



## Effect of Educational Program on Nursing Students' Beliefs and barriers regarding Ova Cryopreservation

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### Abstract

**Background:** Ova cryopreservation is a crucial component of assisted reproductive technology; it is required for fertility preservation, infertility treatment, and reproductive biology. **Aim of the study:** was to evaluate effect of educational program on nursing students' beliefs and barriers regarding ova cryopreservation. **Research design:** Quazi experimental design was adopted to carry out this study. **Setting:** The study was conducted at faculty of nursing, at Zagazig University. **Subjects:** consisted of 200 nursing students in a multistage cluster random sample. **Tools of data collection:** Three tools were used for data collection. **Tool I:** A Structured Interviewing questionnaire, **Tool II:** Beliefs Assessment Tool and **Tool III:** Barriers Assessment Tool. **Results:** Following the implementation of the teaching program, there was a noticeably positive change in the overall students' beliefs on ova cryopreservation, with a highly statistically significant difference at ( $P < 0.001$ ). Additionally, a highly statistically significant difference at ( $P < 0.001$ ) indicated a significant improvement in the overall students' barriers about ova cryopreservation after the implementation of the teaching program. **Conclusion:** it was concluded that; there was highly statistical significant improvement regarding total nursing students' beliefs and barriers regarding ova cryopreservation after implementation of educational program. Also there were high significant statistical positive correlation between students' beliefs and barriers regarding ova cryopreservation at pre and post implementation of educational program ( $p < 0.001$ ). **Recommendations:** All students should have access to a concise and in-depth handbook about ova cryopreservation, and there is a need to support and enhance the infrastructure for introducing services and providing financial support for fertility preservation.

**Key words:** Ova cryopreservation, reproductive biology, fertility preservation, beliefs, barriers

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### Introduction

Ova cryopreservation (OC) is a popular method of fertility preservation (FP). After stimulating the ovaries, mature oocytes are removed, frozen, and kept for later use. (Ahmad Sindi, et al., 2022)<sup>(1)</sup>. In order to collect, freeze, and store eggs for future in vitro fertilization (IVF), OC uses assisted reproductive technology (ART) to hyper-stimulate ovaries. This could potentially increase a woman's natural fertility. (Johnston et al., 2021)<sup>(2)</sup>.

OC to delay pregnancy, often known as "social egg freezing" in the media, has gained popularity as a fantastic way to maintain female fertility. The loss in female fertility after age 32 and the acceleration of the drop after age 35 are well-known facts. The key factor contributing to age-related fertility decline is the reduction in follicular pool size and oocyte quality, as well as the increased chance of fetal chromosomal abnormalities

that result in fetal loss. (Alteri, et al., 2019)<sup>(3)</sup>.

Over the past 20 years, OC has received widespread support as a recognized method for FP, not just for women undergoing fertility-endangering cancer treatment or dealing with other medical illnesses, but also for healthy women looking to preserve their future reproductive potential. (Rashedi, et al., 2020)<sup>(4)</sup>. There are two varieties of OC; the first is known as medical ova cryopreservation (MOC), and it was primarily utilized for "medical" reasons, such as for patients who were due to receive radiation for the treatment of cancer or gonadotoxic medicines. (Walker, et al., 2022)<sup>(5)</sup>.

The second type is referred to as non-medical ova cryopreservation (NMOC), which occurs in healthy women and is also known by a variety of other names, including "social ova cryopreservation (SOC)," "elective ova cryopreservation (EOC)," "elective fertility preservation (EFP)," "oocyte banking (OB) for anticipated gamete exhaustion," and "planned ova cryopreservation (POC)". The ASRM practice committee approved the morality of social egg freezing. (Ethics Committee of the American Society for Reproductive Medicine., 2018)<sup>(6)</sup>. Women can delay parenting to a period that is more convenient for them because to a recent phenomenon known as SOC. (Simopoulou, et al., 2018)<sup>(7)</sup>.

Premature ovarian failure (POF) and ovarian illnesses such as endometriosis that necessitate frequent or severe surgery are examples of MOC reasons for OC. These illnesses, which include cancer and autoimmune disorders, call for treatments like radiotherapy, cytotoxic chemotherapy, and endocrine therapy that harms the ovarian reserve. (Lantsberg, et al., 2020)<sup>(8)</sup>.

**Egypt's Dar Al-Ifta**, In response to a widely shared Facebook post by an unmarried Egyptian woman who had chosen to freeze her eggs, one of the major Sunni Islamic bodies that issues fatwas, Dar Al-Ifta, declared that OC among unmarried women is "permissible" as

long as it is carried out under four conditions, including the avoidance of any harm to the eggs that could endanger future offspring; safe control over the procedure; prevention of any damage to the eggs that might pose a risk to future offspring; safe storage of the eggs; and safe control with no use of frozen eggs or fertilized embryos following divorce or death of the husband (Inhorn, et al., 2020)<sup>(9)</sup>.

Nursing role according to **ESHRE Guideline Group on Ovarian Stimulation Bosch, et al., 2020** <sup>(10)</sup>. 1. Examination and medical counselling NOTE: If a patient needs fertility preservation for oncologic reasons, make sure there isn't a waiting list for consultation appointments and that you can get one as quickly as feasible. 2. Review the patient's medical history and prior records, and determine their current state of general health. 3. Keep a relational database with all the data, including the oncologist's approval for cancer patients to undergo ovarian stimulation. 4. Provide the patient with detailed advice on the procedure's viability. 5. Describe how the procedure's steps (ovarian stimulation, oocyte retrieval, and oocyte verification) work. 6. Explain the procedure's costs and restrictions, as well as the odds of success that may be reasonably expected (mostly based on maternal age and the anticipated amount of MII oocytes at the time of oocyte retrieval). 7. Assist in transvaginal ultrasound procedures to determine the ovarian reserve (also known as AFC) and to determine whether the ovaries are accessible for egg collection. 8. Conducting all necessary tests on the women, including Hepatitis B, Hepatitis C, HIV, Venereal Disease Research Laboratory/Treponema pallidum Hem agglutination Assay, coagulation screening (blood count, prothrombin, thromboplastin, fibrinogen, Protein C, Protein S, anti-thrombin III, homocysteine), and blood tests to determine blood group and Rhesus factor. A more thorough evaluation may include baseline FSH, LH, E2, AMH, breast examination, Papanicolaou test. Patients who enroll in a fertility preservation program for non-

emergency medical reasons should have testing for factor V of Leiden and prothrombin as well as TORCH screening for toxoplasmosis, rubella, and CMV.

### Significance of the Study:

Ova cryopreservation has long been advocated as a way for young women who want to put off having children until their fourth or fifth decade to maintain their fertility. The preservation of fertility is equally important for young women undergoing potentially sterilizing operations like chemotherapy or radiation therapy or undergoing surgery related to contemporary oncology therapies. (Gelety, 2022)<sup>(11)</sup>. These young people (nurses) are considering their future reproductive options as they get ready for hard professional careers after completing university courses and because their age (early and mid-20s) is suitable for advantageous ova cryopreservation. There have been sporadic studies to evaluate this topic in Egypt. (Tozzo, et al., 2019)<sup>(12)</sup>. At Zagazig University, however, no comparable research on ova cryopreservation has been done. Based on the aforementioned, it was observed that nursing personnel played a significant role in the education of patients regarding fertility preservation. In order to assess the impact of the educational program on nursing students' beliefs and barriers regarding ova cryopreservation, the current study will be done.

#### ❖ Aim of the study:

*The aim of the study* was to evaluate effect of educational program on nursing students' beliefs and barriers regarding ova cryopreservation.

**Such aim had been fulfilled through the following objectives:**

1. Determine nursing students' beliefs regarding ova cryopreservation.
2. Recognize barriers regarding ova cryopreservation.
3. Design educational program on nursing students' beliefs and barriers regarding ova cryopreservation.
4. Implement and evaluate effect of educational program on nursing students' beliefs and barriers regarding ova cryopreservation.

#### ❖ Research hypothesis:

Nursing students' beliefs and barriers regarding ova cryopreservation will be significantly improved after implementation of educational program.

#### ❖ Subjects and Methods:

##### **A-Technical Design**

The research design, study environment, sample and data collection instruments were all described in the technical design.

##### ➤ Research design:

The relevant research issue was investigated using a quazi experimental design (pre- and posttest).

##### ➤ Study Setting:

This research was done at Zagazig University's nursing faculty, under the supervision of the El-sharkia administration. The faculty building is divided into five sections: the first section (ground floor) is used for administrative offices; the second section (staff offices), the third section (practical laboratories), the fourth section, and the fifth section (lecture halls) are used for each academic year.

##### ➤ Study Subjects:

Multistage cluster random sample composed of 200 nursing students from 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> academic grade of the female faculty student who accept to participate in the program.

- Exclusion criteria:

1. Male nursing students (as they don't practice obstetric nursing).
2. Female nursing students who refused to participate in the program.
3. Female nursing students who attain any training courses about ova cryopreservation.

○ Sample size calculation:

Sample size needed was 200 nursing students who completed the study. It was calculated to be respectively based on the following formula: Design effect =  $1 + \delta (n - 1)$ . 45, 81, 44, 30 students from 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> academic grade  $\delta$  = interclass correlation for the statistic. n = average size of the cluster.

**-Tool for data collection:**

In order to fulfill the objectives of the study *three tools* were used to collect necessary data:

**Tool I: A Structured Interviewing questionnaire:**

After studying the pertinent literature, the researcher created this questionnaire. To gather the information required to meet the study's aims, it was initially designed in English and then translated into Arabic language. One part of it was this:

**Part (I): Demographic Characteristic:**

Age, academic year, domicile, marital status, and other items are included in the survey to gather demographic information about the students under study.

**Tool II: Beliefs Assessment Tool (pre/post):**

An Arabic self-administered questionnaire developed by researcher and guided by the recent related literature (**Hasab Allah, et al., 2021**)<sup>(13)</sup>. It was designed to assess the subjects' opinions on ova cryopreservation. It consisted of 13 questions, each of which had two possible answers (agree or disagree) regarding topics such as the relationship between cancer and ova cryopreservation, the lifespan of frozen eggs, whether having children or finding a compatible partner constitutes ova cryopreservation, whether doing so is against

religious doctrine, how long frozen eggs can be used, whether the children produced by ova cryopreservation are considered normal.

**Total Score for students, Beliefs related to ova cryopreservation:**

• According beliefs toward Ova cryopreservation which includes 13 questions reflects students beliefs, each one with 2 responses (agree or disagree).

• Nine questions of them have (**agree**) and take (1) score as a correct answer ( number 1,2,3,5,6,7,8,12 and 13) meanwhile, the remaining four questions have (**disagree**) which take (1) score as a correct answer (questions number 4,9, 10 and 11) with total score of positive beliefs equal to or more than 60 % (score 8 or more) and negative beliefs score less than 60% (less than 8).

**Tool III: Barriers Assessment Tool (pre/post):**

An Arabic self-administered questionnaire developed by researcher and guided by the recent related literature (**Fahmy, & Mohamed, 2021**)<sup>(14)</sup>. It featured 14 questions with 2 possible answers (agree or disagree), with the goal of evaluating the subject's hurdles to ova cryopreservation. Lack of understanding about ova cryopreservation, The teenage years are a challenging time to make judgements regarding oocyte cryopreservation due to religious restrictions, In Egypt, ova cryopreservation is not permitted. Eggs are the largest cells in the human body; future fertility; age; daily routine and employment; husband's agreement after marriage; traditions; social barriers; costs; culture; age of women; and the possibility of egg mixing with those of another woman.

**Total Score for students, barriers related to ova cryopreservation:**

• Barriers facing ova cryopreservation questionnaire that include 14 statements, each one have 2 responses (agree or disagree)

• The optimal responses in 10 statements is (**disagree**) which take 1 score as a correct answer (statement number 1, 4, 5, 6, 7, 8, 10, 12, 13 & 14), only 4 statements marked with (**agree**) that take 1 score as a correct answer (statement number 2, 3, 9 & 11), the total score of satisfactory response equal to or more than 60 % (score 8.5 or more) and an unsatisfactory response less than 8.5.

### **B) Operational design:**

The operational design included preparatory phase, validity, reliability, pilot study and fieldwork.

#### **\*Preparatory phase**

Using books, papers, the internet, periodicals, and scientific magazines, a review of the literature from the past, present, local, and international contexts was conducted. This was required to gain in-depth knowledge about the subject and approaches used to solve the research challenge. It also aided in the selection of an appropriate and reliable data gathering tool and the creation of a booklet with instructional guidance.

#### **\*Validity and Reliability:**

##### **\* Validity**

Three experts, including one professor and two assistant professors from the obstetrics and gynecological nursing department, evaluated the tools for content validity. These experts evaluated the tool's clarity, usefulness, comprehensiveness, simplicity, and understanding. According to their judgement, the tool's recommendations were all implemented. In addition, the researcher created a guided guidebook for the subjects of the study that addressed every aspect of ova cryopreservation in light of their assessed needs and the relevant literature. The guided manual was updated and validated by the same specialists who validated the product. The complete adjustments were made.

##### **\*Reliability**

The reliability of the items of the tools was assessed using Cronbach's alpha test, its results were 0.836 for beliefs assessment tool and 0.850 for barriers assessment tool.

##### **Pilot study**

On a sample of 20 students, or 10% of the sample, who met the requirements, a pilot research was conducted. These were left out of the sample size calculations. The goal of the pilot study was to determine its viability, to spot any peculiar issues with the statement, such as sequence and clarity, to estimate the time needed for the student to complete the study's tools, to gauge the level of the students being studied, to gauge their comprehension of the questionnaire, to gauge their willingness to participate in the study, and to identify any potential issues and challenges that might arise for the researcher. Based on the pilot study's findings, all required modifications were done by adding or omission of some questions to be simpler and easier.

##### **Field work:**

The following phases were used to achieve the study's objectives: assessment, planning, implementation, and evaluation. These phases were completed over a 6-month period, starting on October 1, 2022, and ending on March 31, 2023.

##### **1-Assessment Phase:**

At the beginning of the interview, the researcher greeted each student and provided them with information about the study's purpose, duration, instructions for completing the questionnaire, and activities. This phase involved interviewing the study's participants for the first time to gather baseline data. This was done in the educational lecture hall at the Faculty of Nursing at the University of Zagazig during the participants' free time. They have been informed that their participation is entirely voluntary and that they have the opportunity to end it whenever they choose. Each student gave their approval orally. Each student was given a

self-administered questionnaire to evaluate their demographic traits, oocyte cryopreservation-related views, and perceived impediments. The study was completely voluntary. Average time for the completion of each studied student self-administered questionnaire was around (30 minutes).

### **2-Planning Phase:**

Based on the findings from the assessment phase and a pertinent literature study, the researcher created the intervention program and session materials with an eye on assessing the students' attitudes towards oocyte cryopreservation through a pretest questions sheet.

Before implementing the educational sessions, the students were divided into four groups (each group specific to a different academic year), according to their availability and free time, to make it easier for them to attend the sessions. There were 45, 81, 44, and 30 students from the first through fourth academic grades, respectively. For a month, the material was broken up into four interactive sessions that were held "once a week" for each group of students. The length of each session was one hour. Lessons were delivered to the students utilizing audiovisual aids (PowerPoint presentations, films, graphics, and printed Arabic booklets) in the form of lectures and group discussions.

### **3-Implementation phase:**

Implementation of an educational session took sixteen weeks. Four groups were created. Additionally to the 8 weeks that were indicated for Students who did not show up during a scheduled period for each academic grade. These students were divided into two groups. This allocation is made in accordance with their free time, theoretical lectures, and practical portions to make it easier for them to attend the sessions and complete their academic obligations.

At the Nursing Faculty of Zagazig University, these sessions were conducted in the instructional lecture hall. For four weeks straight, each set of students participated in one

interactive session of the divided topic. Each session lasted around an hour (60 min), during which a PowerPoint presentation was made and backed with videos and pictures, then a group discussion ensued.

To help students grasp and hold their interest, simple explanation language, modern teaching strategies and media, instructional brochure, and supplies of pencils and notes were given to the students for gathering feedback. The educational pamphlet offers all the most recent data on ova cryopreservation. To make sure the student understood the material and to re-explain any incomprehensible material, feedback was given at the conclusion of each session and at the start of each one on the previous one.

### **4 -Evaluation Phase:**

The researcher asked the students to complete a post-test at the end of the final session using a format of beliefs and barriers questionnaires to compare their beliefs and barriers before and after the educational sessions. This allowed them to see how the educational sessions had an impact on the students' beliefs and barriers towards ova cryopreservation.

\*The study's limitations include the following:

The sessions occasionally lasted longer than planned due to clinical schedule conflicts that demanded additional time.

### **Ethical consideration:**

The scientific and ethical committee of the nursing department at Zagzig University granted its clearance for the study. Prior to participation, each nursing student was informed of the study's purpose. After receiving their oral agreement, nursing students were freely enrolled. The study procedures did not have any negative effects on the participating nursing students because participant anonymity was preserved, confidentiality of any information gathered was guaranteed, and the study was conducted. The obtained data will only be used for research purposes, and nursing students have the right to leave the study at any time and without providing a reason.

### **III. Administrative design:**

By submitting an official letter to the relevant authorities of the study setting and outlining the goal of the study, the dean of the nursing faculty at Zagazig University granted official authorization to collect data.

#### IV. Statistical design

Using the proper statistical tests, the data will be organized, categorized, tabulated, and analyzed. Statistical Package for Social Science (SPSS) version 25 and the Microsoft Excel program were used to conduct the data analysis. For categorical data, frequencies and percentages were used, while arithmetic means (X) and standard deviations (SD) were used for quantitative data. Descriptive statistics were used to present the data. Using the chi square test (X<sup>2</sup>), qualitative variables were compared. Paired t test was used to evaluate differences between the group during the course of the two visits. The R-test was also employed to determine whether the study variables were correlated.

#### Degrees of significance of results were considered as follows:

- P-value > 0.05 Not significant (NS)
- P-value ≤ 0.05 Significant (S)
- P-value ≤ 0.001 Highly Significant (HS).

#### ❖ Results:

**Figure (1):** showed the distribution of the studied students according to their academic year. It was revealed that, two fifth (40.5%) of the studied students were at second year. Also, less than one-quarter (22.5%) of them were at first year. While, less than one-quarter (22.0%) of them were at third year. Moreover, less than one-fifth (15.0%) of them were at fourth year.

**Table (1):** showed that, there was a marked improvement in all items of students' beliefs regarding ova cryopreservation after implementing educational program with a highly statistically significant difference at (P= ≤ 0.001). As evidence, more than one-third (37.5% and 37.5% , respectively) of the studied students agreed that woman should freeze her eggs if she had cancer and Egg donation after freezing is legally prohibited pre

implementing educational program. While improved to the majority (95.5% and 93.0%, respectively) after implementing educational program.

**Figure (2):** showed the distribution of the studied students according to their beliefs about Babies born using ova cryopreservation are normal babies. It was revealed that, pretest of 31.0% of the studied students agree with Babies born using ova cryopreservation are socially acceptable .while the majority (90.0%) of the studied students agree with Babies born using ova cryopreservation are normal babies in posttest.

**Table (2):** showed the total students' beliefs regarding ova cryopreservation at pre and post implementation of educational program. It clarified that, there was a marked improvement in total students' beliefs regarding ova cryopreservation after implementing educational program with a highly statistically significant difference at (P= ≤ 0.001). As evidence, (42.0%) of the studied students have positive beliefs regarding ova cryopreservation pre implementing educational program. While improved to the majority (91.0%) after implementing educational program. with significant improvement in total mean beliefs score from 6.28 ± 2.01 to 10.87 ± 0.94 after program implementation..

**Table (3):** showed that, there was a marked improvement in all items of students' barriers regarding ova cryopreservation after implementing educational program with a highly statistically significant difference at (P= ≤ 0.001). As evidence, more than two fifth (41.5%) of the studied students agreed that ova cryopreservation should be used with the consent of husband after marriage pre implementing educational program. While improved to the majority (95.5 %) after implementing educational program.

**Figure (3):** showed the distribution of the studied students according to Lack of knowledge about ova Cryopreservation may be prevent women from freezing her egg. It was revealed that, pretest of 43.0% of the studied students agree with Lack of knowledge about

ova Cryopreservation may be prevent women from freezing her egg while posttest of 95.0% of the studied students agree with Lack of knowledge about ova Cryopreservation may be prevent women from freezing her egg.

**Table (4):** showed the total students' barriers regarding ova cryopreservation at pre and post implementation of educational program. It clarified that, there was a marked improvement in total students' barriers regarding ova cryopreservation after implementing educational program with a highly statistically significant difference at ( $p < 0.001$ ). As evidence, more than one-third (37.5%) of the studied students have satisfactory response towards barriers regarding ova cryopreservation pre implementing educational program. While improved to the majority (87.0%) after implementing educational program. With observation, the total mean barriers score improved from  $6.42 \pm 1.81$  to  $11.21 \pm 1.14$  with statistical significant difference.

**Table (5):** concerned the relationship between students' beliefs and their demographic data. It showed that, there were statistically significant relation between total students' beliefs and their socio-demographic data as age, academic year, parents' education level and if have background about ova cryopreservation at pre and post implementation of educational program at ( $P = < 0.05$ ). While, there was no statistically significant relation with their residence and marital status at pre and post implementation of educational program at ( $P = > 0.05$ ).

**Table (6):** presented the relationship between students' barriers and their demographic data. It showed that, there were statistically significant relation between total students' barriers and their socio-demographic data as age, academic year, parents' education level and if have background about ova cryopreservation at pre and post implementation of educational program at ( $P = < 0.05$ ). While, there was no statistically significant relation with their residence and marital status at pre and post implementation of educational program at ( $P =$

$> 0.05$ ).

**Table (7):** showed that, there were high significant statistical positive correlation between students' beliefs and barriers regarding ova cryopreservation at pre and post implementation of educational program at ( $p < 0.001$ ).

#### Discussion:

An ART that protects the chance to procreate later in life is ova cryopreservation (OC). Initially, this technology was only employed for medical purposes, such as when a woman had a medical condition or required treatment (such as chemotherapy or radiation therapy) that would endanger her fertility. Over the past ten years, OC has grown in relevance as a strategy to preserve fertility for reasons other than obvious medical ones. The terms "social egg freezing," "non-medical egg freezing," "elective" or "planned oocyte cryopreservation" are frequently used to describe this. (*Kanters ., 2022*)<sup>(15)</sup>.

This study was designed with the following assumptions: Nursing students' beliefs and barriers regarding ova cryopreservation will be significantly improved after implementation of an educational program. The study's findings showed that these assumptions were correct, and the improvement in nursing students' beliefs and barriers was statistically significant, supporting the research hypothesis.

**Regarding demographic characteristics,** the current study related to the academic year revealed that most of the nursing students are from the second year, but the least number are from the fourth year. This result disagree with (*Hasab Allah, et al ., 2021*)<sup>(13)</sup> In a study on the effects of educational guidelines on nursing students' knowledge, attitudes, and beliefs regarding oocyte cryopreservation at Minia University in Egypt, it was discovered that first-year nursing students make up the majority of the student body, while third-year nursing students make up the least amount.



The overall student population's beliefs on ova cryopreservation both before and after the educational program's implementation are relevant to the research hypothesis. The study's findings demonstrated that there were statistically significant differences across all study domains ( $p < 0.001$ ).

To the claim "If a woman is not ready to have a child in her 20s or 30s, she should think about preserving her fertility through ova cryopreservation," Only half of nursing students agreed in the current study's pre evaluation, however virtually all nursing students agreed in the post evaluation. This result in agreement with ( *Daniluk & Koert, 2016*)<sup>(16)</sup> study on Oocyte freezing for younger women who weren't ready to have children is supported by 66% of childless women who indicated they 'probably' or 'certainly' favour the practice. The younger women in the study also supported the practice. According to the current study, 65% of nursing students agreed on the pretest and 91.5% agreed on the posttest addressing the question of whether a woman can freeze her eggs if she hasn't yet met a compatible spouse. This finding is consistent with that of a study by ( *Jones et al. 2020*)<sup>(17)</sup> conducted in the UK, which found that 60% ( $n = 56$ ) of participants "definitely" thought that not having a partner affected their choice. Also in this regard ( *Zhou , et al 2022*)<sup>(18)</sup> About 60% of those surveyed in an eastern China study on Chinese college students' perceptions and attitudes about elective egg freezing thought that being married shouldn't be a prerequisite for egg freezing.

As well ( *Platts et al, 2021*)<sup>(19)</sup> According to the study, the most common motivation for planned oocyte cryopreservation is the absence of a partner. The current study found that just 31% of nursing students agreed with the claim that "Babies born using ova cryopreservation are normal babies" before the exam, but that number rose to 90% after the test. This study supported by ( *Mayeur , et al ., 2021*)<sup>(20)</sup> study in France to assess Two healthy babies were born from oocyte cryopreservation after in vitro maturation (IVM) carried out in the context of

breast cancer, according to the results of frozen oocytes or embryos cryopreserved after controlled ovarian stimulation (COS) or in vitro maturation (IVM) for female cancer patients who underwent a fertility preservation (FP) before gonado toxic therapy. As a result, there were 13.3% (2/15) live births per patient (LBR).

Furthermore, in the study by ( *Van Reckem et al. 2021*)<sup>(21)</sup> When compared to peers born after fresh oocyte donation, the congenital anomaly rates of 2-year-old infants born after vitrified oocyte donation were lower than those observed in the fresh oocyte group. On the contrary ( *Pan et al .,2022*)<sup>(22)</sup> According to a study regarding The Effect of Freezing Twice During Assisted Reproductive Technology on Perinatal and Neonatal Outcomes, patients who underwent frozen oocyte (FET) had a greater stillbirth rate than those who underwent frozen-thawed embryo transfer. According to the most recent survey, 93% of nursing students who were evaluated agreed that egg donation after freezing was illegal. This disagree with study of ( *Bracewell-Milnes , et al ., 2021*)<sup>(23)</sup> It sought to determine how well-informed and what attitudes women in the general public had towards fertility, egg donation, and egg sharing, and which found that 86.0% of respondents approved with egg donation when given an objective, educational statement about the program. The many cultures and religions are to blame for this.

According to the current study, all of the students' beliefs about ova cryopreservation have significantly decreased after the implementation of an educational program, with a highly statistically significant difference at ( $P < 0.001$ ). Two fifths (43.0%, respectively) of the students who participated in the study believed that a lack of awareness regarding ova cryopreservation would deter women from storing their eggs prior to the implementation of an educational program. While improved to the majority (95.0%, respectively) after implementing educational program This result consistent with study carried by ( *Kim, et al ., 2022*)<sup>(24)</sup> regarding knowledge, intentions, and

attitudes about planned oocyte cryopreservation among female medical staff, who reported that respondents believed that lack of knowledge would be a significant barrier to embracing the surgery (57.6%).

Regarding to statement of religious is consider barriers for ova cryopreservation, the study of (*Fahmy & Mohamed ., 2021*)<sup>(14)</sup> At South Valley University in Egypt, a study on the knowledge, attitudes, and barriers of single female bridging program nurses regarding egg freezing revealed that 71.1% of the students thought that religious beliefs were obstacles to performing egg freezing. However, the current study revealed that the majority of nursing students disagreed with this conclusion after receiving their post-evaluation results. The results of the current survey showed that almost all of the students disagreed with the statement that everyone cannot afford ova cryopreservation since it is so expensive. This finding in agreement with the result reported by (*Inhorn, et al., (2019)*)<sup>(25)</sup>, who stated that the majority of the study's female participants were highly-paid professionals who could afford to pay the direct costs of elective egg freezing (EEF) in the USA.

The current study revealed that there was high significant statistical positive correlation between students' beliefs and barriers regarding ova cryopreservation at pre and post implementation of educational program. This result is matching with study of (*Hasab Allah et al ., 2021*)<sup>(13)</sup> which aimed to evaluate the impact of educational guideline on nursing students' knowledge, beliefs and attitudes toward oocyte cryopreservation and revealed that there was moderate positive correlation between beliefs and attitudes about oocyte cryopreservation of studied students.

❖ **Conclusion:**

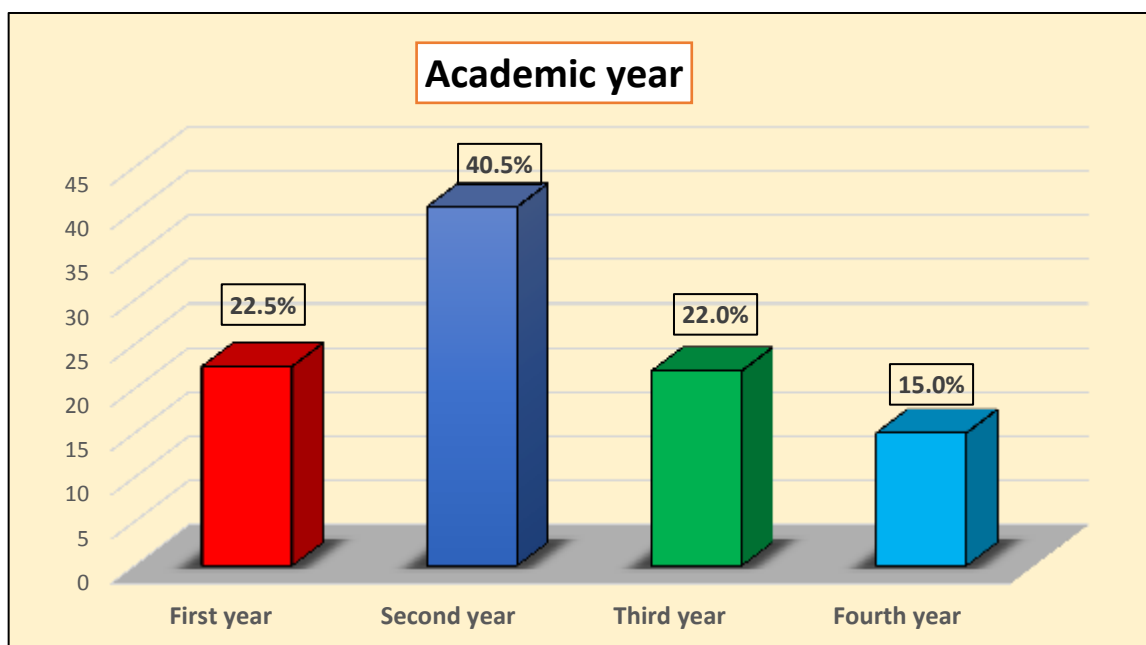
It can be concluded based on the current study's results and the validation of the research hypothesis that there was a highly statistically significant improvement in all nursing students' beliefs towards ova cryopreservation and their perceived barriers to it, both before and after

the instructional program was implemented ( $p < 0.001$ ). Also there was high significant statistical positive correlation between students' beliefs and barriers regarding ova cryopreservation at pre and post implementation of educational program ( $p < 0.001$ ).

**Recommendation:**

**In the light of the result of the present study, the following recommendations are suggested:**

- ❖ All students, both those studying medicine and those who aren't should have access to a concise and in-depth guide on ova cryopreservation.
- ❖ There is a need to assist and strengthen the infrastructure for introducing services and providing financial support for fertility preservation.
- ❖ **Further researches are required to performed :**
  - A larger probability sample from various geographic locations being used in the study's replication to aid in the result's generalization. Studies involving couples in premarital counselling and family members in various maternal and child health centers (MCH) to increase knowledge of ova cryopreservation to enhance their quality of life later on and to eliminate obstacles related to them.



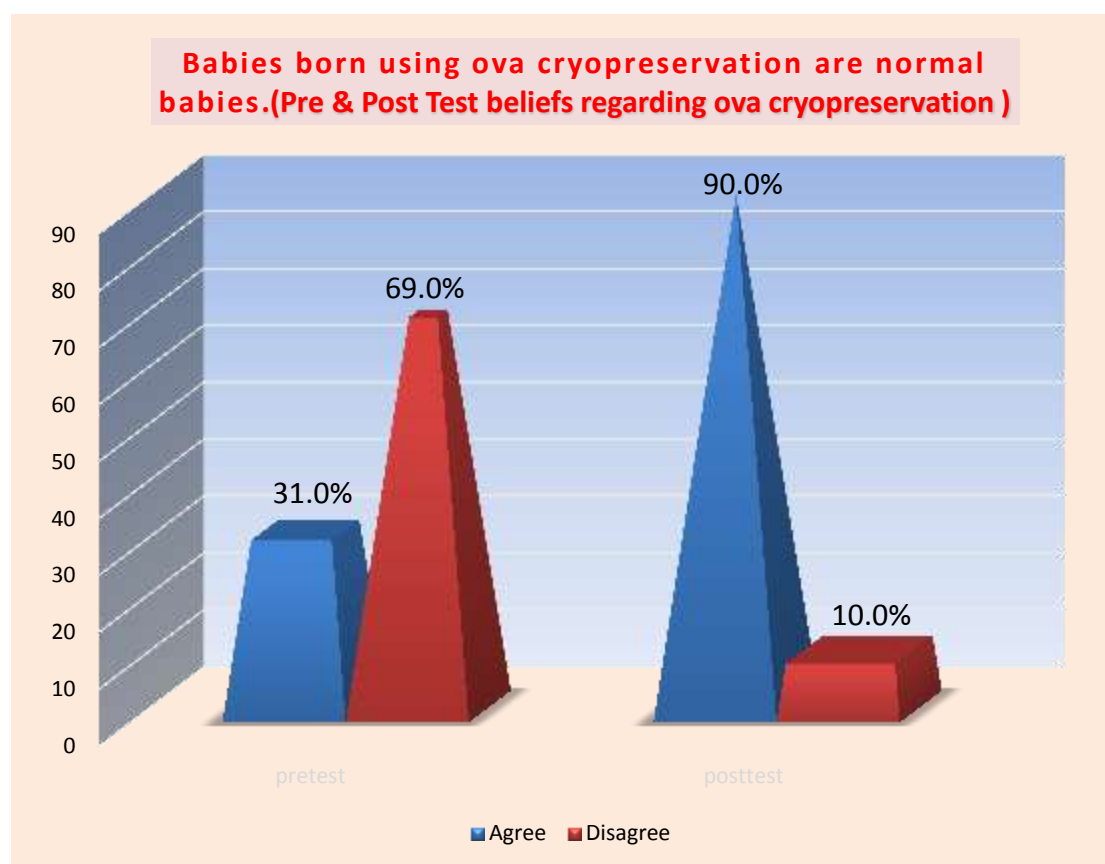
**Figure (1):** Percentage distribution of the studied students according to their academic year (n=200).

**Table (1):** Comparison between students' beliefs regarding ova cryopreservation at pre and post implementation of educational program (n=200).

Items	Pre program				Post program				X <sup>2</sup>	P-value
	Agree		Disagree		Agree		Disagree			
	No.	%	No.	%	No.	%	No.	%		
a woman should consider preserving her fertility through ova cryopreservation for future pregnancy .	108	54.0	92	46.0	193	96.5	7	3.5	21.07	0.000**
*Woman should freeze her eggs if she had cancer.	75	37.5	125	62.5	191	95.5	9	4.5	24.15	0.000**
*Woman can freeze her eggs if she had not yet found a suitable partner.	130	65.0	70	35.0	183	91.5	17	8.5	16.99	0.000**
*Ova cryopreservation is forbidden by your religion	72	36.0	128	64.0	12	6.0	188	94.0	28.87	0.000**
*The frozen eggs remain usable for about 5-10 years.	85	42.5	115	57.5	185	92.5	15	7.5	26.10	0.000**
*Babies born using ova cryopreservation are socially acceptable.	102	51.0	98	49.0	187	93.5	13	6.5	29.85	0.000**
* Importance of confidence	75	37.5	125	62.5	186	93.0	14	7.0	27.41	0.000**

<b>in the physicians and the laboratory staff who are involved in the storage.</b>										
<b>* Ova cryopreservation is not affordable/ accessible</b>	98	49.0	102	51.0	13	6.5	187	93.5	23.74	0.000**
<b>*Ova cryopreservation is an emotional burden</b>	90	45.0	110	55.0	15	7.5	185	92.5	26.91	0.000**
<b>*Ova cryopreservation is not very attractive, as the success rate is very low.</b>	95	47.5	105	52.5	13	6.5	187	93.5	25.00	0.000**
<b>*Egg donation after freezing is legally prohibited</b>	75	37.5	125	62.5	186	93.0	14	7.0	27.40	0.000**
<b>*Social acceptance and culture may effect on decision making toward ova cryopreservation</b>	67	33.5	133	66.5	185	92.5	15	7.5	37.90	0.000**

$\chi^2$ : Chi Square Test. (\*) Reverse score. (\*\*) highly statistically significant at  $p < 0.001$ .



**Figure (2):** Percentage distribution of the studied students according to their beliefs

about Babies born using ova cryopreservation are normal babies.

**Table (2):** Comparison between total students' beliefs regarding ova cryopreservation at pre and post implementation of educational program (n=200).

Levels of total beliefs	Pre program		Post program		X <sup>2</sup>	p-value
	No.	%	No.	%		
Positive beliefs	84	42.0	182	91.0	21.79	0.000**
Negative beliefs	116	58.0	18	9.0		
Mean ±SD	6.28 ± 2.01		10.87 ± 0.94		t=13.56	0.000**

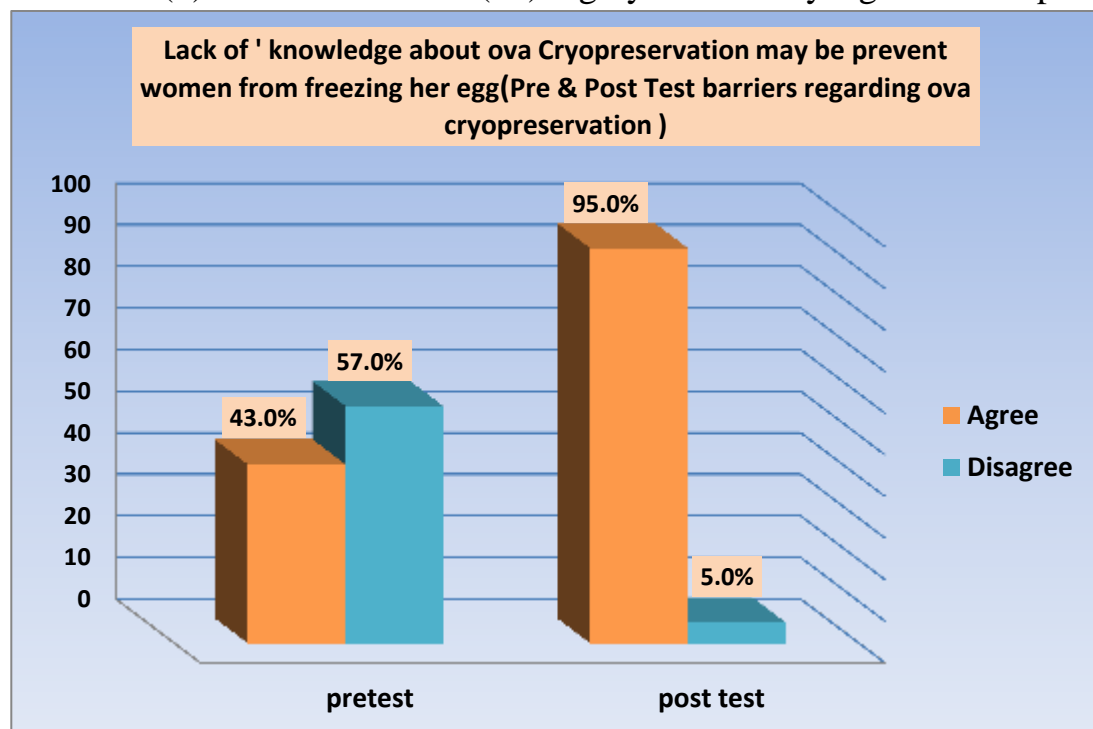
t= Paired t. test. X<sup>2</sup>: Chi-square. \*\*highly significant at p < 0.001.

**Table (3):** Comparison between students' barriers regarding ova cryopreservation at pre and post implementation of educational program (n=200).

Items	Pre program				Post program				X <sup>2</sup>	P-value
	Agree		Disagree		Agree		Disagree			
	No.	%	No.	%	No.	%	No.	%		
* Fear for future husband refusal may be prevent the women from freezing her egg	142	71.0	58	29.0	41	20.5	169	79.5	21.87	000**
*Adolescence is a difficult time to make decisions for ova cryopreservation	85	42.5	115	57.5	185	92.5	15	7.5	1.55	000**
* Religious is consider barriers for ova cryopreservation	126	63.0	74	37.0	19	9.5	181	90.5	9.86	000**
*Ova cryopreservation do not apply in Egypt	115	57.5	85	42.5	21	10.5	179	89.5	1.31	000**
* Ova cryopreservation is very expensive and therefore cannot be feasible to anyone	136	68.0	64	32.0	13	6.5	187	93.5	6.80	000**
* Eggs are the largest cells in the human body which make freezing and thawing quite difficult	128	64.0	72	36.0	25	12.5	175	87.5	6.40	000**
*Ova cryopreservation decreases future fertility	95	47.5	105	52.5	17	8.5	183	91.5	8.55	000**

*Age at 50 year is consider barriers for ova cryopreservation	130	65.0	70	35.0	188	94.0	12	6.0	7.90	000**
* Ova Cryopreservation influence on daily habits and working activity	111	55.5	89	44.5	21	10.5	179	89.5	0.31	000**
*ova cryopreservation should be used with the consent of husband	83	41.5	117	58.5	191	95.5	9	4.5	7.55	000**
* Ova Cryopreservation lead to loss of virginity for single women	105	52.5	95	47.5	18	9.0	182	91.0	0.30	000**
* Ova cryopreservation make women more prone to moral criticism	115	57.5	85	42.5	15	7.5	185	92.5	7.88	000**
* Egg may mixed with another women's eggs.	107	53.5	93	46.5	17	8.5	183	91.5	1.12	000**

$\chi^2$ : Chi Square Test. (\*) Reverse score. (\*\*) highly statistically significant at  $p < 0.001$ .



**Figure (3):** Percentage distribution of the studied students according to lack of knowledge about ova Cryopreservation affect women decision to freeze her egg (n=200).

**Table (4):** Comparison between total students' barriers regarding ova cryopreservation at pre and post implementation of educational program (n=200).

Levels of total barriers	Pre program		Post program		X <sup>2</sup>	p-value
	No.	%	No.	%		
Satisfactory response	75	37.5	174	87.0	26.93	0.000**
Unsatisfactory response	125	62.5	26	13.0		
Mean ±SD	6.42 ± 1.81		11.21 ± 1.14		t=15.84	0.000**

t= Paired t. test. X<sup>2</sup>: Chi-square. \*\*highly significant at p < 0.001.

**Table (5): Relationship between demographic characteristic of the studied students and their beliefs regarding ova cryopreservation at pre and post implementation of educational program (n=200).**

Demographic characteristic		Levels of total beliefs at pre program				X <sup>2</sup>	P-Value	Levels of total beliefs at post program				X <sup>2</sup>	P-Value
		Positive beliefs (n=84)		Negative beliefs (n=116)				Positive beliefs (n=182)		Negative beliefs (n=18)			
		No.	%	No.	%			No.	%	No.	%		
Age (year)	18-19	18	21.4	102	87.9	9.869	0.038*	109	59.9	11	61.1	11.15	0.030*
	20-21	50	59.5	12	10.4			55	30.2	7	38.9		
	≥ 21	16	19.1	2	1.7			18	9.9	0	0.0		
Academic year	First year	5	6.0	40	34.5	7.965	0.048*	35	19.2	10	55.6	12.96	0.019*
	Second year	13	15.5	68	58.6			75	41.2	6	33.3		
	Third year	40	47.6	4	3.5			42	23.1	2	11.1		
	Fourth year	26	30.9	4	3.5			30	16.5	0	0.0		
Residence	Urban	70	83.3	64	55.2	1.589	0.243	124	68.1	10	55.6	1.140	0.310
	Rural	14	16.7	52	44.8			58	31.9	8	44.4		
Marital status	Married	25	29.8	50	43.1	1.997	0.212	68	37.4	7	38.9	2.055	0.201
	Not married	59	70.2	66	56.9			114	62.6	11	61.1		
Parents' education level	Illiterate	0	0.0	18	15.5	13.52	0.012*	9	4.9	9	50.0	13.01	0.015*
	Primary education	0	0.0	14	12.1			7	3.8	7	38.9		
	Preparatory education	2	2.4	12	10.3			12	6.6	2	11.1		
	Secondary education	32	38.1	48	41.4			80	44.0	0	0.0		
	University education	50	59.5	24	20.7			74	40.7	0	0.0		

<b>Do you have background about ova cryopreservation</b>	Yes	50	59.5	36	31.0	<b>10.56</b>	<b>0.025*</b>	84	46.2	2	11.1	<b>12.00</b>	<b>0.013*</b>
	No	34	40.5	80	69.0			98	53.8	16	88.9		

No significant at  $p > 0.05$ .

\* Statistically significant at  $p < 0.05$ .

\*\*Highly statistically significant at  $p < 0.001$ .

Demographic characteristic		Levels of total barriers at pre program				X2	P-Value	Levels of total barriers at post program				X2	P-Value
		Satisfactory response (n=75)		Unsatisfactory response (n=125)				Satisfactory response (n=174)		Unsatisfactory response (n=26)			
		No.	%	No.	%			No.	%	No.	%		
<b>Age (year)</b>	18-19	12	16.0	108	86.4	<b>10.08</b>	<b>0.035*</b>	104	59.8	16	61.5	<b>9.582</b>	<b>0.040*</b>
	20-21	48	64.0	14	11.2			52	29.9	10	38.5		
	≥ 21	15	20.0	3	2.4			18	10.3	0	0.0		
<b>Academic year</b>	First year	4	5.3	41	32.8	<b>7.841</b>	<b>0.049*</b>	31	17.8	14	53.8	<b>10.91</b>	<b>0.022*</b>
	Second year	10	13.3	71	56.8			71	40.8	10	38.5		
	Third year	36	48.0	8	6.4			42	24.1	2	7.7		
	Fourth year	25	33.4	5	4.0			30	17.3	0	0.0		
<b>Residence</b>	Urban	65	86.7	69	55.2	<b>1.800</b>	<b>0.220</b>	120	69.0	14	53.8	<b>1.009</b>	<b>0.329</b>
	Rural	10	13.3	56	44.8			54	31.0	12	46.2		
<b>Marital status</b>	Married	20	26.7	55	44.0	<b>1.700</b>	<b>0.230</b>	65	37.4	10	38.5	<b>2.958</b>	<b>0.196</b>
	Not married	55	73.3	70	56.0			109	62.6	16	61.5		
<b>Parents' education level</b>	Illiterate	0	0.0	18	14.4	<b>14.00</b>	<b>0.010*</b>	5	2.9	13	50.0	<b>15.41</b>	<b>0.000**</b>
	Primary education	0	0.0	14	11.2			5	2.9	9	34.6		
	Preparatory education	2	2.7	12	9.6			10	5.7	4	15.4		
	Secondary	27	36.0	53	42.4			80	46.0	0	0.0		



	education												
	University education	46	61.3	28	22.4			74	42.5	0	0.0		
<b>Do you have background about ova cryopreservation?</b>	Yes	65	86.7	21	16.8	<b>12.94</b>	<b>0.012*</b>	84	48.3	2	7.7	<b>14.99</b>	<b>000**</b>
	No	10	13.3	104	83.2			90	51.7	24	92.3		

**Table (6):** Relationship between demographic characteristic of the studied students and their barriers regarding ova cryopreservation at pre and post implementation of educational program (n=200).

No significant at  $p > 0.05$ .

\* Statistically significant at  $p < 0.05$ .

\*\*Highly statistically significant at  $p < 0.001$ .

**Table (7):** Correlation between total students' beliefs and barriers regarding ova cryopreservation at pre and post implementation of educational program (n=200).

Variables		Total students' beliefs	
		Pre program	Post program
<b>Total students' barriers</b>	<b>r</b>	0.518	0.602
	<b>p</b>	0.000**	0.000**

R= correlation coefficient test. P= p-value \*\*highly significant at  $p < 0.001$ .

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