

Effect of Educational Program on University Nursing Students' Knowledge Regarding Ova Cryopreservation Technology
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Abstract

Background: Over the past ten years, ova cryopreservation technology has advanced substantially, allowing women greater choices for their future reproductive lives. **Aim of the study:** Evaluate effect of educational program on university nursing students' knowledge regarding ova cryopreservation technology. **Subjects and Method: Research design:** Quazi experimental design (pre & posttest) was adopted to carry out this study. **Setting:** The study was conducted at faculty of nursing, at Zagazig University. **Subjects:** Multistage cluster random sample composed of 200 nursing students. **Tools of data collection:** Two tools were used for data collection. **Tool I:** A structured interviewing questionnaire which composed of demographic Characteristic. **Tool II:** Knowledge Assessment Tool (pre/post) **Results:** The study's findings indicated that overall student understanding of ova cryopreservation had changed significantly ($P \leq 0.001$) after the implementation of an educational program. Only 9.0% of the students who were studied prior to the implementation of the educational program had a fair level of overall understanding of ova cryopreservation. After the implementation of the instructional program, the majority (85.0%) had changed. **Conclusion:** It was concluded that educational program significantly improve university nursing student's knowledge regarding ova cryopreservation technology. **Recommendations:** A simplified and comprehensive booklet about ova cryopreservation should be available for all students, More efforts needed by the health care system, educational institutions, and all public media to reduce the gab in fertility awareness between the youth.

Key words: Educational program, knowledge, Ova cryopreservation.

Introduction

Ova cryopreservation (OC) is a technique used to freeze and store women's eggs so it can be used in later IVF cycles. The experimental status of OC was removed by **the American Society of Reproductive Medicine and the European Society for Human Reproduction and Embryology in 2012** because it now IVF pregnancy rates are equivalent to those reached with fresh oocytes, allowing women to freeze and keep oocytes with a realistic chance of becoming pregnant later. OC is also known as oocyte cryopreservation or egg freezing. ⁽¹⁾

Ova cryopreservation (OC) is defined as a process carried out to preserve a woman's eggs for use in subsequent reproductive treatments.

A woman's eggs are stimulated, collected, frozen, and then stored during the procedure. Similar to IVF, collecting eggs for OC requires injecting hormones into the ovaries for a few weeks to induce the production of numerous eggs. When the eggs are ready, the patient has them removed and frozen. The procedure usually takes two weeks. There are two techniques for OC: the time-tested SF technique or the more contemporary OV flash-freezing technique. The conventional approach is slower and more likely to result in ice crystals, which can harm the egg and lower the birth rate. The more recent verification technique is now frequently utilized since it is substantially more productive ⁽²⁾.

Four types of women are listed in the most recent guidelines as candidates for fertility preservation (FP): 1. post-pubertal women with cancer who are receiving gonadotoxic therapies, 2. Conditions that will cause them to lose their fertility prematurely, such as Turner syndrome. 3. Post-pubertal women with benign conditions who are receiving gonadotoxic treatments (including surgery). 4. Patients who are transgender (born female) and 5. Women who request OC for age-related infertility⁽³⁾.

It is thought that a woman's fertility decline happens throughout the course of her lifetime, with a minor increase in the rate of decrease starting after the age of 32 and a more pronounced and faster loss of eggs starting after the age of 37. The quantity and quality of a woman's eggs decrease as she gets older, which has a big impact on her capacity to conceive on her own and carry a healthy pregnancy to term. In fact, studies have revealed that a woman's likelihood of becoming pregnant decreases as she ages⁽⁴⁾.

There are no extra recognized concerns related to freezing, despite the fact that numerous pregnancies and the aftereffects of prematurity, such as cerebral palsy, provide the biggest risks to kids after reproductive treatment with OC. These concerns should be taken into account by women who plan to use their own frozen eggs at a later age. In particular, the risk of multiple pregnancy, which is correlated with age (as a measure of egg quality) at storage, should be reduced by using a single embryo transfer technique. Pre-eclampsia, gestational diabetes, and the possibility of a caesarean section are among the major obstetric hazards associated with pregnancy at a later age, especially in a first pregnancy.⁽⁵⁾

Measurements of a person's reproductive potential in relation to the

number of surviving oocytes are referred to as ovarian reserve tests. When compared to the best assays for quantitative ovarian reserve are histological evaluation of primordial follicle counts, measurement of follicle stimulating hormone (FSH), luteinizing hormone (LH), estradiol (E2), serum anti-Mullerian hormone (AMH), and antral follicle count (AFC) by ultrasound.⁽⁶⁾ Additionally, blood tests for determining blood group, rhesus factor and coagulation screening, and infectious disease testing for syphilis, hepatitis B, hepatitis C, and HIV are advised⁽⁷⁾.

The endometrium was prepared using the hormone replacement therapy (HRT) cycle and the natural cycle for frozen-thawed embryo transfer (FET). Patients began receiving 2 to 8 mg/day of oral estradiol valerate (Progynova, Bayer, Germany) for the HRT cycle on the third day of the menstrual cycle. Transvaginal ultrasonography was used to track endometrial growth starting on day 12 and to evaluate serum hormone levels. When endometrial thickness was less than 8 mm and the duration of estrogen application was less than 12 days, two of these progestogens, such as oral DYG (20 mg/day), vaginal progesterone gel (90 mg/day; Crinone; Merck Serono, Germany), or progesterone injection (60 mg/day; Xian Ju; Zhejiang Xianju Pharmaceutical Co., Ltd.), were used.⁽⁸⁾

Despite being extensively tested, widely used, and generally regarded as safe, OC techniques still contain some dangers. Ovarian hyperstimulation syndrome (OHSS) is one of the most often seen side effects of OS medication. In its mildest form, OHSS is an iatrogenic side effect of the ovarian stimulation process and causes bloating and abdominal discomfort. Additional hazards of the OC procedure include bleeding and infection following damage to the intra-peritoneal tissues during ova

retrieval OR as well as bladder, bowel, or artery perforation and, in very rare cases, the danger of ovarian torsion from larger ovaries. ⁽⁹⁾

In order to talk to patients who are interested in this service regarding fertility preservation, nurses need to be aware of the available cryopreservation options. To maximise prospects for the future, it is essential to provide accurate information, counselling, and clear referral pathways to guarantee fast, appropriate access to fertility services. To avoid cross-contamination of stored samples, patients must be tested for transmissible viruses before gamete cryopreservation. Additionally, individuals must specify how long their gametes will be stored and provide written, informed consent. Although gametes can sometimes be preserved for up to 55 years, the typical storage period for eggs and sperm is 10 years ⁽¹⁰⁾.

Significance of the Study:

According to estimates from the World Health Organisation (WHO), 80 million people worldwide are infertile. In their lifetime, 10%–15% of couples experience it ⁽¹¹⁾. Nurses need to be knowledgeable with ova cryopreservation for a variety of reasons, including spreading awareness among the public, working in ova cryopreservation facilities, and being a recipient of ova cryopreservation. In order to assess the impact of educational programs on nursing students' understanding of 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 university nursing students' knowledge regarding ova cryopreservation technology.

Research hypothesis:

Knowledge among nursing students regarding ova cryopreservation will be improved after the application of educational program.

Subjects and Method:

Research design:

The pre- and post-test quazi experimental design was used to conduct this study.

Study Setting:

This research was done at Zagazig University's El-Sharkia government's nursing faculty. The faculty building is separated into five sections: the first section (ground floor) is used for administrative offices, the second section is used for faculty staff offices, and the third, fourth, and fifth sections are used for practical laboratory spaces and lecture halls for each academic year.

Study Subjects:

Multistage cluster random sample will be utilized to collect the sample 1st, 2nd, 3rd and 4th academic grade of the female faculty student who accepts 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.

- **Sample size calculation:**

Number of nursing students' 1st, 2nd, 3rd and 4th academic grade were 875, 1553, 844, 581 respectively, total number equal 3853 students. 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 1st, 2nd, 3rd and 4th academic grade
 δ = interclass correlation for the statistic.

n = average size of the cluster.

Tool for data collection:

Two tools were used to gather the information required to meet the study's objectives:

Tool I: A Structured Interviewing questionnaire:

The researcher created this questionnaire after reading through

the pertinent literature. It was created in English and then translated into a straightforward Arabic language to gather the information needed to meet the study's objectives. There were two components:

Part (I): demographic characteristic:

Age, academic year, residence, marital status, parents' educational background, knowledge of ova cryopreservation, and source of knowledge of ova cryopreservation are among the seven questions used to gather information about the demographic characteristics of the students under study.

Tool II: Knowledge Assessment Tool (pre/post):

It was designed to test students' knowledge of ova cryopreservation. It consists of 23 multiple-choice questions (MCQs) on topics such as definition, types, indication, suitable age for freezing, number of eggs to freeze, ova cryopreservation procedure, including egg retrieval procedures, temperature required for the egg storage process, needed laboratory tests, hormonal therapy for ova cryopreservation, complications, and statements from Dar Al-Ifra that permit using ova cryopreservation.

Scoring system of students' knowledge:

The total score was ranged from (0-23) grade for each item and was assigned : a score 1 was given for correct answer and a score 0 was given for incorrect answer or don't know answer.

Total knowledge regarding ova cryopreservation based on the statistical analysis was calculated as :

- 1- Poor or insufficient knowledge :< 50% (less than 11.5)
- 2- Average or moderate knowledge: from 50 - 75% (from 11.5- 17)
- 3- Good knowledge: >75% (more than 17).

Content Validity and Reliability:

One professor from the

obstetrics and gynecological nursing department and two assistant professors from the same department examined the tools for its simplicity, clarity, comprehensiveness, and applicability. Their judgement was used to implement all suggested changes to the tool. In addition, the guided handbook's revision and validation were done by the same specialists. All changes have been made. Cronbach's alpha test was used to determine the tools' reliability, and the findings showed that they were 0.824 for each item.

Pilot study

A pilot research was carried out on a sample of 20 students (10%) of the entire sample, who met the predetermined criteria. These were excluded from the sample size overall. The goal of the pilot study was to determine its viability and to spot any statement-specific issues like problems with sequence and clarity.

Field work:

To fulfil the aim of the study, The following phases were adopted: assessment phase, planning phase, implementation phase and evaluation phase. These phases were carried out from 1st of October 2022 to the end of March 2023 over 6 months.

❖ **Assessment phase:**

This phase included the initial interviewing of the 200 studied students to gather baseline data. The researcher welcomed all students and provided information about the purpose, duration, instructions for filling out the questionnaire, and activities of the study before the interview began. This was done in the lecture hall of Faculty of Nursing at Zagazig University. They have been informed that their participation is optional and that they have the choice to stop at any moment. The majority of the students gave their agreement orally. Each student was given a self-administered questionnaire to evaluate their demographic traits and ova cryopreservation expertise. To

prevent being influenced by others, they were requested to fill it out on their own. The research was entirely voluntary. Average time for the completion of each studied student self-administered questionnaire was around (30 minutes).

❖ **Planning Phase :**

The researcher created the intervention program and session content in accordance with evaluating the students' knowledge, relating oocyte cryopreservation, using pretest questions sheet, based on the results received from the assessment phase and pertinent evaluation of literature.

The students were divided into four groups (one for each academic year) according to their availability and free time in order to facilitate their attendance at the sessions. The researcher aimed to facilitate the use of the teaching method before implementing the educational sessions, the number of the students (45, 81, 44, 30 students from 1st, 2nd, 3rd and 4th academic grade) . For a month, the content 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. These lessons were put into practice at the nursing faculty lecture hall at Zagazig University.

❖ **Implementation phase :**

Implementing the educational sessions continued over the course of sixteen weeks. The students were divided into four smaller groups. Additionally to the 8 weeks that were designated for students who did not show up for class at the scheduled time for each academic grade. These students were divided into two groups. This allocation in accordance with their free time, theoretical lectures, and practical portions is done to make

it easier for them to attend the sessions and complete their academic obligations.

These sessions were applied at the educational lecture in faculty of nursing at Zagazig University. Each set of students received the material in four interactive sessions, one "once a week" for four weeks. Each session lasted roughly an hour (60 min), during which a PowerPoint presentation was made and backed with videos and pictures, followed by a group discussion.

In order to aid students' comprehension and grab their attention, straightforward explanation language, visual aids, educational booklet and supplies of pens and notes were given to the students. All of the most recent data about ova cryopreservation is contained in the educational pamphlet. Feedback was given at the conclusion of each session and at the start of each one regarding the previous one to make sure the student had understood the material and to re-explain any concepts they had trouble understanding.

❖ **Evaluation Phase:**

The researcher asked the students to complete a post-test at the conclusion of the final session using a knowledge questionnaire format to compare their knowledge before and after the educational sessions in order to measure the effect of the educational sessions on students' knowledge regarding ova cryopreservation.

The study's limitation was that sessions occasionally dragged on because of clinical schedule conflicts that necessitated additional time.

Ethical consideration and Administrative design:

The faculty of nursing at Zagazig University's scientific and ethical committee provided their ethical approval. Each nursing student was informed of the study's purpose prior to their participation. Following oral agreement, nursing students

freely signed up for the program. The participant's anonymity was preserved, the confidentiality of any information gathered was guaranteed, and the study procedures had no negative effects on the participating nursing students. The nursing students were made aware that the information gathered would only be utilised for research purposes and that they had the right to leave the study at any time and without providing a reason.

After describing the goal of the study to the relevant authorities in the study setting, an official letter was submitted to request authorization for data collection from the dean of the nursing faculty at Zagazig University.

Statistical design:

Data will be arranged, categorized, tabulated and analyzed using appropriate statistical tests. The statistical analysis of data was done by using the computer software of Microsoft Excel Program and Statistical Package for Social Science (SPSS) version 25. Data were presented using descriptive statistics in the form of frequencies and percentage for categorical data, the arithmetic mean (\bar{X}) and standard deviation (SD) for quantitative data. Qualitative variables were compared using chi square test (χ^2).

Degrees of significance of results were considered as follows:

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

Results:

Table (1): showed the distribution of the studied students according to their demographic characteristic. It was observed that, 81.0% of the studied students were aged <20 years old with mean age 19.43 ± 0.609 years. Also, two thirds (67.0%) of the studied students reside at urban areas. Moreover, more than three fifth (62.5%) of them are not married. Furthermore, two fifth (40.0%) of the studied students whose parents have

secondary education.

Figure (1): showed the distribution of the studied students according to have background about Ova Cryopreservation. It was revealed that, 72.0% of the studied students did not have background about Ova Cryopreservation while 28.0 % of the studied students had background about Ova Cryopreservation.

Figure (2): showed the distribution of the studied students according to sources of background about ova cryopreservation. It was revealed that, the internet represent 80.4% as a main source, books represent 32.1%, television represent 25.0%, health care worker represent 7.1% and friends represent 3.6% from source of background about ova cryopreservation.

Table (2): showed the students' knowledge regarding ova cryopreservation. It clarified that, After implementing the instructional program, all of the students' understanding of ova cryopreservation significantly improved, with a highly statistically significant difference. at ($P = \leq 0.001$). As evidence, (8.0% and 11.0%, respectively) of the studied students have correct knowledge about the number of required ova for ova cryopreservation and The temperature required for the ova storage process pre implementing educational program. While improved to (91.0% and 92.0%, respectively) after implementing educational program.

Table (2) continue: showed that, following the implementation of an educational program, there was a considerable improvement in all areas of students' understanding related ova cryopreservation, with a highly statistically significant difference. at ($P \leq 0.001$). As evidence, (21.0% and 27.5%, respectively) of the studied students have correct knowledge the Age is not the best indication of fertility; general health and fitness level are and Dar Al-Ifta statements

that permissible for using ova cryopreservation pre implementing educational program. While improved to the majority (90.0% and 91.0%, respectively) after implementing educational program.

Table (3): displayed the total students' knowledge regarding ova cryopreservation at pre and post implementation of educational program. It clarified that, there was a marked improvement in total students' knowledge regarding ova cryopreservation after implementing educational program with a highly statistically significant difference at ($P = \leq 0.001$). As evidence, only (9.0%) of the studied students have good level of total knowledge regarding ova cryopreservation pre implementing educational program. While improved to the majority (85.0%) after implementing educational program. With observation, the total mean knowledge score improved from 10.05 ± 2.81 to 18.66 ± 2 .

Table (4): showed the relation between the demographic information of the students and their knowledge. It demonstrated that the age, academic year, and background of the subjects were statistically related to the subjects' knowledge of ova cryopreservation at ($P < 0.05$). In addition, The findings showed a statistically significant relationship between students' overall knowledge following the implementation of the educational program and their age, academic year, parents' educational level, and background regarding ova cryopreservation. at ($P < 0.05$). Also, Overall student knowledge before to the implementation of the educational program and their demographic information, such as their parents' education level, showed a highly statistically significant relationship. at ($P < 0.001$). While, Before and after the educational program's implementation, there was no statistically significant correlation between their place of residence and

marital status at ($P > 0.05$).

Discussion:

Fertility preservation (FP) is increasingly being used in adolescents and young adults. Ovarian cryopreservation (OC), one of the proven techniques for FP, keeps the possibility of conceiving biological children after cancer treatment. (**Suzuki , et al**⁽¹²⁾ . The goal of OC, a novel assisted reproductive technique (ART), is to cryopreserve ova (female gametes) so that future conceptions are possible. **Pérez-Hernández**⁽¹³⁾ .

This study was designed with the following hypothesis in mind: Once an educational program is in place, nursing students' knowledge of ova cryopreservation will be significantly improved. The study's results showed that these nursing students' knowledge had improved statistically significantly, supporting the research hypothesis.

The current study's demographic findings showed that the researched students' average age was 19.43 ± 0.609 years old. This finding was congruence with **Hasab Allah, et al**⁽¹⁴⁾ The mean age was 19.35 ± 1.2 years old, according to a study examining the influence of educational guidelines on nursing students' knowledge, beliefs, and attitudes about oocyte cryopreservation at Minia University in Egypt.

Meanwhile , (**Hashiloni – Dolev et al**⁽¹⁵⁾ study about Gamete preservation: knowledge, concerns and intentions of Israeli and Danish students regarding egg and sperm freezing , who found that mean age of studied students was 25.7 ± 5.6 . Also **E'lysse , et al**⁽¹⁶⁾ The mean age of participants in the study about medical students' attitudes and understanding of oocyte cryopreservation [A10] at Washington was 24.0 (SD 1.6) years. This may be related to the age differences among university students in various nations as well as

differences in the sample ages between researches.

The majority of female nursing students in the study were single, according to the present study's marital status data. This result agrees with the study of **Giannopapa, et al**⁽¹⁷⁾ Characteristics, Information Sources, and Oocyte Disposition Regarding Women Who Choose Oocyte Cryopreservation: A Systematic Review and study of **Kim, et al**⁽¹⁸⁾, The majority of participants in both research, which examined opinions and choices made by women regarding elective oocyte cryopreservation (OC), were single. This might be connected to the recent rise in the average marriage age.

The current study indicated that 28% of nursing students have background about ova cryopreservation while 72% of nursing students did not. This outcome corresponded to **Tozzo, et al**⁽¹⁹⁾ Apparently, according to a study about social oocyte freezing in Italy: a scoping survey on university-age female students' understanding and attitudes, many students (41.7%) had never heard of the practice whereas 34.3% were aware of it.

The current study found that the internet was the most popular source for background information on ova cryopreservation, followed by books (32,1%), television (25%) and then health care facilities (7.1%), before friends (3.6%). This result was consistent with **Arendt**⁽²⁰⁾ The internet was the most popular source of information for participants in a research about Australian women's awareness of and attitudes about non-medical oocyte cryopreservation (74.9%), followed by health professionals and public health centers (62.8%). In addition, a sizable portion of participants (47.1%) and relatives (42.2%) were consulted for information. This may be because the use of technology and the internet has

become a daily habit for everyone.

Women must be informed about their fertility, especially FP like OC, in order for them to plan motherhood. The primary goal of the current study was to evaluate nursing students' understanding about OC. The study's findings show that there was a highly statistically significant difference between the total students' knowledge of ova cryopreservation before and after the training program was implemented. In this regard the study of **Sayegh, et al**⁽²¹⁾ in the United Arab Emirates, who found that the mean knowledge score for planned oocyte cryopreservation was 44.44%, which was substantially higher among women of reproductive age (49.66% vs. 40.55%).

The current investigation concerning the indication for medical ova cryopreservation revealed that more than 4/5 of nursing students after evaluation answered properly, which is consistent with the explanation of students' knowledge regarding ova cryopreservation. This result supported by **Specchia et al**⁽²²⁾ a study in Italy looked into the 18 years of medical OC experience at a tertiary care referral facility. They comprised all 244 patients who completed 252 cycles of medical OC at a single centre between January 2001 and March 2019. Hodgkin's or non-Hodgkin's lymphoma (27.4%) or breast cancer (59.9%) were the most common diagnoses for the patients.

Furthermore **Kato, et al**⁽²³⁾ In a multi-center, retrospective case series of oocyte cryopreservation in unmarried women with haematological malignancies in Japan, the study found that acute myeloid leukaemia (23.3%), acute lymphoid leukaemia (19.7%), and Hodgkin's lymphoma (15.5%) were the most prevalent cancers among 193 patients. Oocyte retrieval was performed on a total of 162 individuals (83.9%), and 155 patients' (80.3%)

oocytes were successfully cryopreserved. Oocyte retrieval cycles and cryopreserved oocytes each had an average of 1.7 +/- 0.2 and 6.3 +/- 0.4, respectively.

In the other hand , the indication for non-medical ova cryopreservation .The current study revealed that 87.5 % from nursing students post evaluation answer correct answer . This result supported by *wafi , et al*⁽²⁴⁾ article about Sixty-five percent of women who had planned oocyte cryopreservation (OC) anticipated using their oocytes in the future, according to a follow-up poll on the reproductive goals and experiences of those who had undergone OC.

The current study showed that more than three-fifths of nursing students didn't know the answer to the question regarding the appropriate age for ova cryopreservation in the pretest, but that nearly all of them (age of 35) answered it properly in the posttest. The study result was in acceptance by the findings of study conducted by (*Will et al*⁽²⁵⁾) in The University of Connecticut Health Centre evaluated medical students' and house staff's knowledge of age-related fertility and fertility preservation as well as their personal and professional perspectives of these topics before and after an educational intervention. At 25 to 29 years old, a woman can efficiently freeze her oocytes, according to more than half of respondents.

The same in *Santo , et al*⁽²⁶⁾ results of a study on Brazilian women revealed that the group under study (282/444) had a reasonable understanding of the ideal age to cryopreserve their oocytes (35 years = 69.8%). This due to the age is very important for ovarian reserve.

The majority of nursing students who participated in the educational program accurately identified the amount of ova needed for ova

cryopreservation in the current study. This result disagree with *Mahesan et al*⁽²⁷⁾, who conducted their study in Eastern Virginia to gauge female undergraduate students' and medical students' attitudes towards EOC and found that only a quarter of them are aware of the precise number of ova needed for ova cryopreservation when asked a question to gauge their knowledge of EF.

The results of the current study suggested that hormone therapy is usually needed to induce ovulation after ova cryopreservation in most situations. This result supported by *MIQUEL , et al*⁽²⁸⁾ study on 129 women in all were participated in the trial, which aimed to evaluate the viability and efficiency of delayed ovarian stimulation, independent of the main condition, and oocyte banking for fertility preservation after treatment that impairs fertility. For the purpose of oocyte cryopreservation, 113 of these 129 women began controlled ovarian stimulation.

The present study revealed that there is increase in awareness of nursing students (97.5% posttest)about With increasing age, a woman's fertility drastically declines. It was in the same line with the findings of study conducted by *Argyle et al*⁽²⁹⁾ who made the discovery that fertility declines beyond age 35. This degradation is brought on by a drop in follicle count and oocyte quality, as well as, it was in similarity with *Ikhen, et al*⁽³⁰⁾ An urban institution conducted a study of medical students' knowledge, intentions, and opinions regarding elective egg freezing and employer coverage. Is Employer Coverage of Elective Egg Freezing Coercive? found that three-quarters of respondents thought that women's fertility significantly declined at the age of 35 years.

A similar finding was reported in the study of *Harzif, et al*⁽³¹⁾ about knowledge, attitude, purpose, and

religious factors related to fertility preservation among Indonesian obstetrics and gynecology residents found that nearly half of the residents (46%) incorrectly believed that fertility drops significantly between the ages of 35 and 39.

In confirmation of the forgoing results, the study carried out by **Meissner et al**⁽³²⁾ in Hannover, Germany, who found that roughly one-third of students believed wrongly that women's fertility clearly declines after age 40 and that nearly half of students were aware that a first decline in women's reproductively begins before the age of 30. In the other side **Nasab, et al**⁽³³⁾ study disagree with the results of current study, who showed that The age at which there is a significant drop in female fertility was wrongly identified by 41% of participants.

Regarding the association between the demographic information of pupils and their knowledge. The results indicated that there was a statistically significant relationship between their age, academic year, and if they had any prior knowledge of ova cryopreservation ($P \leq 0.05$). The results also showed that there was a statistically significant relationship ($P \leq 0.05$) between the overall amount of knowledge that students had acquired after the implementation of the educational program and their age, academic year, parents' educational level, and whether they had prior knowledge of ova cryopreservation. Additionally, there was a very statistically significant relationship ($P \leq 0.001$) between the sociodemographic information of the pupils and their parents' educational level prior to the implementation of the educational program.

This is congruence with **Farrag & El-tohamy**⁽³⁴⁾ study about Oocyte Cryopreservation: Awareness and Perception of Infertile Couple Undergoing In-Vitro Fertilization in

Egypt, which showed that there was a statistically significant relationship between women's levels of knowledge about oocyte cryopreservation and all demographic parameters, with the exception of occupation, among the study sample.

The current study demonstrated that there was no statistically significant relationship between the participants' residency and marital status before and after the execution of the educational program in this regard ($P > 0.05$). This consistent with **Rafiei et al**⁽³⁵⁾ study investigate 315 The Effects of the Nursing Education Program on Nursing Students' Knowledge of Fertility Preservation After completing an education program, knowledge scores did not significantly differ by sex, place of residence, or marital status, according to a quasi-experimental study.

Conclusion:

In the light of the current study findings and verified of the research hypothesis, it could be concluded that there was highly statistical significant improvement regarding total nursing students' knowledge regarding ova cryopreservation at pre and post implementation of educational program.

Recommendation:

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

❖ A simplified and comprehensive booklet about ova cryopreservation should be available for all students (medical and nonmedical).

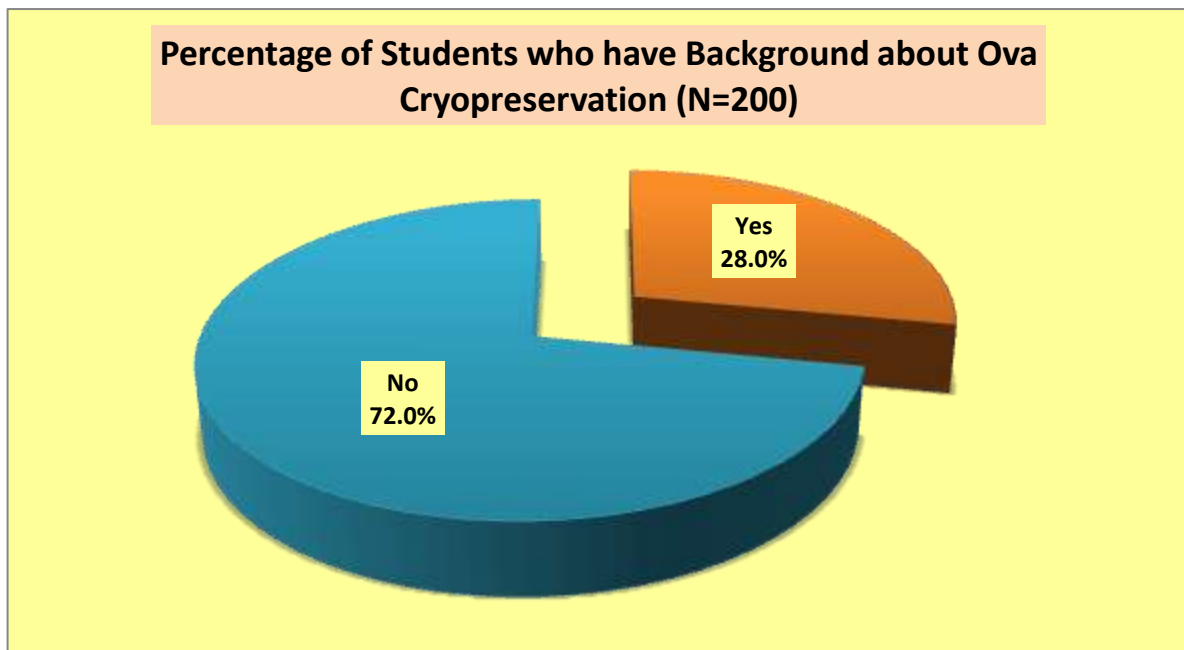
❖ **Further research are required to performed :**

• Training program for nurses about ova cryopreservation.

Table (1): Frequency and percent distribution of the studied students according to their socio-demographic characteristic (n=200).

Demographic characteristic data of the studied students	No.	%
Age (years)		
<20	120	81.0
20-21	62	12.1
≥ 21	18	6.9
Mean ±SD	19.43±0.609	
Residence		
Urban	134	67.0
Rural	66	33.0
Marital status		
Married	75	37.5
Single	125	62.5
Parents' education level		
Illiterate	18	9.0
Primary education	14	7.0
Preparatory education	14	7.0
Secondary education	80	40.0
University education	74	37.0

(*) Responses not mutually exclusive

**Figure (1):** Percentage distribution of the studied students according to have background about Ova Cryopreservation (n=200).

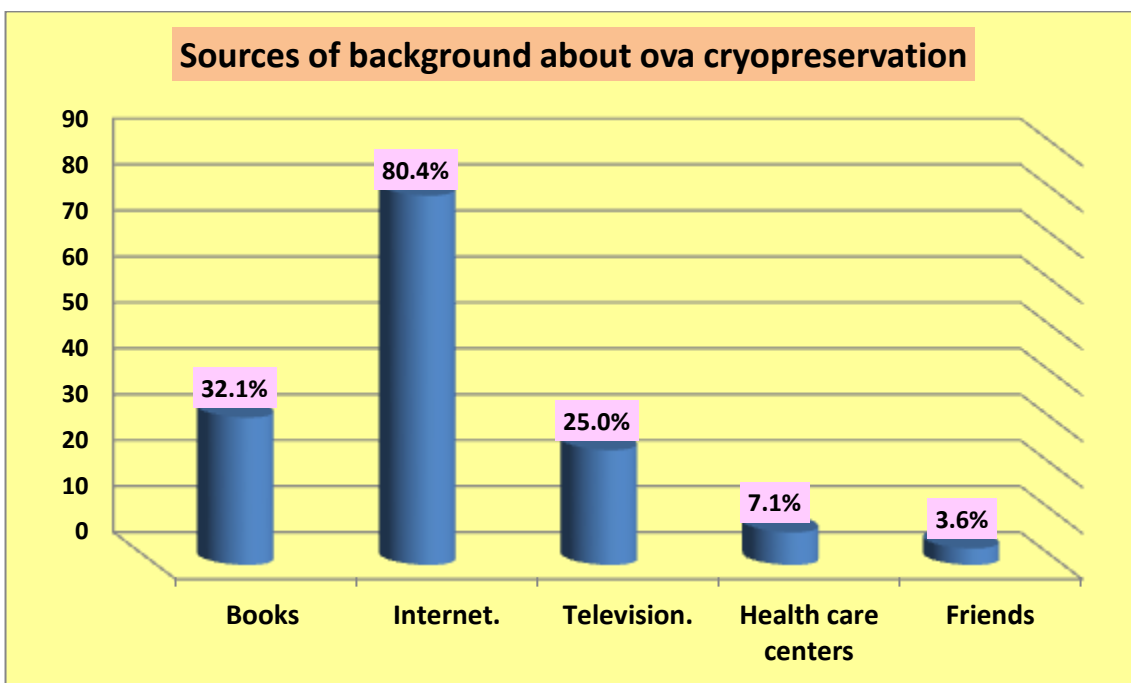


Figure (2): Percentage distribution of the studied students according to Sources of background about ova cryopreservation (n=56).

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

Items	Pre program				Post program				X ²	P-value
	Correct answer		Incorrect answer		Correct answer		Incorrect answer			
	No.	%	No.	%	No.	%	No.	%		
Definition of ova cryopreservation	124	62.0	76	38.0	190	95.0	10	5.0	15.07	0.000**
Types of ova cryopreservation	95	47.5	105	52.5	185	92.5	15	7.5	30.09	0.000**
Indication for medical Ova cryopreservation	55	27.5	145	72.5	180	90.0	20	10.0	36.17	0.000**
Indication for nonmedical Ova cryopreservation	72	36.0	128	64.0	175	87.5	25	12.5	31.09	0.000**
The suitable age for ova cryopreservation	64	32.0	136	68.0	185	92.5	15	7.5	32.00	0.000**
Number of required ova for ova cryopreservation	16	8.0	184	92.0	182	91.0	18	9.0	74.05	0.000**
What is time required ova retrieval from the ovaries?	25	12.5	175	87.5	175	87.5	25	12.5	71.19	0.000**
The temperature required for the ova storage process	22	11.0	178	89.0	184	92.0	16	8.0	71.81	0.000**
Complications of ova cryopreservation	36	18.0	164	82.0	180	90.0	20	10.0	69.05	0.000**
Laboratory tests needed for Ova cryopreservation	114	57.0	86	43.0	198	99.0	2	1.0	21.19	0.000**
Hormonal therapy required to stimulate ovulation.	93	46.5	107	53.5	192	96.0	8	4.0	30.24	0.000**
Vitrification is essential for ova cryopreservation	60	30.0	140	70.0	191	95.5	9	4.5	33.14	0.000**

X²: Chi Square Test. (**): highly statistically significant at p<0.001.

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

Items	Pre program				Post program				X ²	P-value
	Correct answer		Incorrect answer		Correct answer		Incorrect answer			
	No.	%	No.	%	No.	%	No.	%		
a woman's fertility decrease with advanced age	145	72.5	55	27.5	195	97.5	0	2.5	14.00	0.000**
Ova cryopreservation can prolong a woman's fertility.	105	52.5	95	47.5	187	93.5	13	6.5	26.31	0.000**
overall health and fitness level is a better indicator of fertility than age.	42	21.0	158	79.0	180	90.0	20	10.0	53.74	0.000**
There is a significant decrease in a woman's ability to become pregnant over 37 years.	131	65.5	69	34.5	184	92.0	16	8.0	14.31	0.000**
Ova cryopreservation knowledge is important for me as a health care provider	128	64.0	72	36.0	197	98.5	3	1.5	16.07	0.000**
The process of freezing and storage of ova must be followed up	109	54.5	91	45.5	195	97.5	5	2.5	17.11	0.000**
Ova cryopreservation banks should be accredited and standards	122	61.0	78	39.0	194	97.0	6	3.0	16.49	0.000**
Infection control precautions must be used during ova cryopreservation procedure .	122	61.0	78	39.0	198	99.0	2	1.0	16.91	0.000**
Dar Al-Ifta statements that permissible for using ova cryopreservation.	55	27.5	145	72.5	182	91.0	18	9.0	29.60	0.000**
What's your opinion about ova cryopreservation?	131	65.5	69	34.5	197	98.5	3	1.5	14.81	0.000**
Do you like to practice ova cryopreservation?	70	35.0	130	65.0	193	96.5	7	3.5	28.10	0.000**

X²: Chi Square Test. (**) highly statistically significant at p<0.001.

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

Levels of total knowledge	Pre program		Post program		X ²	P-value
	No.	%	No.	%		
Good	18	9.0	170	85.0	31.85	0.000**
Average	50	25.0	23	11.5		

Poor	132	66.0	7	3.5
Mean ±SD	10.05 ± 2.81		18.66 ± 2.74	t=18.51 0.000**

t= Paired t. test. χ^2 : Chi-square. **highly significant at $p < 0.001$.

Table (4): Relationship between demographic characteristic of the studied students and their knowledge regarding ova cryopreservation at pre and post implementation of educational program (n=200).

Demographic characteristic	Total knowledge													
	Pre program						χ^2 (p)	Post program						χ^2 (p)
	Good (n=18)		Average (n=50)		Poor (n=132)			Good (n=170)		Average (n=23)		Poor (n=7)		
	No.	%	No.	%	No.	%		No.	%	No.	%	No.	%	
Age (years)														
18-19	0	0.0	4	8.0	116	87.9	11.53	95	55.9	20	87.0	5	71.4	10.18
20-21	6	33.3	40	80.0	16	12.1	(0.031*)	57	33.5	3	13.0	2	28.6	(0.35*)
≥ 21	12	66.7	6	12.0	0	0.0		18	10.6	0	0.0	0	0.0	
Academic year														
First year	0	0.0	0	0.0	45	34.1	14.56 (0.010*)	28	16.5	13	56.5	4	57.1	13.91 (0.011*)
Second year	0	0.0	5	10.0	76	57.6		72	42.4	6	26.1	3	42.9	
Third year	8	44.4	27	54.0	9	6.8		40	23.5	4	17.4	0	0.0	
Fourth year	10	55.6	18	36.0	2	1.5		30	17.6	0	0.0	0	0.0	
Residence														
Urban	11	61.1	20	40.0	103	78.0	2.504	114	67.1	17	73.9	3	42.9	1.901
Rural	7	38.9	30	60.0	29	22.0	(0.219)	56	32.9	6	26.1	4	57.1	(0.267)
Marital status														
Married	13	72.2	32	64.0	30	22.7	5.174	60	35.3	13	56.5	2	28.6	4.927
Single	5	27.8	18	36.0	102	77.3	(0.102)	110	64.7	10	43.5	5	71.4	(0.116)
Parents' education level														
Illiterate	0	0.0	0	0.0	18	13.6	19.66 (0.000**)	3	1.8	10	43.5	5	71.4	12.57 (0.018*)
Primary education	0	0.0	0	0.0	14	10.6		5	2.9	8	34.8	1	14.3	
Preparatory education	0	0.0	4	8.0	10	7.6		10	5.9	3	13.0	1	14.3	
Secondary education	6	33.3	11	22.0	63	47.7		78	45.9	2	8.7	0	0.0	
University education	12	66.7	35	70.0	27	20.5		74	43.5	0	0.0	0	0.0	
Do you have background about ova cryopreservation?														
Yes	14	77.8	38	76.0	4	3.0	12.99	53	31.2	3	13.0	0	0.0	10.47 (0.032*)
No	4	22.2	12	24.0	128	97.0	(0.014*)	117	68.8	20	87.0	7	100	

No significant at $p > 0.05$. * Statistically significant at $p < 0.05$. **Highly statistically significant at $p < 0.001$.

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