Oocyte Cryopreservation: Awareness and Perception of Infertile Couple Undergoing In-Vitro Fertilization

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Abstract:

Background: Since the In-vitro fertilization law imposed no more than three embryos for a single transfer; oocyte banking has become a current practice in order to avoid the destruction of surplus oocytes and repeated ovarian stimulations. The Oocyte cryopreservation remains a rare practice. The current study **aimed** to assess the awareness and perceptions of infertile couple undergoing In-Vitro fertilization regarding oocyte cryopreservation. Descriptive cross section **design** was adopted. A purposive **sampling** technique was used to recruit 500 infertile couple undergoing IVF at **six centers** of fertility in Cairo and Giza, Egypt with different category (governmental hospital, private hospital and private centers). Data were collected using structured interviewing questionnaire and couple's perception towards oocyte cryopreservation. **Results**: slightly more than half of men and women (54.6% and 62.4%) respectively heard about the oocyte cryopreservation, while (13.8% and 14.4%) of men and women respectively had satisfactory level of knowledge regarding the oocyte cryopreservation. In addition, about less than half of women (46.5%) and less than one third of men (30.4%) had the willing to utilize Cryopreservation services**.** The most factors affecting women to utilize the oocyte cryopreservation services were long-term risks of the health from the ovarian hyper simulation and egg retrieval process as well as age, while among the men were; save the time, money in the case of failure IVF trail, and current success rates. Also, the study highlighted that, about less than half (43.3%) of the studied women and slightly more than one third (36.6%) of the studied men had positive perception toward the oocyte cryopreservation. **Conclusion**: most of infertile couples undergoing IVF had unsatisfactory knowledge regarding oocyte cryopreservation, which leads to negative perception about the practice among more than half of the studied subject. **Recommendation**: couples should be counseling about oocyte cryopreservation, its steps and benefit before starting the cycle of IVF procedure.

Keywords: Oocyte cryopreservation, infertile couple, in- vitro fertilization, awareness and perception.

Introduction

Infertility is the inability to conceive within one year of unprotected intercourse, and it has been identified as a public health priority **(Karimzadeh, 2017)**. The Centers for Disease Control and Prevention of the United States emphasizes that infertility is more than a quality-of-life issue, with considerable public health consequences including psychological distress, social

stigmatization, economic strain, and marital discord **(Centers for Disease Control and Prevention, 2014)**. The average prevalence of infertility in developed countries is 3.5-16.7% and in developing countries is 6.9-9.3% **(Inhorn & Patrizio, 2015)**. Worldwide > 186 million people suffer from infertility, the majority being residents of developing countries **(Ghraib & Khait, 2017)**. National Survey of Family Growth estimated that 6% of married females aged 15–44 years in the United States are infertile **(Masoumi, et al, 2015).**

Infertility is increasingly being overcome through advancements in fertility treatment, in particular assisted reproductive technologies (ARTs) **(International Committee for Monitoring Assisted Reproductive Technology, 2016)**. Reproductive treatments or techniques to achieve reproduction with 'artificial' or 'assisted' means. ART does not actually restore fertility but attempts to bypass infertility for couples who have medically-diagnosed infertility problems **(Terzioglu, 2016)**. Assisted Reproductive technology gave hope to a lot of people all over the world to have children. Statistics show that almost Three million infants have been delivered using ART in the last 30 years, all over the world **(European Society of Human Embryology and Reproduction, 2016).** The Assisted Reproductive Technology is expensive, invasive, and involves some risk to women **(Inhorn & Marcia, 2015).** It includes a range of methods used to treat human sub-fertility, including In Vitro Fertilization (IVF), Embryo Transfer (ET), Gamete Intra-Fallopian Transfer (GIFT), and all manipulative procedures involving gametes and embryos as well as treatment modalities to induce ovulation or spermatogenesis when used in conjunction with the above methods **(Bayer & Penzias, 2017).**

In Vitro Fertilization is a human-assisted technology of reproduction that helps a couple who is infertile to get pregnant. It involves four fundamental measures: stimulating the ovaries to develop numerous ovarian follicles; Aspiring mature oocytes from the ovaries of the woman with ultrasound guidance under anesthesia; oocytes and sperm are put in the laboratory to allow fertilization, and embryos are transmitted to the woman's uterus for the establishment of pregnancy **(Velez, et al, 2014).** This method is the most common fertility treatment used when the fallopian tubes are severely damaged or absent, or there is unexplained or male-factor infertility. Due to its high success rate, IVF has been used more frequently in recent years as a first line of therapy for all causes of infertility **(American Society for Reproductive Medicine, 2015)**. Over 8 million IVF children have been born, and over 2.5 million cycles are being performed every year **(Kathryn & Suheil & Muasher, 2019).**

Cryopreservation refers to the process of freezing human gametes**,** embryos and/or ovarian **or** testic ular tissues, with a view to thawing the cells for use in assisted reproduction treatments. Cryopreservation plays an important role in assisted reproduction, as it enables the reproductive cells collected and/or fertilized in one treatment cycle, to be used for fertilization and/or implanted into the female patient's uterus, in a future treatment cycle. This increases the efficiency of infertility treatment and reduces the cost and discomfort to the patients involved **(Kim, et al, 2018).**

The cryopreservation of oocytes has proven more challenging than the cryopreservation of sperm, in particular because many regimens cause damage to an egg's zona pellucida (i.e. shell).

However there are now a range of cryopreservation protocols which can be used to preserve mature or immature oocytes. While survival rates for immature oocytes have reached 60%, the freezing process often alters the oocyte development process and fertilization and live birth rates for surviving oocytes, are consistently lower than those achieved using fresh oocytes **(Gook & Edgar, 2007).**

Recently a healthy baby boy was delivered to an Arab Muslim woman who had her ovarian tissue cryopreserved during childhood. This has created more awareness of the possibility of ovarian cryopreservation in the Middle East. Delivery rate with Ovarian Transplant is estimated to be around 24% **(Abdelwahab & Samy, 2017).**

The main indication for cryopreservation in IVF programs is extra oocyte preservation after the embryo transfer **(Baldwin, et al, 2015).** Also sperm and testicular tissue cryopreservation follows the biopsy and then is used for fertilization in IVF programs in certain cases of pathospermia **(Baysal, et al, 2019).**Another indication for cryopreservation consists in the maintenance of males and females fertility if they are going to undergo ovary or sperm chemotherapy, radiotherapy or surgical aggression. Also decrease risk of ovarian hyper stimulation syndrome, as well as they should also consider preservation of their fertility if they have genetic predisposition to early menopause. Also there exists a modern tendency to perform a 'social' cryopreservation based on woman's decision to postpone conception and pregnancy and build her career first **(Waldby, 2015).**

The fertility nurses play important roles in the ART especially in IVF technique. These include assessment, planning, implementation, evaluation, counseling and education roles. They are the primary health care personnel who communicate with couples during the IVF, coordinate the various stages of treatment and ensure the couple' commitment to the treatment **(Kathryn & Suheil & Muasher, 2019**). Fertility nurses play an integral role in the care of the couple undergoing IVF treatment from both a medical and psychological perspective through counseling. Counseling is the use of interactive process directed toward the health needs or problems of the individual and significant others to improve or support coping with disease or health problem. Nurses play a vital role in helping infertile couple undergoing ART in making health behavior changes through upgrading their knowledge, modifying attitude toward cryopreservation process. Good counseling helps couples cope and decide better **(Hammarberg, et al, 2016).** Decisions about what choices to make become more clear and are based on realism and sufficient knowledge. The process is strictly confidential **(Dittrich , et al, 2015).**

Significant of the study

Infertility affects 8 to 12 percent of reproductive-age couples around the world. However, the infertility rates are much higher in some regions of the world, reaching 30% in some regions **(Centers for Disease Control and Prevention, 2014)**. In Egypt, infertility incidence has been estimated to be 10.4% of married couples **(Ghraib & Khait, 2017)**. Assisted Reproductive Technology is a demanding and stressful situation; it's usually the final treatment for infertile. In vitro fertilization is a commonly performed technique. , many factors affect the IVF procedure success and outcomes. During routine clinical

treatment, the use of controlled ovarian stimulation protocols led to the production of large number of human oocytes and consequently embryo. In a routine IVF practice, 60% of stimulated cycles may yield surplus embryos suitable for embryo transfer. In order to avoid the risk of multiple pregnancies without discarding the embryos in excess of the number appropriate for safe transfer, cryopreservation appears to be the suitable solution. In addition the ovarian stimulation protocols are costly especially in developing countries so it help in decrease the fees of repeated cycle for couple with limited resources as well as decrease risk of ovarian hyper stimulation syndrome, thus the availability to preserve the oocytes seems to be of high importance. It is unquestionable that successful cryopreservation of oocyte, zygotes, and embryos has greatly enhanced the clinical benefits and cumulative conception rate possible for couples following a single cycle of ovarian stimulation. in spite of all the previous benefit for cryopreservation, but there are many facts affect the decision of the couple to adopt this way like the awareness and perception of the couple regarding the cryopreservation, and the main role for the nurse is to assess the awareness and perceptions of infertile couple undergoing IVF regarding cryopreservation to give more explanation or modification for their concept. In Egypt, there were scattered researches carried out to assess this issue, in this context, the current study handled this important subject.

Aim of the study:

Assess awareness and perceptions of infertile couple undergoing In-Vitro fertilization regarding oocyte cryopreservation.

Research question:

What are the level of awareness and perceptions of infertile couple undergoing In-Vitro fertilization regarding oocyte cryopreservation?

Subjects and Methods

Research design:

Descriptive cross section design. The study conducted from June 2018 to August 2019. The benefit of a cross-sectional design is that it allows the researchers to look at numerous things at once such as age, educational level, occupation, income, factors affecting the awareness and perception of infertile couple to adopt the oocyte cryo-preservation procedure.

Setting:

There are many centers for Artificial reproductive technology in Cairo and Giza city in Egypt with different category (governmental hospital, private hospital and private centers).The researchers selected 2 centers randomly from each category. The six centers included were: El- Galaa Hospital (Governmental hospital), Al kasir El Ani (Governmental hospital), Gana (private hospital), Tahra (private hospital), El nor (private center) and Al Amal (private center)

Sample technique

The sample size was calculated using the Cochran formula **[23]**. Assuming a margin of error of 5% and a 95% confidence level, the minimum required sample size was 500 infertile couple. After adding 10% for non-response rate, a sample size of 550 infertile couple was found to be sufficient for this study. After considering the

proportional distribution of respondents, the sample was divided as the follows: El-Galaa hospital (105), Al kasir El Ani hospital (93), Gana hospital (71), Tahra hospital (75), El nor center (90) and Al Amal center (66). Purposive sampling technique was used through taking all infertile couples from the pre-mentioned setting according the following criteria:

Inclusion criteria: infertile couple diagnosed (primary / secondary) infertility, infertile couple undergoing IVF/ICSI treatment.

Exclusion criteria: Unwillingness or refused to participate in the study.

Tool of Data Collection:

Two tools were used for data collection to obtain the necessary information from the participants and covered the aim of the study; A structured interviewing questionnaire and couple's perception towards oocyte cryopreservation.

Tool 1- Structured interviewing questionnaire:

It designed by the researchers after reviewing the related-literature. It was written in an Arabic language, in the form of close and open-ended questions. It was divided into four major parts:

Part I. Covered the socio-demographic characteristics of the sample as (age of couple, education level, income, residence, occupation, duration of marriage), 9 items.

Part II. Concerned with causes of infertility, duration of infertility, and number of IVF/ICSI trail, has heard to cryopreservation, source of information regarding oocyte cryopreservation.

Part III. Included infertile couple knowledge about oocyte cryopreservation (31 items). It distributed as the following: concept and type of cryopreservation, (6 items), indication, advantages and disadvantages of oocyte cryopreservation, (16 items), storage and successful rate of oocyte cryopreservation (5 items), practice guideline, regulation and opinion of religion, (4 items).

The scoring system for the third part:

Each complete correct answer responses were given three marks; the incomplete correct answer responses were given two marks and the wrong or didn't know answer was given one mark. The total score ranged from 1-93 score and it was converted into percentage. Total score 93(100%), the higher scores indicated the higher level of knowledge. A score of <50% was considered as unsatisfactory knowledge and≥50% score was considered as satisfactory knowledge. Overall test- retest reliability coefficients were Cronbach's α values was 0.83 in this study.

Part IV: this part cover questions related to factors affecting (utilizing / continuing/discontinuing) of oocyte cryopreservation. These questions asked only for the couples hear about the oocyte cryopreservation. This part consists of 17 questions (10 related for utilization, 2 related for continuing and 5 related to discontinuing).

Tool 2: Couple's perception towards oocyte **cryopreservation**

This instrument was developed by the researchers based on recent relevant literature reviews and revised by a jury of qualified experts, then tested for validity and reliability. It consisted of ten statements. It used to assess perception of

infertile couple undergoing In-Vitro fertilization regarding oocyte cryopreservation. It was a three Points Likert Scale: (1) disagree, (2) neutral and (3) agree. The total score ranged from 1 to 30. A total score of (<50%) indicated negative attitude and a total score of (≥50%) indicated positive attitude.

Validity and reliability:

Study tools were submitted to a panel of five experts in the field of obstetrics and gynecological health nursing and medicine to test the content validity. Modifications were done according to the panel's judgment on the clarity of sentences and content appropriateness. Reliability analysis was conducted to investigate the instrument internal consistency, which used in the study. Internal consistency describes the extent to which all the tools items measure the same concept or construct. Cronbach alpha coefficients were calculated to examine the measurement reliability with multipoint items. The accepted values of Cronbach alpha coefficient range from 0.60 to 0.95. The items of the present study tools (tool 1, and 2) were proven reliable where α = 0.85, and 0.92.

Pilot Study

It was conducted on 10% of the participants, were selected randomly and excluded from the total sample. Its aim was to evaluate the simplicity and clarity of the tools. It also helped in the estimation of the time needed to fill in the forms. According to the pilot study results, simple modifications were done as rephrasing or added / cancelled some questions.

Ethical consideration

An official permission was granted from the director of the pre-mentioned centers. The researchers introduced themselves to the couple who met the inclusion criteria and informed them about the purpose of this study in order to obtain their acceptance to share in this study, the researchers ensured that the study posed no risk or hazards to their health and their participation in the study is volunteer. Couple who were willing to participate in the study and met the inclusion criteria were approached by the researchers and asked for verbal consent to confirm their acceptance, and all events that occurred during data collection were considered confidential.

Fieldwork:

Recruitment of the participants was carried out from June 2018 to October 2019. The researchers attended the pre-mentioned study setting for 3 days per week from 9 am to 1 pm until the end of the pervious predetermined sample size. The researchers visited the predetermined settings, one by one, and spent time in each one until reach the sample proportion which determined for each one. Before conducting the study, a written permission was obtained from the predetermined centers. After that, the researchers have introduced themselves to the couple who met the inclusion criteria and inform them about the purpose of this research to get their acceptance and cooperation to be recruited in it. Confidentiality of information was ensured to gain the couple confidence and trust. The researchers were constructed and prepared the different data collection tools, and revised by experts in the field of maternity nursing and obstetric medicine. The participants were interviewed one couple-one -couple at the designated locations, where privacy was ensured. The interview was conducted in the native language of Arabic, using data collection tools and lasted between 25-35 minutes.

Statistical design

All statistical analyses were done using SPSS version 20. Initially, the internal consistency coefficients were examined to ensure the reliability of the used instrument for the present samples. Frequencies, means and standard deviations were calculated to describe the samples. Relations between different numerical variables were tested using Pearson correlation. Statistical tests included Chi-square ($\chi 2$) test for analysis of qualitative variables. Statistical significance was considered at p-value <0.05.

Results:

Table (1): Represented the distribution of socio-demographic characteristics of the studied sample; the results revealed that the mean age were 31.5±4.7& 35.4±5.1 for women and men respectively, Moreover, about half of the sample in women and men (42% &52%) respectively, were highly educated. In addition, more than one third of the couple (36%) married about >4-7 years. Regarding the occupation, the result revealed that (40% & 62%) of women and men respectively were employees and about half of them(46%) their income was enough and cover the treatment cost.

Table (2): Pointed to the distribution of the studied sample according to their infertility history. The results showed that, (77.4%) had primary infertility and the reason of infertility was (44%) among the women. Regarding the duration of infertility, the results pointed to (44%) of the studied sample suffer from infertility about 1-4 years. In addition (77.6%) of the studied sample pass 1-3 trails for IVF/ICSI, while (59%) of them had positive outcome from the last trail. On the other hand, (60.4%) of the studied sample treated in private sector.

Figure (1): illustrated the distribution of the studied sample according to ever heard about oocyte Cryopreservation and source of their information. The results represented that, (54.6% and 62.4%) among men and women respectively, heard about the oocyte cryopreservation. The main source of information regarding oocyte cryopreservation among women was the internet (38.5%) while among the men was family, colleague and physician (29.3%).

Table (3): Showed the satisfactory levels of studied sample's knowledge regarding oocyte cryopreservation, only (14.4% & 13.8%) of women and men respectively had satisfactory level of knowledge regarding the oocyte cryopreservation. There was no statically significant difference between the women and men regarding all items of knowledge ($P < 0.05$).

Table (4): revealed that, the factors affecting (utilizing /continuing / discontinuing) of **oocyte** cryopreservation among the studied sample. Long-term risks of the health from the ovarian hyper simulation and egg retrieval process as well as women age were the most common factor affects the women to utilize the cryopreservation services (99.4%). Regarding the factors affect the men to utilize the service were; save the time and money in the case of failure IVF trail, current success rates, decide what to do with any unused egg and the ethical or moral / religious concerns, represented (100%). The main reasons to continue storage among women was; more baby wish (79.5%), while among men was health status for women / men (67.4%). On the other hand, the reason which affect discontinue storage among women

was (Family is completed, 100%), while among men was (storage fee, 100%). There was no statistically significant difference between women and men regarding factors affecting (utilizing / continuing /discontinuing) cryopreservation except in age ($P < 0.05$).

Figure (2): The result pointed to (46.5% & 30.4%) among women and men respectively willing to use the oocyte Cryopreservation services.

Table (5): highlighted the studied couple's perception towards the oocyte cryopreservation, the results showed that, (43.3% & 36.6%) of women and men respectively had positive perception regarding the oocyte cryopreservation. There was no statistically significant difference between women and men regarding perception towards the oocyte cryopreservation ($P < 0.05$).

Table (6): Illustrated the relation between total levels of studied sample's levels of knowledge regarding oocyte cryopreservation and their socio-demographic data. The result revealed that; among women there was a statistically significant difference between their levels of knowledge regarding oocyte cryopreservation and all the parameters in their socio-demographic data except the occupation. While among the men; there was no a statistically significant difference between their levels of knowledge regarding oocyte cryopreservation and the parameters of socio-demographic data except the income (($P < 0.05$).

Table (7): Illustrated the relation between total levels of studied sample's perception regarding oocyte cryopreservation and their socio-demographic data. The result revealed that; among women there was a statistically significant difference between their levels of perception regarding oocyte cryopreservation and the parameters in their socio-demographic data except the occupation. While among the men; there was a statistically significant difference between their levels of perception regarding oocyte cryopreservation and the parameters in their socio-demographic data except the age, and married years ($P < 0.05$).

Figure (3): Illustrated the relation between total levels of studied sample's perception and knowledge regarding oocyte cryopreservation. The result revealed that; there was highly significant difference between knowledge and perception among the infertile couple ($P < 0.001$).

Table (8): Represent the multivariate logistic regression analysis of factors associated with willing to utilize the oocyte cryopreservation services among couple , the result revealed that; women age ≥35yrs educational level(Diploma /highly educated) , married years >4-7, income(Cover treatment cost and save money), type of infertility(Primary), reason for infertility(Female), duration of infertility >3-6 number of IVF/ICSI trail >3 and outcome of the previous trail (Negative) were the significant predictors for willing to utilize the oocyte cryopreservation services.

Discussion:

Nowadays, oocyte freezing is an alternative to embryo freezing when the latter is not applicable for ethical or legislative reasons **(Keurst & Boivin & Gameiro, 2016**). From a medical point of view, the indications for oocyte freezing are the risk of ovarian hyper stimulation syndrome (as an alternative to embryo freezing) to avoid repeated ovarian stimulation, the risk of losing fertility

(surgical removal of ovaries, endometriosis, chemotherapy and radiotherapy for cancer patients).The fertilization, cleavage rates and embryo qualities of fresh oocytes after IVF or ICSI and of frozen−thawed oocytes after ICSI were the same. **(Daniluk &Koert, 2016)** Currently the majority of IVF laboratories in the Middle East do not routinely freeze oocytes. In Mansoura, Egypt with over ten IVF laboratories in the Delta region, not a single lab regularly freezes eggs. The only times oocyte cryopreservation was done after oocyte picking up and failure of male partner to show up or very poor quality testicular biopsy **(Richard, et al, 2019).**

The study findings provide important insights into infertile couple's awareness and perception regarding oocyte cryopreservation, and the finding answers the research question, which concerned to determine the level of awareness and perceptions of infertile couple undergoing In-Vitro fertilization regarding oocyte cryopreservation. The findings were discussed in the following three sections: Section I: showed the socio-demographic characteristics of the studied sample and their infertility history, Section II: couple's knowledge related to oocyte preservation, factors affecting utilizing /continuing /discontinuing of oocyte cryopreservation, and Section III: represented the studied sample's perception towards the oocyte cryopreservation and the factors affecting the level of awareness and perceptions of the couple.

Section I: showed the socio-demographic characteristics of the studied sample and their infertility history.

The current result revealed that, the mean ages were 31.5±4.7 & 35.4±5.1 for women and men respectively, Moreover; about half of the samples in both groups were highly educated. In addition, more than one third of the couple married about >4-7 years. And about half of studied sample their income was enough and covered the treatment cost. In addition more than three fourth of the sample had primary infertility and slightly less than half of the sample, the reason of infertility was the women. Regarding the duration of infertility, the results pointed to, slightly less than half of the samples suffer from infertile 1-4 years. In addition the current study revealed, more than three fourth of the sample passed 1-3 trails for IVF/ICSI, while about more than half of them had positive outcome from the last IVF trail.

The study result conducted by (**Lukman, et al, 2017)** which entitled **'**Assisted reproduction technology: Perceptions among infertile couples in Ilorin, Nigeria'', was consolidated with the current result in the following point; the mean age of the infertile couple was 36.1 ± 6.6 years and slightly more than half of the studied sample were belong to the middle social class. While the result of their study contradicted with the result of the current study in the following point; about half of the studied sample had primary infertility. More than one third were females who considered alone factor of infertility. Also, the duration of infertility ranged between 1 and 33 years with a mean duration of 7.3 ± 5.8 years.

Section II: couple's knowledge related to oocyte preservation, factors affecting utilizing /continuing / discontinuing of oocyte cryopreservation.

As for couple's level of knowledge regarding the oocyte cryopreservation, the results of the current study revealed that, only less than quarter of the couple had

satisfactory level of knowledge regarding the oocyte cryopreservation. There was no statically significant difference between the women and men regarding all items of knowledge. As well as about half of the studied sample among women and men heard about the oocyte cryopreservation. In addition the main source of information regarding the cryopreservation was internet among women (more than one third of the sample), while family, colleague and physician were among men (more than quarter of the sample).

The current result was in the same line with (**Rashed , Ismaeel & Kamel, 2018)** who studied ''Cryopreservation counseling and Its effect on knowledge and attitude of young female cancer patients'' and reported that, the total knowledge score was poor level before counseling among slightly less than three quarter of studied females. Also, the result agreed with (**Yeon, 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'' and reported that, most of the respondents answered incorrectly for question about oocyte cryopreservation. This similarity could be explained by, the cryopreservation is still new practice and the most of couple still prefer and hope the pregnancy from fresh oocyte, in addition the culture aspect may be not easily accepted this practice.

While, the current study result contradicted with (**Stoop, Nekkebroeck, & Devroey, 2011)** who studied ''A survey on the intentions and attitudes towards oocyte cryopreservation for non-medical reasons among women of reproductive age'' and reported that, about more than three fourth of all respondents had already heard about the oocytes cryopreservation. However, the potential freezers were more willing to receive additional information on oocyte freezing when compared with the non-freezers. The majority of the potential freezers wanting more information would consult the website of a fertility center, which represented more than one third, or look on the internet, represented more than quarter or talk to their gynecologist, represented slightly less than quarter of the sample.

On the other hand the current study result revealed that, the factors affecting utilizing /continuing / discontinuing of oocyte cryopreservation among the studied sample as the following; the most factors affecting women to utilize the oocyte cryopreservation services were, long-term risks of the health from the ovarian hyper simulation and egg retrieval process as well as women age. While, the factors affecting all the men in the study to utilize the service were; save the time and money in the case of failure IVF trail, current success rates, decide what to do with any unused egg and the ethical or moral / religious concerns. In addition, the current result illustrated that, the main reason to continue storage among women was; more baby wish and represented more than three fourth of the sample, while among men was health status for women / men ,that represented more than two third of the sample. Finally regarding the most reason which affects discontinue storage among women was family completed, while among men was storage fee. There was no statistically significant difference between women and men regarding the studied factors except in age, this may be explained by the fertility among the men remain till more than 50 years.

The current study finding was in agreement with (**Daniluk & Koert, 2016)** who studied '' Childless women's beliefs

and knowledge about oocyte freezing for social and medical reasons and reported that, The highest rated considerations were possible health risks to a child using frozen oocytes, long-term risks to their health or future fertility from the oocyte retrieval process, the cost of the procedure, age, and current success rates. Three of these factors were significantly more important to older women in the study as the following; cost ($P < 0.05$), number of times they would need to go through the procedure ($P < 0.02$), and concerns regarding disposition of any remaining oocytes ($P < 0.02$). Ethical or moral concerns were more important to lower income women ($P < 0.03$). Also, the current result was in accordance with (**Maren ,et al ,2017)** who studied **‘’** Attitudes towards Social Oocyte Freezing from a Socio-cultural Perspective and reported that , all reasons were seen as more relevant by women who accepted oocyte cryopreservation for non-medical reasons than by women who were not in favor of social Oocyte Freezing(SOF). Most women rated possible issues concerning the health of the baby, more financial reimbursement, and their own future fertility as the most important reason when giving their preference for or against social Oocyte Freezing. And less organizational effort was less important factors for social Oocyte Freezing. This similarity could be explained by the couple spend more money for infertility treatment especially for IVF procedure, so the financial issue was the most factor for utilize the cryopreservation, as well as the age is very important for the women because fertility age shorter than the men, so the age is important for women and not important for men.

Also, the result of the current study was in correspondence with the work of (**Provoost et al, 2011) who studied ‘’** to continue or discontinue storage of cryopreserved? Patients' decisions in view of their child wish and reported that, only slightly more than quarter of the patients who wanted to continue storage had made plans for a transfer within the year. Half of the patients either wanted to keep all options open or postpone the decision. About one eighth of patients wanted to continue storage because there was a difference of opinion between the partners about what to do with the oocyte. The most common reason for patients to want to discontinue the storage of their cryopreserved was that they considered their families to be completed, that represent about less than three fourth of the sample. In addition, some wanted another child but found the treatment too burdensome. One in four of the patients stated another reason. In 8.9% of the patients, age and/or medical reasons were mentioned. Alternatively, 6.5% had achieved natural pregnancy. Four patients (2.4%) merely mentioned that they had given up on further treatment and five patients (3.0%) indicated that they did not want these cryopreserved.

Section III: represented the studied sample's perception towards the oocyte cryopreservation and the factors affecting the level of awareness and perceptions of the couple.

Moreover the current study highlighted that, about less than half of the studied women and slightly more than one third of the studied men had positive perception toward the oocyte cryopreservation. There was no statistically significant difference between women and men's perception towards the oocyte cryopreservation. This finding was in congruence with the work of (**Bekhatroh & Adel & Fathi, 2018)** who studied ‘’Cryopreservation Counseling and Its Effect on Knowledge and Attitude of Young Female Cancer Patients’’ and reported that, Comparison between total

attitude score before and after counseling revealed that , only about one third of studied females had positive attitude toward cryopreservation. As a result of counseling, the percentage of positive attitude increased to the majority of the sample.

As well, the current result approved by (**Meissner & Schippert & Frauke 2016)** who studied '' Awareness, knowledge, and perceptions of infertility, fertility assessment, and ART in the era of oocyte freezing among female and male, and revealed that, half of the participants knew the principal of oocyte freezing independent of gender. Two third of females and males participants would not personally consider using this option. However, quarter of the participant was interested in more information. Over half of the participants had negative perception and strongly disagreed that payment for this elective procedure should be entirely covered by the health insurance.

Also, the current result illustrated that; among women in the study sample, there was a statistically significant relation between women's levels of knowledge regarding oocyte cryopreservation and all the parameters of the socio-demographic parameter except the occupation. While, among the men; there was no a statistically significant relation between their levels of knowledge regarding oocyte cryopreservation and the parameters of socio-demographic data except the income. This may be explained by; the women always searched about any update in the infertility treatment or solve their problem to save her marital stability and martial live, in addition there were many factors effecting on women gaining knowledge regarding any new practice which help their cases as; age because the women fertility year was no longer; residence and family type which had an effect on the culture view for infertile women. While, the only factor can affect men's level of knowledge was the financial, this may be due to the men think thought through masculine culture, which mean they can married from another one, so what affect on their seeking for knowledge regarding the cryopreservation was the cost only.

The previous finding was not in harmony with (**Mohamed, et al, 2017)** in the following point; age , education , occupation and residence not affecting on the level of knowledge of infertile women regarding new treatment and aids for their case. While the study represent harmony with the current finding in the following point; there was no a statistical relation between age, education, occupation, residence and the level of knowledge of infertile men regarding new treatment and aids for their case. This harmony may be explained by, the men in east countries have a concept there isn't anything affect on their value even the infertility but vice versa (if the women infertile) not valid..

In addition the current results illustrated that, there was a statistically significant relation between levels of perception regarding cryopreservation and the socio-demographic parameters. The result revealed that; among women there was a statistically significant relation between their levels of perception regarding cryopreservation and the parameters in their socio-demographic data except the occupation. While among the men; there was a statistically significant relation between their levels of perception regarding oocyte cryopreservation and the parameters in socio-demographic data except the age, occupation, and married years. This result was not congruence with (**Mohamed, et al, 2017)** who reported that, the age, education, occupation and residence were

not affected on couple attitude regarding the ART.

Also, the current study revealed that, there was a statistically significant relation between the couple's knowledge and perception. This finding was in harmony with (**Rashed , Ismaeel & Kamel, 2018)** who revealed that, 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.

Moreover, the current study represented the multivariate logistic regression analysis of factors associated with willing to utilize the oocyte cryopreservation services among couple , as the following; women age ≥35yrs educational level(Diploma /highly educated) , married years >4-7, income(Cover treatment cost and save money), type of infertility(Primary), reason for infertility(Female), duration of infertility >3-6 number of IVF/ICSI trail >3 and outcome of the previous trail (Negative) were the significant predictors for willing to utilize the oocyte cryopreservation services. This finding was in agreement with (**Daniluk & Koert, 2016)** who reported that, most factors affecting cryopreservation utilization were, the cost of the procedure, age, current success rates, as well as the educational level.

Table (1): Frequency and percentage distribution of socio-demographic characteristics of the studied sample.

Items	Women n(%)=500	Men
Age		
<35yrs	201(40.2)	124(24.8)
≥35yrs	299(59.8)	376(75.2)
(M±SD)	31.5±4.7	35.4±5.1
Educational level		
Illiterate	60(12)	30(6)
Can read &write	50(10)	35(7)
Elementary	30(6)	65(13)
Preparatory	40(8)	15(3)
Diploma	110(22)	95(19)
Highly educated	210(42)	260(52)
Married years		
1-4	125(25)	
>4-7	180(36)	
>7-10	140(28)	
>10	55(11)	
Occupation		
Employee	200(40)	310(62)
Free work	0	85(17)
Technician	124(24.8)	58(11.6)
Professional	63(12.6)	47(9.4)
No work	113(22.6)	0
Residence		
Urban	315(63)	
Rural	185(37)	
Income		
Not enough to cover treatment cost	150(30)	
Enough and cover treatment cost	230(46)	
Cover treatment cost and save money	120(24)	
Family type		
Extended family(live with parents)	143(28.6)	
Nuclear(small family)	357(71.4)	

Table (2): Frequency and percentage distribution of the studied sample according to their infertility history.

Items n(%)=500	Couple
Type of infertility	
Primary	387(77.4)
Secondary	113(22.6)
Reason for infertility	
Male	124(24.8)
Female	220(44)
Both	126(25.2)
Unknown	30(6)
Duration of infertility	
1-4	220(44)
>4-7	157(31.4)
>7	123(24.6)
Number of IVF/ICSI trail	
1-3	388(77.6)
>3	112(22.4)
Outcome of the previous trail	
Negative	205(41)
positive	295(59)
Place of infertility treatment	
Private sector	302(60.4)
Governmental sector	198(39.6)

Fig (1): Percentage distribution of the studied sample according to ever heard about oocyte Cryopreservation and source of their information. n=500

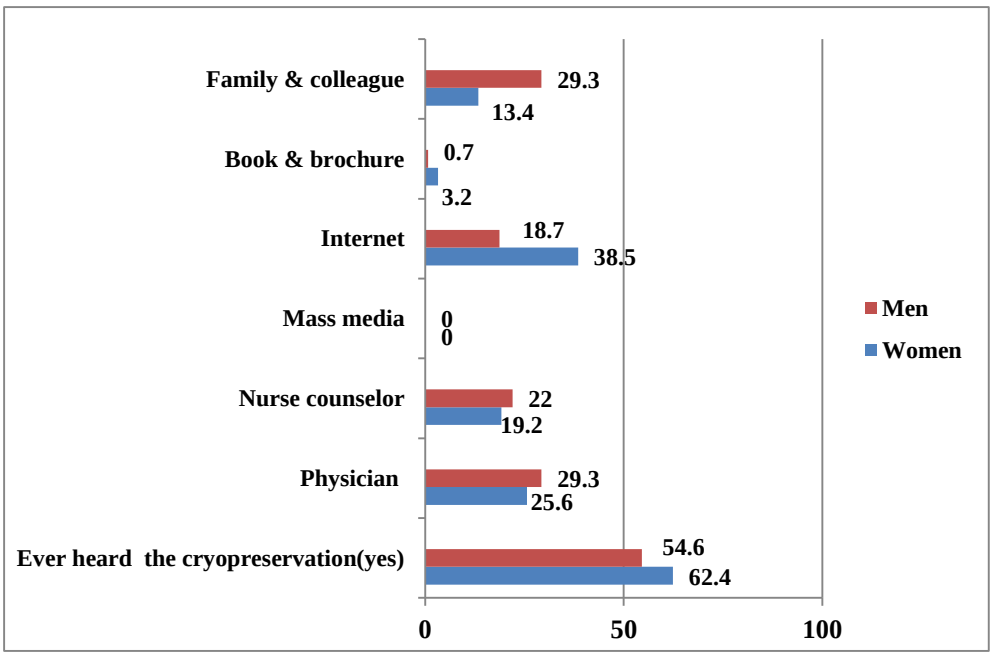

Table (3): Frequency and percentage distribution of total satisfactory levels of studied sample's knowledge regarding oocyte cryopreservation.

Items	Women n(%)=500	Men	χ^2	P
Cryopreservation concept	312(62.4)	273(54.6)	18.3	0.07
Types of cryopreservation	94(18.8)	67(13.4)	21.8	0.12
Indication of **oocyte** cryopreservation	145(29)	93(18.6)	14.8	0.14
Advantages of **oocyte** cryopreservation	123(24.6)	111(22.2)	16.4	0.09
Disadvantages of **oocyte** cryopreservation	35(7)	25(5)	17.1	0.17
Successful rate	23(4.6)	12(2.4)	15.2	0.09
Cost	104(20.8)	132(26.4)	13.5	0.13
Duration of storage	35(7)	23(4.6)	9.8	0.08
Regulations relating to cryopreservation	0	0	-	-
Practice guidelines of cryopreservation	0	0	-	-
Religious opinion	146(29.2)	130(26)	11.2	0.06
Total satisfactory level	72(14.4)	69(13.8)	14.5	0.08

*Statistically significant difference ($p \leq 0.05$), **A highly statistically significant difference ($p \leq 0$ .001).

Table (4): Frequency and percentage distribution of factors affecting (utilizing/continuing/discontinuing) of oocyte cryopreservation .

Items	Women 312	Men 273	χ^2	P
To use in subsequent treatment (transfer).	284(91)	257(94.1)	9.2	0.09
To keep in order to decide later.	43(13.8)	26(9.5)	7.5	0.12
Age	310(99.4)	92(33.7)	2.8	0.001**
Medical reason.	254(81.4)	194(71.1)	4.9	0.06
Long-term risks to my health of future fertility from the egg retrieval process.	310(99.4)	149(54.6)	8.9	0.07
Can help save the time and money in the case of failure IVF trail.	290(92.9)	273(100)	10.2	0.15
Current success rates.	289(92.6)	273(100)	11.7	0.08
Concerns about having to decide what to do with any unused egg.	291(93.3)	273(100)	9.4	0.09
Ethical or moral and religious concerns in general.	195(62.5%)	273(100)	11.8	0.06
Concerns about negative judgment of others.	54(17.3)	25(9.1)	7.1	0.07
Reasons to continuing storage				
Health status for women / men	211(67.6)	184(67.4)	9.6	0.06
More baby wish	248(79.5)	82(30)	14.2	0.09
Reasons to discontinuing storage				
Storage fee	274(87.8)	273(100)	11.8	0.07
Family is complete	312(100)	270(98.9)	15.1	0.6
Achieved natural pregnancy	234(75)	198(72.5)	11.3	0.08
I want another child but the treatment is too burdensome physical and emotionally	124(39.7)	51(18.7)	9.2	0.06
Worrying about frozen embryos quality	309(99)	217(79.5)	7.9	0.9

***(n= 312, 273) the number who heard about the cryopreservation.**

*Statistically significant difference ($p \leq 0.05$), **A highly statistically significant difference ($p \leq 0$ .001).

Fig (2): Percentage distribution of the studied sample according to their willing to utilize Oocyte Cryopreservation services (yes).

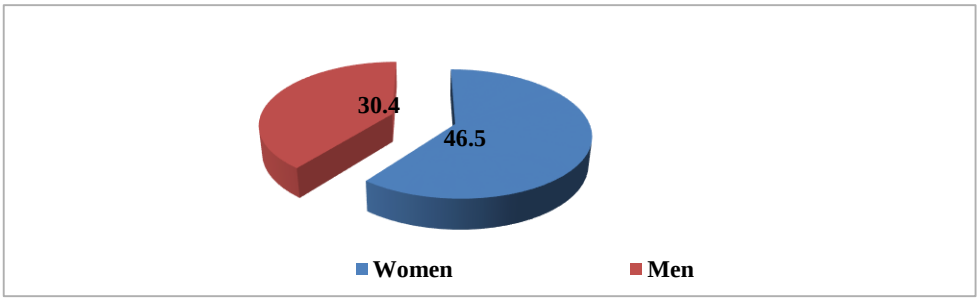

Table (5): Frequency and percentage distribution of the studied couple's perception towards the oocyte cryopreservation (Positive).

Items	Women 312	Men 273	χ^2	P
Cryopreservation babies is				
Normal	85(27.2)	67(24.5)		
Natural babies	54(17.3)	49(17.9)		
Normal but not natural babies	30(9.6)	32(11.7)	11.2	0.07
Not normal and not natural	22(7.1)	18(6.6)		
Do not know	121(38.8)	107(39.2)		
Cryopreservation improves the chance to get baby.	201(64.4)	143(52.4)	9.8	0.8
Embryo from fresh cell more valuable than a cryopreserved cell	183(58.6)	112(41)	7.9	0.6
Do you think it is socially acceptable to have a baby m cryopreserved cell	123(39.4)	66(24.2)	11.5	0.8
Do you have confidence in the physicians and the laboratory staff who are involved in the storage?	65(20.8)1	54(19.8)	8.4	0.7
Do you think Cryopreservation is not affordable/ accessible	179(57.4)	134(49.1)	15.1	0.12
The storage fee is costly.	188(60.3)	86(31.5)	4.6	0.04*
Cryopreservation is an emotionally burden.	201(64.4)	121(44.3)	6.8	0.6
Concern over destroying unused frozen embryos or eggs	290(92.9)	240(87.9)	11.8	0.8
Do you think babies born via Cryopreservation are legitimate	141(45.2)	85(31.1)	8.1	0.6
Do you think babies born via Cryopreservation is consider stigma	146(46.8)	101(37)	12.2	0.8
Total perception				
Positive	135(43.3)	100(36.6)	10.3	0.6
Negative	177(56.7)	173(63.4)		

*Statistically significant difference ($p \leq 0.05$), **A highly statistically significant difference ($p \leq 0$ .001).

Table (6): Relation between total levels of studied sample's knowledge regarding oocyte Cryopreservation and their socio-demographic data.

Socio-demographic data	Women		Men	
	Satisfactory	Unsatisfactory	Satisfactory	Unsatisfactory
Age				
<35yrs	20(4)	181(36.2)	31(6.5)	93(18.6)
≥35yrs	52(10.4)	247(49.4)	38(7.6)	338(67.6)
χ^2	**7.9(p=0.04*)**		**11.1(p= 0.07)**	
Educational level				
Illiterate	0	171(34.2)	0	197(39.4)
Can read &write	1(0.2)	95(19)	6(1.2)	89(17.8)
Elementary	6(1.2)	37(7.4)	14(2.8)	55(11)
Preparatory	15(3)	38(7.6)	9(1.8)	35(7)
Diploma	12(2.4)	49(9.8)	11(2.2)	36(7.2)
Highly educated	38(7.6)	38(7.6)	29(5.8)	19(3.8)
χ^2	**5.2(p=0.03*)**		**9.6(p=0.06)**	
Married years				
1-4	9(1.8)	255(51)	7(1.4)	275(55)
>4-7	12(2.4)	45(9)	15(3)	61(12.2)
>7-10	41(8.2)	89(17.8)	22(4.4)	52(10.4)
>10	10(2)	39(7.8)	25(5)	43(8.6)
χ^2	**4.5(p=0.00**)**		**8.4(p=0.06)**	
Occupation				
Employee	12(2.4)	100(20)	21(4.2)	214(42.8)
Free work	8(1.6)	55(11)	15(3)	115(23)
Technician	20(4)	50(10)	9(1.8)	65(13)
Professional	22(4.4)	22(4.4)	17(3.4)	10(2)
No work	10(2)	201(40.2)	7(1.4)	27(5.4)
χ^2	**13.2(p=0.06)**		**11.3(p=0.09)**	
Residence				
Urban	35(7)	225(45)	35(7)	210(42)
Rural	37(7.4)	203(40.6)	34(6.8)	221(44.2)
χ^2	**6.1(p=0.04*)**		**7.5(p=0.12)**	
Income				
Not enough to cover treatment cost	8(1.6)	350(70)	49(9.8)	310(62)
Enough and cover treatment cost	32(6.4)	40(8)	15(3)	87(17.4)
Cover treatment cost and save money	32(6.4)	38(7.6)	5(1)	34(6.8)
χ^2	**5.2(p=0.02*)**		**3.2(p=0.001**)**	
Family type				
Extended family(live with parents)	54(10.8)	320(64)	52(10.4)	126(25.2)
Nuclear(small family)	18(3.6)	108(21.6)	17(3.4)	305(61)
χ^2	**5.3(p=0.05*)**		**11.0(p=0.14)**	

*Statistically significant difference (p ≤0.05), **A highly statistically significant difference (p ≤0 .001).

Table (7): Relation between total levels of studied sample's perception regarding the oocyte cryopreservation and their socio-demographic data.

Socio-demographic data	Women		Men	
	Positive	Negative	Positive	Negative
Age				
<35yrs	45(14.4)	113(36.2)	45(16.5)	98(35.9)
≥35yrs	90(28.8)	64(20.5)	55(20.1)	75(27.5)
χ^2	**3.1(p=0.03*)**		**7.3(p=0.09)**	
Educational level				
Illiterate	13(4.2)	69(22.1)	14(5.1)	85(31.1)
Can read &write	19(6.1)	35(11.2)	18(6.6)	20(7.3)
Elementary	18(5.8)	14(4.5)	22(8.1)	18(6.6)
Preparatory	15(4.8)	19(6.1)	7(2.6)	20(7.3)
Diploma	40(12.8)	12(3.8)	19(7)	21(7.7)
Highly educated	30(9.6)	28(9)	20(7.3)	9(3.3)
χ^2	**2.5(p=0.02*)**		**3.4(p=0.05*)**	
Married years				
1-4	10(3.2)	79(25.3)	11(4)	93(34.1)
>4-7	32(10.3)	42(13.5)	49(17.9)	22(8.1)
>7-10	41(13.1)	37(11.9)	25(9.2)	40(14.7)
>10	52(16.7)	19(6.1)	15(5.5)	18(6.6)
χ^2	**2.5(p=0.00**)**		**5.6(p=0.05)**	
Occupation				
Employee	19(6.1)	41(13.1)	21(7.7)	15(5.5)
Free work	31(9.9)	35(11.2)	9(3.3)	45(16.5)
Technician	17(5.4)	20(6.4)	29(10.6)	10(3.7)
Professional	55(17.6)	15(4.8)	37(13.6)	12(4.4)
No work	13(4.2)	66(21.2)	4(1.5)	91(33.3)
χ^2	**10.1(p=0.06)**		**9.2(p=0.09)**	
Residence				
Urban	77(24.7)	81(26)	45(16.5)	78(28.6)
Rural	58(18.6)	96(30.8)	55(20.1)	95(34.8)
χ^2	**4.2(p=0.04*)**		**2.4(p=0.03*)**	
Income				
Not enough to cover treatment cost	15(4.8)	88(28.2)	0	151(55.3)
Enough and cover treatment cost	42(13.5)	62(19.9)	43(15.8)	22(8.1)
Cover treatment cost and save money	78(25)	278.7)	57(20.9)	0
χ^2	**2.3(p=0.00**)**		**4.1(p=0.00**)**	
Family type				
Extended family(live with parents)	79(25.3)	91(29.2)	64(23.4)	51(18.7)
Nuclear(small family)	56(17.9)	86(27.6)	36(13.2)	122(4.5)
χ^2	**3.2(p=0.03*)**		**4.1(p=0.04*)**	

*Statistically significant difference (p ≤0.05), **A highly statistically significant difference (p ≤0 .001).

Fig (3): Relation between levels of studied sample's knowledge and perception regarding the oocyte cryopreservation.

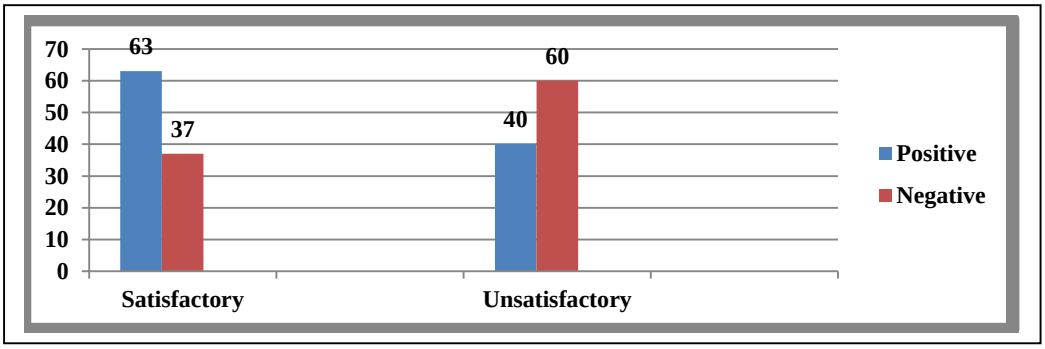

Table (8): Logistic regression analysis of factors associated with willing to utilize The oocyte cryopreservation services.

Variables	P-value	Adjusted OR (95% C.I)
Age ≥35yrs	0.01**	0.39(0.19-0.83)
Educational level(Diploma /highly educated)	0.00**	0.07(0.04 - 0.15)
Married years >4-7	0.04*	2.66 (1.09–7.00)
Occupation(Professional)	0.06	0.32 (0.10–1.06)
Residence	0.07	0.41 (0.23–1.18)
Income(Cover treatment cost and save money)	0.02*	0.26 (0.08–0.84)
Family type	0.08	0.65 (0.12–3.29)
Type of infertility(Primary)	0.04*	0.91 (0.60–1.40)
Reason for infertility(Female)	0.00**	0.87 (1.57-6.99)
Duration of infertility >3-6	0.00**	0.75 (0.16-0.67)
Number of IVF/ICSI trail >3	0.04*	0.88 (0.22-0.97)
Outcome of the previous trail (Negative)	0.02*	0.91 (1.72-8.24)

Conclusion:

Based on the results of the present study the following can be concluded: less than one third of the studied infertile couple undergoing IVF had significantly unsatisfactory knowledge regarding oocyte cryopreservation, which lead to negative perception about the practice among more than half of the studied subjects.

Recommendation:

Based on the findings of the present study, the researchers suggested the following recommendations:

Medical & nursing staff should spend more time in consulting and explaining to women to improve women's satisfaction.

Develop nursing training programs about Educational programs about cryopreservation should be implemented to fertility nurses in the fertility centers as a step toward disseminating such knowledge among the infertile couple.

- Integrate the counseling about cryopreservation practice in the ART protocol by using booklet and illustrated pamphlets.

- Future research to evaluate the effect of educational program and counseling on infertile couple at fertility centers.

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Conflicts of Interest Disclosure

The authors declare that there is no conflict of interest.

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