discussion and post test. The study tools were ensuring that the study didn't touch nurse's dignity, culture, traditional and religious aspects and didn't cause any harm for any nurse during data collection .Also, tools didn't include any immoral statements and respect human rights.

Administrative approval:

An official approval to conduct this study was obtained from the Dean of Faculty of Nursing to the director of Benha University Hospital and delivered to the director of the Obstetrics and Gynecology outpatient clinic, department and emergency department in order to obtain agreement to conduct the study after illustrating the title and its purpose.

Pilot study:

The pilot study carried out before starting data collection and conducted on 10% of the total sample size (10) maternity nurses to test the clarity, objectivity, feasibility, relevance and applicability of the tools and to find out the possible obstacles and problems that might face the researcher and interfere with data collection. Also, it helped to estimate the time needed for data collection. No modifications were done so; nurses involved in the pilot study were included in the main study sample.

Field work:

The study was implemented for 8 months. These phases were carried out from the beginning of May 2025 and completed at the end of December 2025. The researcher visited aforementioned study setting three days/week, (Sundays, Tuesdays and Thursdays), from 9.00 am to 2:00 pm until the calculated study sample size was obtained (100) maternity nurses. This study was conducted through the following sequential phases, preparatory phase, interviewing and assessment phase, planning phase, implementation phase and evaluation phase.

1. ***preparatory phase:***

Preparatory phase is the first phase of the study and included extensive review of current, local and international related literatures. Also, theoretical knowledge of various aspects of the study using books, articles, periodicals, magazines and websites was obtained to develop tools of data collection. This helped the researcher to prepare the required data collection tools &booklet.

2. ***Interviewing and assessment phase (pre-test):***

This phase encompassed interviewing maternity nurses to collect baseline data. At the beginning of interview the researcher introduced herself to all maternity nurses and greeted with each nurse, respectively. Then the researcher explains the aim of the current study, schedule times and frequency of sessions to assure adherence to selected guideline sessions. The researcher took oral consent from nurses to participate in the study.

The researcher distributed self-administered questionnaire sheet (appendix I) to assess maternity nurses' general characteristics and knowledge regarding ova cryopreservation. The average time taken for completion of the questionnaire was around (20-25 minutes) depending on the response of the nurses. each nurse will be reassured that any information obtained will be confidential and use only for the purpose of the study. The number of interviewed nurses was 9-10 nurses / day.

Then, the researcher distributed the attitude (tool II) to assess maternity nurses' attitude regarding ova cryopreservation technology. The average time required for completion of the scale was around (10-15 minutes).

The average time required for completing of the questionnaires was around (30- 40 minutes) depending on the responses of the maternity nurses.

The interviewing process was done in 3 days/ week starting from 9am to 2 pm. Each nurse was interviewed individually. The number of interviewed nurse per week was 27-30 nurses.

The collected pretest data were used as a baseline for further comparison to evaluate the effect of the educational program based on knowledge, and attitude of maternity nurses.

3. Planning Phase

Based on the results obtained from the pretest assessment of maternity nurses' knowledge and attitude regarding ova cryopreservation technology. The researcher designed booklet about ova cryopreservation technology in simple Arabic language contained information about ova cryopreservation technology (meaning, who are the candidates recommended for ova cryopreservation , benefits, appropriate age for egg freezing, number of eggs that should be frozen, the islamic ruling on egg freezing and its regulations, legal procedures, preparations before the procedure, steps of the Procedure for Married Women, the procedure technique for single women, how is egg freezing done, types of techniques, side effects, success rate of the procedure, how does pregnancy occur using frozen eggs, tips for a successful egg freezing process and the role of the nurse in the egg freezing process) .The booklet was supported by different illustrated pictures. In addition, the program's sessions number and its contents were determined about education of ova cryopreservation.

4. Implementation phase:

The researcher implemented the educational program at the pre mentioned setting. All nurses were divided into 10 groups; each group comprised 10 nurses in each group. According to work circumstances, the duration of the educational program lasted 2 weeks for each group, the program was divided into 5 sessions, and each session lasted 45-60 minutes included periods of discussion according to nurses' achievement and feedback.

Each group was informed about the time of the next sessions at the end of session. The subsequent session started by feedback about the previous session and the objectives of the new session, using Arabic language to suit nurses' level of understanding. Various educational methods such as group discussion, using materials (power point presentation & a designed booklet). At the end of each session; nurses 'questions were discussed to correct any misunderstanding and false beliefs.

The first session, nurses were oriented with the program contents then the researchers explained (meaning of ova cryopreservation, types of ova cryopreservation, indications for medical ova cryopreservation indications for non- medical ova cryopreservation, Islamic rulings governing the use of ova cryopreservation, legal procedures for ova cryopreservation and barriers of ova cryopreservation) after completing the first session, nurses were handed an educational booklet.

The second session discussed(optimal age range for ova cryopreservation technology, minimum recommended number of cryopreserved ova for women under 30 year, minimum target number for ova cryopreservation in the 31-40 age cohorts , timeframe required for ultrasound-guided ova retrieval, maximum duration for clinical storage of cryopreserved ova, standardized temperature parameters for ova cryostorage)

The third session focused on educating nurses about (essential laboratory investigations for ova cryopreservation candidates, the primary stage of the ova cryopreservation clinical protocol, factors influencing the clinical outcomes of ova cryopreservation, symptoms

and manifestations associated with the cryopreservation procedure).

The fourth session focused on (methodologies and techniques employed in ova cryopreservation, adverse effects and clinical risks of the procedure, standard surgical approach for ova retrieval in married women and standardized retrieval techniques for virgins/unmarried women)

The fifth session focused on (primary role of the nurse in educating the woman before undergoing ova cryopreservation, psychological preparation of the woman before starting hormonal stimulation, role of the nurse during the ova retrieval procedure and role of the nurse after the completion of the ova cryopreservation process)

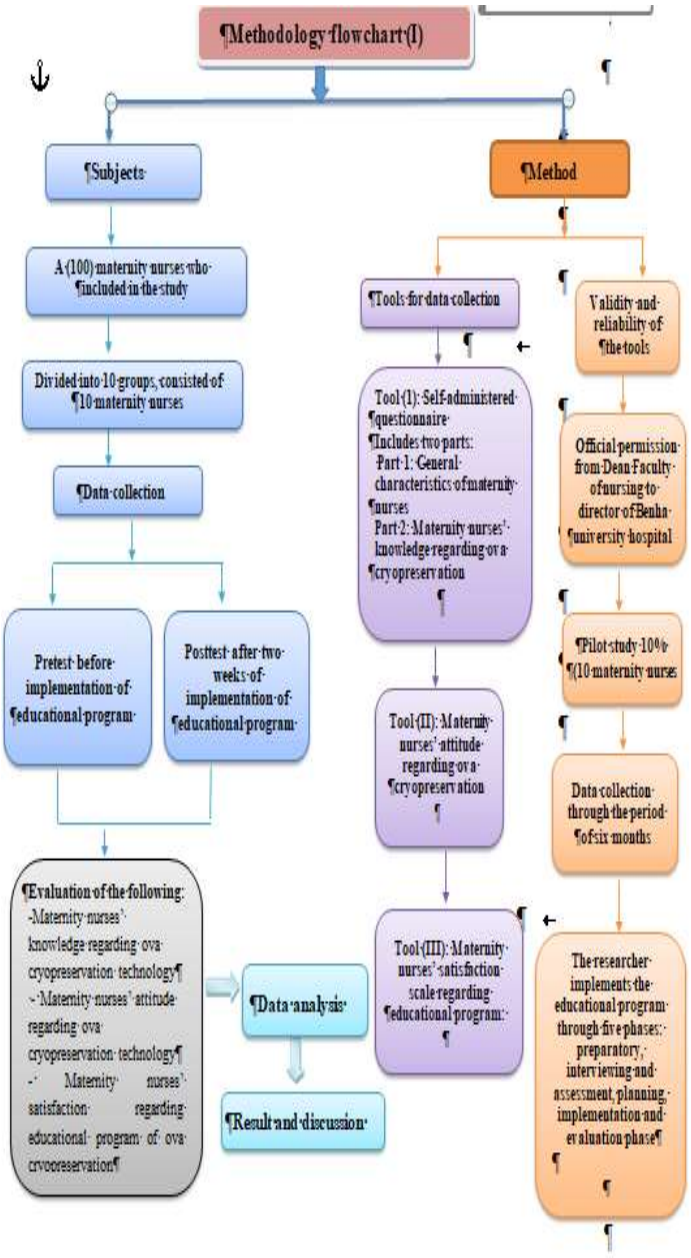
5. Evaluation phase:

After two weeks of implementing the program, the researcher used the same format of tools ; ***tool I part 2*** to assess maternity nurses" knowledge regarding ova cryopreservation technology, ***tool II*** to assess maternity nurses" attitude regarding ova cryopreservation technology. ***Tool III*** to assess maternity nurses' satisfaction regarding educational program of ova cryopreservation.

Statistical analysis:

Data was verified prior to computerized entry. The Statistical package for Social Sciences (SPSS version 26.0) was used for that purpose, followed by data tabulation and analysis. Descriptive statistics were applied (e.g., mean, standard deviation (SD), frequency, and percentages). Inferential statistics as test of significance (Chi-square test (x^2), Fisher Exact Test (FET) and independent t-test). Pearson correlation coefficients (r) were used to test correlation between quantitative data.

- No statistical significance difference was considered when $p > 0.05$.
- A statistical significance difference was considered when $p \leq 0.05$.
- A highly statistical significance difference was considered when $p \leq 0.001$



Results:

Table (1): clarifies that 41.0% of maternity nurses were in age group 20<30 years old with a mean age of 34.11± 8.59. As far as, 68.0% of studied maternity nurses were married. As regard, residence 68.0% of maternity nurses lived in urban area. Regarding educational qualification, 40.0% of maternity nurses had nursing technical institute. Also, 82.0% of maternity nurses working as a nurse. In addition, 44.0% of

maternity nurses had 5<10 years of experience. Moreover, 56.0% had previous information about the technique of ova cryopreservation. Out of 56 nurses surveyed, 28.0% of nurses had information from the internet.

Table (2): reveals that before implementation of educational program 57.0%, 40.0 %, 30.0%, 39.0 %, 33.0 %, 28.0 % and 23.0% of the maternity nurses have correct answers, compared to 91.0%, 87.0 %, 88.0 %, 93.0 %, 95.0 %,85.0 and 84.0% of the maternity nurses have correct answers after implementation of educational program, respectively. Regarding definition of OC, types of OC, indications for medical OC, indications for non-medical OC, Islamic rulings governing the use of OC, legal procedures for OC and barriers of OC. Additionally, there was a highly statistically significant improvement in relation to all items of maternity nurses' general knowledge regarding ova cryopreservation technology after implementation of educational program than before ($P \leq 0.001$).

Table (3): reveals that there was a highly statistically significant improvement in relation to all items of maternity nurses' knowledge regarding technical aspects and methods used in the process of ova cryopreservation after implementation of educational program than before ($P \leq 0.001$).

Table (4): reveals that there was a highly statistically significant improvement in relation to all items of maternity nurses' knowledge about role of the nurse regarding the technique of ova cryopreservation after implementation of educational program than before ($P \leq 0.001$).

Figure (1): Percentage distribution of total nurses' knowledge regarding ova cryopreservation technology before and after educational program (n=100)

Table (5): clarifies that there was a highly statistically significant difference in relation to all items of attitude of the maternity nurses before and after educational program ($P \leq 0.001$).

Figure (2): Percentage distribution of total nurses' attitude regarding ova cryopreservation before and after implementation of educational program (n=100)

Table (6): clarifies that 88%, 91%, 93%, 90%, 92%, 86%, 92%, 88%, 89% and 93%, respectively were highly satisfied with "The information provided about OC was clear and easy to understand, visual aids, such as PowerPoint presentations, helped clarify the information and enhanced my understanding of the content ,the content provided on OC included credible data and up-to-date scientific research, this program met the expectations in learning about the technique of OC, effective educational methods were utilized during the implementation of the program, the program offered adequate opportunities for nurses to engage in questions and topic discussions, the educational booklet provided served as a useful resource in supporting the learning process, the researcher utilized up-to-date, evidence-based information related to the technique of OC, during the implementation of the educational program, the researcher followed a logical progression from basic to more complex concepts related to OC, recommending this program to other nurses.

Figure (3): Distribution of the studied nurses according to satisfaction regarding educational program (n=100)

Table (7): shows that there was a highly statistically positive correlation between total knowledge score and total attitude scores before and after educational program ($P \leq 0.001$).

Table (1): Distribution of the studied nurses according to general characteristics (n=100)

General characteristics	No.	%
Age in years.		
20<30	**41**	**41.0**
30<40	32	32.0
40<50	20	20.0
≥50	7	7.0
Mean ± SD	**34.11± 8.59**	
Marital status.		
Single	21	21.0
Married	**68**	**68.0**
Divorced	6	6.0
Widow	5	5.0
Residence.		
Rural	32	32.0
Urban	**68**	**68.0**
Educational qualifications.		
Diploma in nursing	20	20.0
Nursing technical institute	**40**	**40.0**
Bachelor of Nursing	36	36.0
Post graduate studies	4	4.0
Current job.		
Nurse	**82**	**82.0**
Nursing supervisor	11	11.0
Head nurse	7	7.0
Years of experience.		
(1<5)	30	30.0
(5<10)	**44**	**44.0**
(10<15)	17	17.0
(≥ 15)	9	9.0
Mean ± SD	**2.05± .914**	
Have any information about the technique of ova cryopreservation.		
Yes	**56**	**56.0**
No	44	44.0
Source of information about ova-cryopreservation (n=56).		
Books &Magazines	14	25%
TV program	14	25%
Internet	**28**	**50.0**

Table (2): Distribution of the studied nurses according to general knowledge about ova cryopreservation .(technology before and after implementation of educational program (n=100

knowledge items \ Phase	Before implementation of educational program (n=100)				Two weeks after implementation of educational program (n=100)				X^2	p-value
	Correct answer		Incorrect answer		Correct answer		Incorrect answer			
	No.	%	No.	%	No.	%	No.	%		
Defination of ova cryopreservation technology.	57	57.0	43	43.0	91	91.0	9	9.0	**30.04**	**0.000****
Types of ova cryopreservation technology.	40	40.0	60	60.0	87	87.0	13	13.0	**47.65**	**0.000****
Indications for medical ova cryopreservation technology.	30	30.0	70	70.0	88	88.0	12	12.0	**69.53**	**0.000****
Indications for non-medical ova cryopreservation technology.	39	39.0	61	61.0	93	93.0	7	7.0	**64.97**	**0.000****
Islamic rulings governing the use of ova cryopreservation technology.	33	33.0	67	67.0	95	95.0	5	5.0	**83.42**	**0.000****
Legal procedures for ova cryopreservation technology.	28	28.0	72	72.0	85	85.0	15	15.0	**66.10**	**0.000****
Barriers of ova cryopreservation technology.	23	23.0	77	77.0	84	84.0	16	16.0	**74.79**	**0.000****

X2: Chi Square Test **(**) highly statistically significant at p<0.01.**

Figure (1): Percentage distribution of total nurses' knowledge regarding ova cryopreservation technology before and after educational program (n=100)

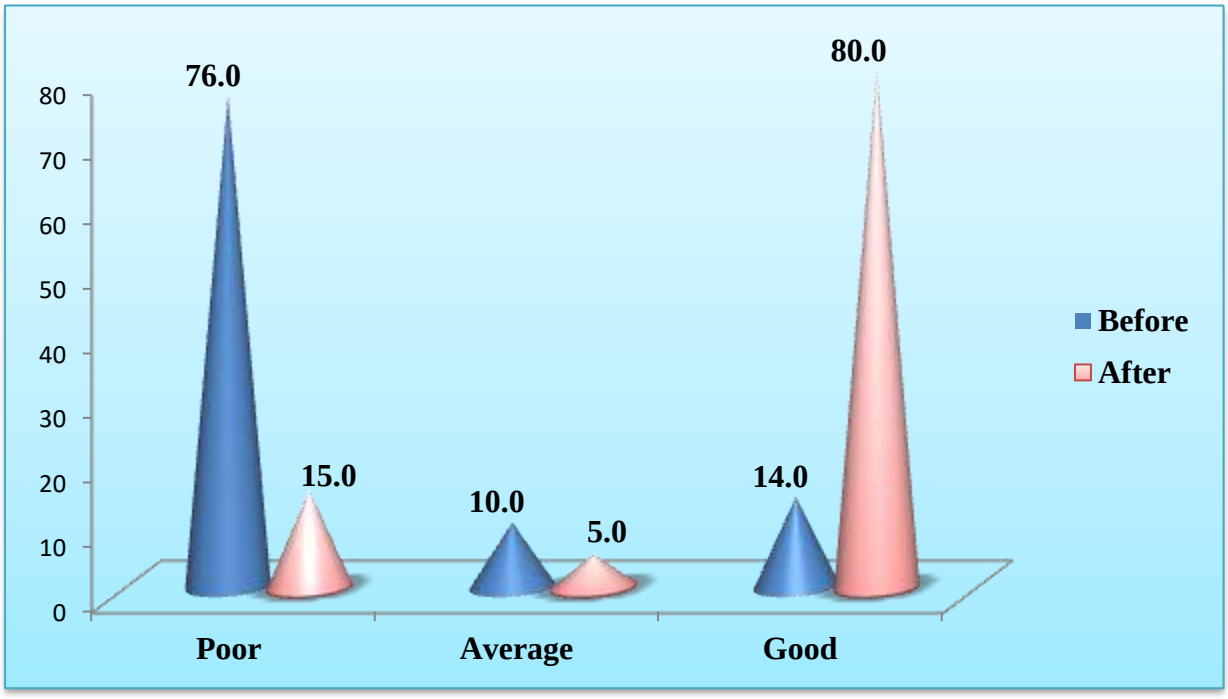


Table (3): Distribution of the studied nurses according to knowledge about technical aspects and methods used in the process of ova cryopreservation technology before and after implementation of educational program (n=100)

Phase / knowledge items	Before implementation of educational program (n=100)				Two weeks after implementation of educational program (n=100)				X^2	p-value
	Correct answer		Incorrect answer		Correct answer		Incorrect answer			
	No.	%	No.	%	No.	%	No.	%		
Optimal age range for ova cryopreservation technology.	29	29.0	71	71.0	81	81.0	19	19.0	**54.63**	**0.000****
Minimum recommended number of cryopreserved ova for women under 30 year.	26	26.0	74	74.0	89	89.0	11	11.0	**81.21**	**0.000****
Minimum target number for ova cryopreservation in the 31-40 age cohorts.	24	24.0	76	76.0	83	83.0	17	17.0	**69.96**	**0.000****
Timeframe required for ultrasound-guided ova retrieval.	32	32.0	68	68.0	86	86.0	14	14.0	**60.27**	**0.000****
Maximum duration for clinical storage of cryopreserved ova.	33	33.0	67	67.0	82	82.0	18	18.0	**49.13**	**0.000****
Standardized temperature parameters for ova cryostorage.	23	23.0	77	77.0	82	82.0	18	18.0	**69.79**	**0.000****
Essential laboratory investigations for ova cryopreservation candidates.	47	47.0	53	53.0	94	94.0	6	6.0	**53.11**	**0.000****
The primary stage of the ova cryopreservation clinical protocol.	36	36.0	64	64.0	90	90.0	10	10.0	**62.55**	**0.000****
Factors influencing the clinical outcomes of ova cryopreservation.	30	30.0	70	70.0	91	91.0	9	9.0	**77.85**	**0.000****
Symptoms and manifestations associated with the cryopreservation procedure.	33	33.0	67	67.0	89	89.0	11	11.0	**65.91**	**0.000****
Methodologies and techniques employed in ova cryopreservation	28	28.0	72	72.0	82	82.0	18	18.0	**58.91**	**0.000****
Adverse effects and clinical risks of the procedure.	17	17.0	83	83.0	80	80.0	20	20.0	**79.45**	**0.000****
Standard surgical approach for ova retrieval in married women.	38	38.0	62	62.0	93	93.0	7	7.0	**66.93**	**0.000****
Standardized retrieval techniques for virgins/unmarried women.	29	29.0	71	71.0	87	87.0	13	13.0	**69.05**	**0.000****

.X2: Chi Square Test **(**) highly statistically significant at p<0.01**

Table (4): Distribution of the studied nurses according to knowledge about role of the nurse regarding the technique of ova cryopreservation technology before and after implementation of educational (program (n=100

Phase / knowledge items	Before implementation of educational program (n=100)				Two weeks after implementation of educational program (n=100)				X^2	p-value
	Correct answer		Incorrect answer		Correct answer		Incorrect answer			
	No.	%	No.	%	No.	%	No.	%		
Primary role of the nurse in educating women before undergoing ova cryopreservation technology.	27	27.0	73	73.0	88	88.0	12	12.0	**76.13**	**0.000****
Psychological preparation of the woman before starting hormonal stimulation.	31	31.0	69	69.0	90	90.0	10	10.0	**72.83**	**0.000****
Role of the nurse during the ova retrieval procedure.	26	26.0	74	74.0	85	85.0	15	15.0	**70.47**	**0.000****
Role of the nurse after the completion of the ova cryopreservation technology process.	23	23.0	77	77.0	82	82.0	18	18.0	**69.794**	**0.000****

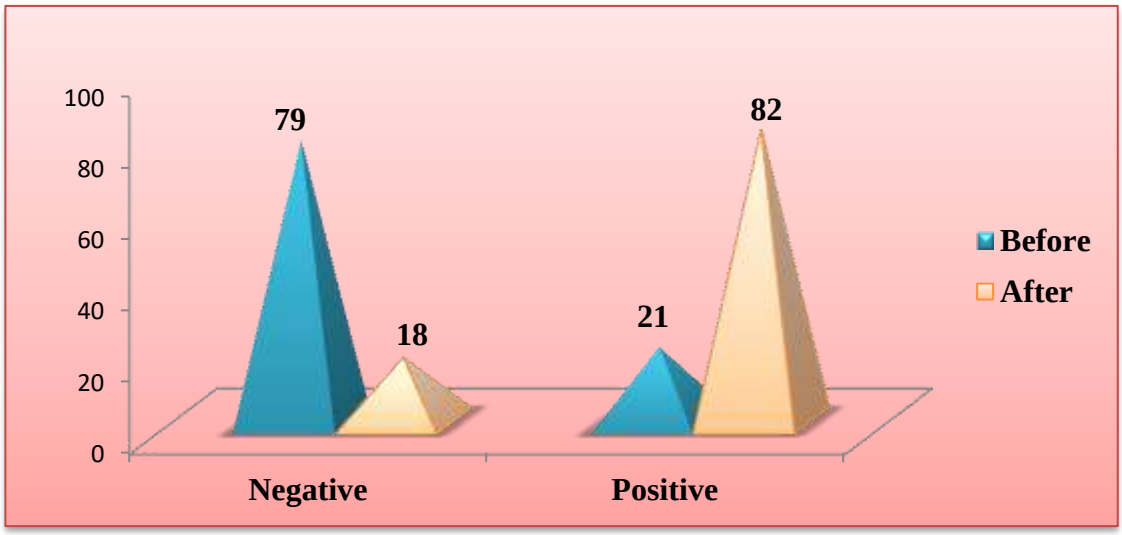
.X2: Chi Square Test **(**) highly statistically significant at p<0.01**

Table (5): Distribution of the studied nurses according to attitude about ova cryopreservation technology (before and after implementation of educational program (n=100

Phase / Attitude items	Before implementation of educational program (n=100)						Two weeks after implementation of educational program (n=100)						X^2	p-value
	Agree		Uncertain		Disagree		Agree		Uncertain		Disagree			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Ova cryopreservation banks must be certified and have standards	40	40.0	33	33.0	27	27.0	90	90.0	8	8.0	2	2.0	**56.026**	**0.000****
Believing that Ova cryopreservation is dangerous for women	36	36.0	32	32.0	32	32.0	88	88.0	11	11.0	1	1.0	**61.183**	**0.000****
ova cryopreservation is illegal and religiously prohibited	39	39.0	36	36.0	25	25.0	84	84.0	14	14.0	2	2.0	**45.736**	**0.000****
Acquiring comprehensive knowledge about Ova cryopreservation is essential for professional development in healthcare.	43	43.0	35	35.0	22	22.0	93	93.0	5	5.0	2	2.0	**57.549**	**0.000****
Ova cryopreservation is perceived as a vital tool for enhancing female reproductive autonomy and family planning flexibility.	42	42.0	27	27.0	31	31.0	87	87.0	10	10.0	3	3.0	**46.567**	**0.000****
The technical complexity of the cryopreservation process may be viewed as a psychological barrier for some women.	33	33.0	35	35.0	32	32.0	82	82.0	13	13.0	5	5.0	**50.664**	**0.000****
Believing that a child born through ova cryopreservation may be at a higher risk of congenital anomalies	43	43.0	36	36.0	21	21.0	16	16.0	9	9.0	75	75.0	**58.931**	**0.000****
Concerns that advocating for Ova cryopreservation might devalue traditional norms of early marriage and natural conception.	30	30.0	38	38.0	32	32.0	89	89.0	7	7.0	4	4.0	**72.385**	**0.000****
The absence of health insurance coverage significantly limits access to cryopreservation for low-to-middle-income demographics.	29	29.0	40	40.0	31	31.0	85	85.0	11	11.0	4	4.0	**64.828**	**0.000****
The substantial financial cost associated with ova cryopreservation remains a primary obstacle to universal accessibility.	32	32.0	35	35.0	33	33.0	88	88.0	8	8.0	4	4.0	**65.817**	**0.000****

.X2: Chi Square Test **(**) highly statistically significant at p<0.01**

Figure (2): Percentage distribution of total nurses' attitude regarding ova cryopreservation before and after implementation of educational program (n=100)



(Table (6): Distribution of the studied nurses' satisfaction regarding educational program (n=100

Phase / Satisfaction Items	Highly satisfied		Satisfied		Dissatisfied	
	No.	%	No.	%	No.	%
The information provided about OC was clear and easy to understand	88	88.0	10	10.0	2	2.0
Visual aids such as PowerPoint presentations helped clarify the information and enhanced my understanding of the content	91	91.0	7	7.0	2	2.0
The content provided on OC included credible data and up-to-date scientific research	93	93.0	3	3.0	4	4.0
Educational program met the expectations in learning about the technique of OC	90	90.0	7	7.0	3	3.0
Effective educational methods were utilized during the implementation of the program	92	92.0	4	4.0	4	4.0
The program offered adequate opportunities for nurses to engage in questions and topic discussions	86	86.0	9	9.0	5	5.0
The educational booklet provided served as a useful resource in supporting the learning process	92	92.0	6.0	6.0	2	2.0
The researcher utilized up-to-date, evidence-based information related to the technique of OC	88	88.0	7	7.0	5	5.0
During the implementation of the educational program, the researcher followed a logical progression from basic to more complex concepts related to OC	89	89.0	9	9.0	2	2.0
The researcher would recommend this program to other nurses	93	93.0	7	7.0	0	0.0

Figure (3): Distribution of the studied nurses according to satisfaction regarding educational program ((n=100

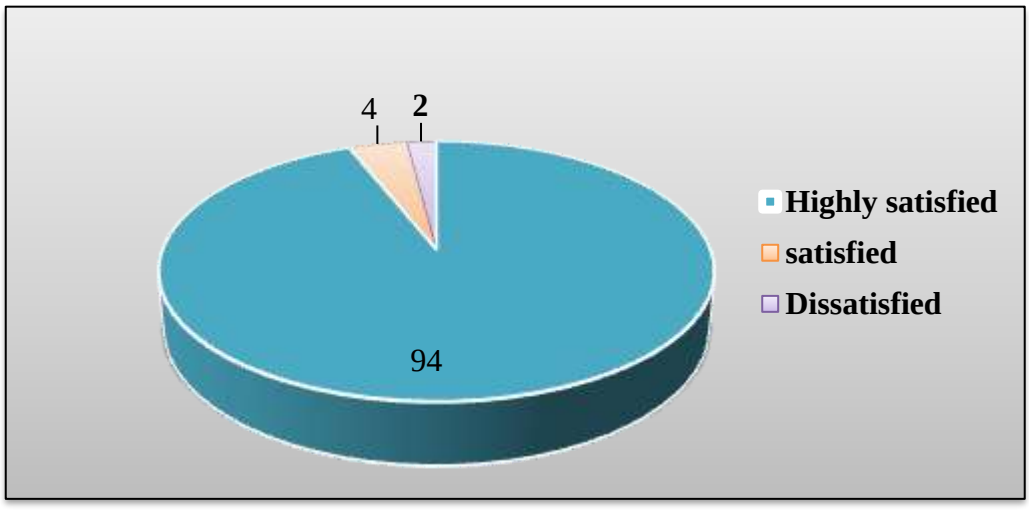


Table (7): shows that there was a highly statistically positive correlation between total knowledge score .and total attitude scores before and after educational program (P ≤ 0.001)

Variable	Total knowledge score			
	Before implementation of educational program (n=100)		two weeks after implementation of educational program (n=100)	
	r	p	r	p
Total attitude score	.501	0.000**	.866	0.000**

Discussion

Oocyte cryopreservation commonly known as EF is a reproductive technology that involves freezing and storing a woman's eggs for future use in assisted reproductive treatments, such as IVF. OC is a rapidly advancing and ground breaking technique that involves the extraction, freezing, and storage of a woman's oocytes ***(Nouh et al., 2025).*** Additionally, embryo cryopreservation, as a long-established fertility preservation method, can guarantee the best outcomes for fertility preservation. However, oocyte cryopreservation is preferred since most adolescents are unlikely to have a permanent partner and using donor sperm is less desired and poses ethical issues ***(Chen et al., 2023).***

The study aimed to investigate the effect of educational program on maternity nurses' knowledge and attitude regarding ova cryopreservation. The current study results were discussed under the following sections: general characteristics of studied nurses, knowledge of the studied nurses regarding ova cryopreservation before and after implementation of educational program, Attitude of the studied nurses regarding ova cryopreservation before and after implementation of educational program, maternity nurses' satisfaction after implementation of educational program, relation and correlation between the studied variables.

Concerning general characteristics of the studied nurses, the results of current study revealed that less than half of studied nurses were in age group 20<30 years old with a mean age of 34.11± 8.59 years . Moreover, less than half of studied nurses were married. Concerning residence, approximately less than half of the studied nurses lived in urban area.

As regards Educational qualifications, less than half of studied nurses had nursing technical institute, concerning current job, approximately more than half of studied nurses working as a nurse, concerning years of experience, approximately less than two-quarters of studied nurses had (5<10) years of experience, Moreover, approximately less than half of studied nurses had previous information about the technique of ova cryopreservation. More than one-quarter of nurses had information about the technique of ova cryopreservation from the internet.

The results of the current study agreed with ***Gouda Ahmed et al, (2025)*** who studied *"Efficacy of Educational Package on Oncology Nurses' Knowledge and Attitude towards Oocyte Cryopreservation, Assiut, Egypt"* and stated that (54.8%) of oncology nurses were in age group 18-25 years old and

(61.9%) lived in urban area. Also, (78.6) of oncology nurses had information about the technique of ova cryopreservation and (33.3%) had information about the technique of ova cryopreservation from the internet. this is likely due to the internet's widespread availability and accessibility as a daily reachable source of information.

Also, these results were in congruent with ***Mansour & Hassan (2021)*** who studied *" An educational packa*ge for oncology nurses regarding fertility preservation among female cancer patients ,*Mansoura*, Egypt*"* and stated that (52.5%) of oncology nurses were in age group 18-25 years old and (86.9%) were married.

The current study showed a significant total knowledge improvement post-implementation of educational program. Before implementation of educational program a few nurses had good knowledge, while half of nurses had poor knowledge, after the implementation of educational program more than three quarters of the nurses had good knowledge. This result demonstrated that educational program was very effective in improving the maternity nurses' knowledge level regarding ova cryopreservation technology.

From the researcher's point of view, this improvement might be related to that the implementation of educational program and educational sessions affected the knowledge of the maternity nurses positively as active participation of studied sample maternity nurses during sessions and became more equipped by the important information about ova cryopreservation and booklet included the needed information about ova cryopreservation in simple, concise and clear language.

Also, these results were in agreement with ***Hassan et al, (2025)*** who studied *" Working Females' Knowledge, Attitude, and Intention at Beni-Suef University regarding Oocyte Cryopreservation: Effect of an Educational Program, Beni-Suef, Egypt"* and revealed that acceptable and highly statiscal significant improvement in the mean knowledge score of the studied females post program.

Moreover, the results were in congruent with ***Rashed et al, (2018)*** who studied *" Cryopreservation Counseling and Its Effect on Knowledge and Attitude of Young Female Cancer Patients, Menofia , Egypt"* and showed a statistically significant improvement in their knowledge after counseling as compared to before.

The above mentioned results were in accordance with ***Araby et al, (2025)*** who studied *" Effect of Nano-Educational Sessions on Awareness, Willingness and Barriers toward Elective Oocyte Cryopreservation among Unmarried Females, Benha, Egypt"* and revealed that the implementation of the program resulted in a substantial enhancement in the knowledge of the studied sample regarding elective oocyte cryopreservation. Also, A highly statistically significant difference was observed between the pre- and post-intervention phases ($p<0.001$).

Moreover, the results were in congruent with ***Hong et al., (2019)*** who studied *" A survey on the awareness and knowledge about elective oocyte cryopreservation among unmarried women of reproductive age visiting a private fertility center, South Korea"* and mentioned that most of the study participants' responses to egg freezing were found to be accurate.

In relation to total attitude score, the current study findings clarified that, there was a highly statistically significant difference in relation to all items of attitude of the maternity nurses before and after educational program ($P \leq 0.001$).

As well as, the results of the current study were congruent to ***Hassan et al, (2025)*** who studied *" Working Females' Knowledge, Attitude, and Intention at Beni-*

Suef University regarding Oocyte Cryopreservation: Effect of an Educational Program, Beni-Suef, Egypt" and revealed that acceptable and highly statiscal significant improvement in the mean attitude score of the studied females post-program.

Furthermore, this result agreed with ***Satılmış et al, (2022)*** who studied *" Oocyte Cryopreservation: Knowledge and Attitudes among turkish midwifery and nursing students, Istanbul, Turkey"* and revealed that more than half of the studied females participated in our study looked favorably on OC as it brings freedom to choose the time to become a mother and reduce pressure of motherhood on the career building women.

Additionally, this result was in harmony with ***El-Adham & Shaban, (2023)*** who studied *"Effect of Educational Program on Knowledge, Attitudes, and Intention of Unmarried Healthy Females regarding Oocyte Cryopreservation, Tanta, Egypt"* and stated that the majority of variables exhibited a highly statistically significant difference in the attitudes of unmarried healthy females toward oocyte cryopreservation before and one month after the program's implementation ($p<0.001$). Where, it was identified that (100%) of the studied unmarried healthy females had negative attitudes regarding oocyte cryopreservation before the program, compared to (80%) of them had positive attitude one month after the program.

Concerning maternity nurses' satisfaction regarding ova cryopreservation, the findings of the current study clarified that more than the majority of the studied nurses were satisfied with the educational program, and less than one-quarter of them were satisfied while, minority of them had low satisfaction. This high satisfaction rate is likely due to the efficiency and ease of the use of the instructional materials, which boosted nurses' confidence and enhanced their knowledge of OC.

Also, these results were in congruent with ***Mansour & Hassan (2021)*** who studied *" An educational package for oncology nurses regarding fertility preservation among female cancer patients, Mansoura, Egypt"* and found that majority of nurses were satisfied and strongly agree that the educational package is an effective to improve their knowledge regarding fertility preservation and increase their feeling of confidence. This finding may be related to clarity and simplicity of the educational materials.

Regarding correlation coefficient between total score of knowledge and attitude, the findings of the current study cleared that there was a highly statistical significant positive correlation between total score of knowledge and attitude after implementation of educational program for maternity nurses.

The results of the current study agreed with ***Rashed et al, (2018)*** who studied *" Cryopreservation Counseling and Its Effect on Knowledge and Attitude of Young Female Cancer Patients, Menofia , Egypt"* and showed a there was a significant, positive correlation between knowledge and attitude before and after counseling ($r=0.49$, $r=0.78$ respectively). The more increased in knowledge score, the more positive attitude young females had.

On the other hand, the current study results disagreed with with ***El-Adham & Shaban, (2023)*** who studied *"Effect of Educational Program on Knowledge, Attitudes, and Intention of Unmarried Healthy Females regarding Oocyte Cryopreservation, Tanta, Egypt"* and stated that the knowledge, attitude, and intentions of the unmarried, healthy females under investigation regarding oocyte cryopreservation did not exhibit a statistically significant correlation in the

period prior to and following the implementation of the educational program ($p>0.05$).

Conclusion

Based on the findings of the current study, it was concluded that the educational program was effective in improving maternity nurses' knowledge, attitude and satisfaction regarding ova cryopreservation technology. Prior to the program implementation, majority of maternity nurses exhibited poor knowledge and negative attitude regarding ova cryopreservation technology. However, after the implementation of the program, there were statistically significant improvement in maternity nurses' knowledge and attitude regarding ova cryopreservation technology. Moreover, a highly statistically significant positive correlation was observed between total knowledge and attitude among the studied maternity nurses before and after the program implementation. These findings confirm that the study's aim was achieved and the proposed research hypotheses were supported.

Recommendations:

In the light of the current study findings, the following recommendations are suggested:

- Disseminating an educational booklet about ova cryopreservation for all maternity nurses.
- Adopting unified standardized clinical guidelines within Obstetrics and Gynecology departments that clearly define the nurse's role in educating and counseling patients regarding fertility preservation options, thereby contributing to the provision of comprehensive, evidence-based nursing care.

Further studies need to be performed:

- Ova cryopreservation should be integrated into premarital counseling in different maternal and child health (MCH) centers to raise awareness about fertility preservation and its potential benefits for future quality of life
- As a result of delay age of marriage in Egypt , more efforts needed by the health care system, to increase the youth knowledge about ways to preserve their fertility especially unmarried girls.
- Educational programs about cryopreservation should be implemented to oncology staff nurses as a step toward disseminating such knowledge among females.
- Structured educational and counseling programs regarding ova cryopreservation should be provided by maternity nurses to females of reproductive age to make informed and timely decisions aligned with their future reproductive life.

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