

Knowledge and Response of Medical Students at Suez University Regarding Elective Oocytes Cryopreservation; A Cross-Sectional Study

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ABSTRACT

Background: With the development of oocyte cryopreservation and the verification process, women who wish to delay pregnancy can avoid the need for donor oocytes and can use their own eggs at a later age.

Objective: To know the knowledge of female medical students at Faculty of Medicine, Suez University regarding elective oocytes cryopreservation.

Subjects and Methods: An observational cross-sectional study through a structured online survey about elective oocyte cryopreservation (egg freezing). The study included 173 Suez University medical students.

Results: Of the total, 50.3% of the students had some knowledge about oocyte cryopreservation, 36.4% of them didn't consider oocyte freezing, 53.2% of them considered oocyte cryopreservation for medical causes (ex. while undergoing radiation therapy or chemotherapy), 69.4% of them didn't think that this procedure has a negative effect on their future fertility, 72.8% of them believed that oocytes freezing should be self-paid and 66.5% of them would be more amendable to freezing their eggs.

Conclusion: Our study revealed an appreciable level of awareness about the oocytes freezing. We found that medical education has a positive impact on raising awareness regarding the causes of oocytes freezing, the availability, and its protective efficacy.

Key words: Medical Students; Knowledge; Oocytes Cryopreservation.

INTRODUCTION

Oocyte cryopreservation for nonmedical purposes has become more prevalent in recent years⁽¹⁾.

With the removal of the experimental label from oocyte cryopreservation by the American Society for Reproductive Medicine, "elective" use of this technology for fertility preservation has gained support in both the medical community and mainstream society⁽²⁾.

The concept of voluntary fertility preservation is not without dispute, and issues such as the optimal age for oocyte cryopreservation, the implications of cost-benefit analysis, and the scarcity of long-term data all merit further investigation⁽³⁾.

Nonetheless, the focus on age-related fertility decreases and attempts to safeguard future childbearing potential has certainly been brought to the forefront.

Understanding the baseline knowledge and attitudes of individuals involved in the decision-making process, particularly patients and their health care professionals, is critical to this topic⁽⁴⁾.

Numerous studies have been conducted to analyze the general public's comprehension of age-related fertility decline, attitudes toward ovarian reserve monitoring, and perceptions of elective fertility preservation, particularly among young persons pursuing higher education⁽⁵⁾.

Other studies looked at patients' pre-visit information before undergoing medically recommended fertility preservation⁽⁶⁾.

The baseline knowledge and attitudes of medical professionals, including residents in obstetrics and gynecology, were also evaluated⁽⁷⁾.

The findings consistently show that adequate awareness of age-related fertility reduction is poor in all groups, and attitudes toward elective fertility preservation differ greatly⁽⁸⁾.

Medical students are a distinct subset of people when it comes to elective fertility preservation because they are both patient advocates and a representation of the young professional population who may postpone family formation for the sake of their job and could benefit from this service. Aside from their medical knowledge, the interaction between their professional view of elective fertility preservation for patients and their notion of potentially using this technology for their own personal reasons is an intriguing concern⁽⁹⁾.

As a result, the goal of this study was to evaluate medical students' general knowledge as well as their personal and professional opinions of age-related fertility decrease, intentional fertility preservation, and barriers to care. This assessment was conducted after an online survey on the topic and, to our knowledge, is the first study at Suez University to attempt to assess the impact that a brief educational intervention may have on these topics.

SUBJECTS AND METHODS

Study area and subjects

The study was conducted during the time between August and October 2023 at Suez University. The targeted population was Suez University female medical students.

A structured online electronic survey designed by the lecturers of the OBS and GYN Department of Suez University was used in this observational cross-sectional study to assess the knowledge, response and attitude regarding elective egg freezing.

The questionnaire consisted of 13 questions: 3 questions assessing the demographic information and 10 questions assessing the knowledge about egg freezing. The questionnaire was in English. It is found later as an appendix. You can access the online form of the questionnaire through this link: <https://forms.gle/whkyQJBP1fE2A1Q57>

Ethical approval

The ethical approval for this study was obtained from Ethical Committee at Faculty of Medicine, Suez University. It was written at the top of the online form of the electronic survey "Filling out this electronic survey means you agree to be part of this study". This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Sample size and questionnaire

For a confidence level of 95%, the margin of error equals 0.05, and assuming the population proportion (P) equals 50%, these conditions require at least 173 students.

Statistical Analysis

Recorded data were analyzed using the Statistical Package for the Social Sciences, version 23.0 (SPSS Inc., Chicago, Illinois, USA). The quantitative data were presented as mean ± standard deviation and ranges. Also, qualitative variables were presented as number and percentages.

RESULTS

The study included 173 Suez University female medical students. 59% of them were at age group 20-21 years old, 97.1% of them had no children, 79.8% of them planned to have children, 58.2% of them planned to have children at the age interval between 26-30 years old and 5.2% of them faced pressure from their families to have children, as shown in **Table I**.

Table I: Demographic data distribution among study group (n=173)

Demographic data	No.	%
Age (years)		
18-19 years	25	14.5%
20-21 years	102	59.0%
22 or more	46	26.6%
Mean±SD	20.73±1.02	
Do you have children or are you currently pregnant?		
No	168	97.1%
Yes	5	2.9%
If not, do you plan to have children? (n=168)		
No	34	20.2%
Yes	134	79.8%
If yes, what age do you plan to have your first child? (n=134)		
21-25	29	21.6%
26-30	78	58.2%
31-35	8	6.0%
Not sure	19	14.2%
Do you face pressure from your family to have children to those who are married only?		
No	139	80.3%
Yes	9	5.2%
Not sure	24	13.9%
Missed	1	0.6%

Of the total, 50.3% of them had some knowledge about oocyte cryopreservation, 36.4% of them didn't consider oocyte freezing, 53.2% of them considered oocyte cryopreservation for medical causes, 69.4% of them didn't think that this procedure has a negative effect on their future fertility, 72.8% of them believed that oocytes freezing should be self-paid, 66.5% of them would be more amendable to freezing their eggs if their employer paid for oocyte freezing, 41.6% of them thought fertility would significantly decrease at age 45-50 years, 68.8% of them thought that at age 45-50 years old it will be too old to have a child naturally, 41.0% of them believed that decreased fertility with age would impact their decision and 31.2% of them think that 10-190 eggs is the minimum number of eggs they need to freeze to make it likely to have a live birth using them in the future as illustrated in **Tables II**.

Table II: Knowledge about elective oocytes cryopreservation distribution among study group (n=173)

	No.	%
What is your level of knowledge about oocyte cryopreservation (egg freezing)?		
None	26	15.0%
Some knowledge	87	50.3%
Moderate knowledge	54	31.2%
Extremely knowledgeable	6	3.5%
At what age would you consider oocyte freezing?		
21–25	10	5.8%
26–30	19	11.0%
31–35	30	17.3%
36–39	24	13.9%
>40	24	13.9%
Not consider it	63	36.4%
Missed	3	1.7%
For what reasons would you consider oocyte cryopreservation?		
Medical (ex. while undergoing radiation therapy or chemotherapy)	92	53.2%
Social (ex. no current partner)	44	25.4%
Career (ex. education, career prior to children)	30	17.3%
Missed	7	4.0%
Do you think this procedure has a negative effect on our future fertility?		
Yes	52	30.1%
No	120	69.4%
Missed	1	0.6%
Who should pay for the oocytes freezing?		
Self	126	72.8%
Parents	23	13.3%
Insurance	16	9.2%
Employer/Company	7	4.0%
Missed	1	0.6%

Table II Continue: Knowledge about elective oocytes cryopreservation distribution among study group (n=173)

	No.	%
If your employer paid for oocyte freezing, would you be more amenable to freezing your eggs?		
No	115	66.5%
Yes	55	31.8%
Missed	3	1.7%
At what age do you think fertility significantly decreases?		
30-34	6	3.5%
35-39	32	18.5%
40-44	62	35.8%
45-50	72	41.6%
Missed	1	0.6%
At what age do you think it is too old to have a child naturally?		
30-34	5	2.9%
35-39	12	6.9%
40-44	36	20.8%
45-50	119	68.8%
Missed	1	0.6%
When deciding on oocyte cryopreservation, which of the following would impact your decision? (You may choose more than one)		
Decreased fertility with age.	71	41.0%
Increase in miscarriages with age	27	15.6%
Increased chance of having a child with Down Syndrome with age	37	21.4%
The probability of having medical condition affects my fertility.	62	35.8%
Missed	1	0.6%
What do you think is the minimum number of eggs you need to freeze to make it likely to have a live birth using them in the future?		
5-9 eggs	51	29.5%
10-19 eggs	54	31.2%
20-29 eggs	35	20.2%
30-39 eggs	12	6.9%
40+ eggs	19	11.0%
Missed	2	1.2%

DISCUSSION

While assessments of medical students' knowledge on age-related decline in fertility and elective fertility preservation have been conducted in the past, this study is the first that we are aware of that evaluates changes in the students' professional and personal perceptions of these subjects at Suez University⁽¹⁰⁾.

When it comes to the debates around age-related reproductive decrease and intentional fertility preservation, medical students as a whole constitute a unique group. While the incentives of other professionals of a similar age are probably entirely personal, these people also need to absorb information in order to become patient advocates, which may require juggling their personal and professional interests. This argument is strengthened by the fact that almost all of the participants said they were delaying having children, with the most common justifications; being profession and education⁽¹¹⁾.

The majority of participants indicated some prior knowledge of age-related fertility decrease and intentional fertility preservation, as would be expected in this subset of people. Even though formal education was cited as the most common source of this background exposure, social media, internet resources, and the first-hand accounts of friends and family all had an impact⁽¹²⁾.

It is challenging to determine how much each of the previously stated elements may have contributed to participants' baseline understanding. However, the poll findings continued to show a lack of sufficient medical understanding and doubt about the perspectives of professionals and individuals regarding this technology. Concerns about possible health effects, fear of social stigma, and uncertainty about one's alternatives were among the answers given when questioned about potential hurdles⁽¹³⁾.

When evaluating the knowledge-based scores prior to the intervention, further restrictions were acknowledged⁽¹⁴⁾.

It was clear that participants tended to underestimate the rate of miscarriages at younger ages and overestimate the rate of per-cycle conception, even if most of them were accurate in estimating the rates of miscarriages and per-cycle fecundity at advanced ages. When considered collectively, it is plausible to believe that these ambiguities and misrepresentations among young physicians may present serious challenges for individuals making personal decisions as well as for medical professionals advising patients on age-related loss in fertility and optional cryopreservation of oocytes⁽¹⁵⁾.

The debate above emphasizes the need for further knowledge and instruction on a personal and professional level, which is in line with suggestions from past research on the topic⁽¹⁶⁻¹⁷⁾.

But there isn't much information available regarding the precise kinds of interventions or educational initiatives that might actually have an impact⁽¹⁷⁻¹⁹⁾.

In a pre-/post-intervention trial, 137 male and female undergraduate students' knowledge of fertility and the efficacy of IVF was measured both before and after they saw a brief online brochure. The intervention group showed substantial increases in knowledge⁽²⁰⁾.

Additionally, this kind of conversation could aid medical personnel in understanding how their own personal views on the subject may affect their encounters with patients in a professional capacity. In one study, almost all of the survey participants said that medical personnel should be aware of the age-related loss in fertility and the optional cryopreservation of oocytes⁽²¹⁾.

While these results following a single session are promising, it is reasonable to surmise that repetition may be essential, as in many areas of education. These subjects should ideally be covered in the first few years of general medical school and once more during clerkships for all trainees⁽²²⁾.

As women's health-related fields continue to be specialized, exposure should be increased both in frequency and intensity. Even though the educational intervention's format may change, more exposure to the subject matter would undoubtedly raise understanding and familiarity with the material, which would then boost comfort and confidence in relation to patient counseling and, when necessary, independent decision-making⁽²³⁾.

Furthermore, these similar interventions could be utilized to start relevant talks with people who would want to move forward with family formation while training, given the interest in childbearing and the perceived barriers shown in this survey⁽²⁴⁾.

This study had a number of limitations while being unusual in both its topic and how it evaluated an educational intervention. The assessment was voluntary and recruitment took place at a single academic institution, which could have led to bias in a small self-selecting sample and limited the generalizability of the results. It is likely that the results were biased as a result of the attendants' potential personal biases regarding these subjects. Not only were there no male respondents to evaluate gender disparities, but there were also not enough completed questionnaires in general. Additionally, because the question format did not specifically ask participants about their thoughts on being objective in such scenarios, it was difficult to fully assess the impact that individual perceptions and intentions regarding age-related fertility decline and elective fertility preservation may have on professional interactions with patients on these same topics. However, based on the closed-ended comments section of the survey, it was apparent that respondents were cognizant of both the personal and professional implications, with responses

ranging from “I will be able to counsel patients much better now” to “This was invaluable information, especially for women in medicine.”

CONCLUSION

Our study revealed an appreciable level of awareness about the oocytes freezing. We found that medical education has a positive impact on raising awareness regarding the causes of oocytes freezing, the availability, and its protective efficacy.

Supplemental Appendix 1 "Oocyte Cryopreservation (egg freezing) Survey"

1. What is your age?

- 18
- 19
- 20
- 21
- 22
- > 22

2. Do you have children or are you currently pregnant?

- Yes
- No

If so, at what age did you have your first child?

- Not have.
- 21-25
- 26-30
- 31-35
- 36-39
- >40

If not, do you plan to have children?

- Yes
- No

If yes, what age do you plan to have your first child?

- 21-25
- 26-30
- 31-35
- 36-39
- >40
- Not sure

3. Do you face pressure from your family to have children?

- Yes
- No
- Not Sure

4. What is your level of knowledge about oocyte cryopreservation (egg freezing)?

- None
- Some knowledge
- Moderate knowledge
- Extremely knowledgeable

5. At what age would you consider oocyte freezing?

- 21-25
- 26-30

- 31-35
- 36-39
- >40
- Not consider it.

6. For what reasons would you consider oocyte cryopreservation?

- Medical (ex. while undergoing radiation therapy or chemotherapy)
- Social (ex. no current partner)
- Career (ex. education, career prior to children)

7. Do you think this procedure has a negative effect on your future fertility?

- Yes
- No

8. Who should pay for the oocytes freezing?

- Self
- Parents
- Insurance
- Employer/Company.

9. If your employer paid for oocyte freezing, would you be more amenable to freezing your eggs?

- Yes
- No

10. At what age do you think fertility significantly decreases?

- 30-34
- 35-39
- 40-44
- 45-50

11. At what age do you think it is too old to have a child naturally?

- 30-34
- 35-39
- 40-44
- 45-50

12. When deciding on oocyte cryopreservation, which of the following would impact your decision? (You may choose more than one)

- Decreased infertility with age.
- Increase in miscarriages with age.
- Increased chance of having a child with Down Syndrome with age.
- The probability of having medical condition affects my fertility.

13. What do you think is the minimum number of eggs you need to freeze to make it likely to have a live birth using them in the future?

- 5-9
- 10-19
- 20-29
- 30-39
- 40+

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REFERENCES

1. **Anderson R, Davies M, Lavery S et al. (2020):** Elective Egg Freezing for Non-Medical Reasons: Scientific Impact Paper No. 63. *BJOG: An International Journal of Obstetrics & Gynaecology*, 127(9): e113-e121.
2. **Cobo A, García-Velasco J, Coello A et al. (2016):** Oocyte vitrification as an efficient option for elective fertility preservation. *Fertility and sterility*, 105(3): 755-764.
3. **Gunnala V, Schattman G (2017):** Oocyte vitrification for elective fertility preservation: the past, present, and future. *Current Opinion in Obstetrics and Gynecology*, 29(1): 59-63.
4. **Argyle C, Harper J, Davies M (2016):** Oocyte cryopreservation: where are we now?. *Human reproduction update*, 22(4): 440-449.
5. **Gambadauro P, Bränn E, Hadlaczky G (2023):** Acceptance and willingness-to-pay for oocyte cryopreservation in medical versus age-related fertility preservation scenarios among Swedish female university students. *Scientific Reports*, 13(1): 5325.
6. **Cottrell C, Ohaegbulam G, del Priore G (2020):** Fertility Preservation Counseling In Reproductive Aged Women with Localized Gyn Cancers at an Urban Safety Net Hospital: A Pilot Study. *Fertility and Sterility*, 114(3): e257-e258.
7. **Tsai S, Truong T, Pieper C, Eaton J (2019):** Fertility awareness and attitudes among resident physicians across different specialties. *Fertility and Sterility*, 112(3): e406.
8. **Slater A, Liew R, Peate M (2022):** Age-related fertility decline and elective oocyte cryopreservation: Knowledge, attitudes and practices in a pilot study of general practitioners. *Australian Journal of General Practice*, 51(8): 611-619.
9. **Tozzo P, Fassina A, Nespeca P et al. (2019):** Understanding social oocyte freezing in Italy: a scoping survey on university female students' awareness and attitudes. *Life sciences, society and policy*, 15(1): 1-14.
10. **Hickman L, Fortin C, Goodman L et al. (2018):** Fertility and fertility preservation: knowledge, awareness and attitudes of female graduate students. *The European Journal of Contraception & Reproductive Health Care*, 23(2): 130-138.
11. **Clarke A, Wallgren-Pettersson C (2019):** Ethics in genetic counselling. *Journal of Community Genetics*, 10(1): 3-33.
12. **Balkenende E, van Rooij F, van der Veen F et al. (2020):** Oocyte or ovarian tissue banking: decision-making in women aged 35 years or older facing age-related fertility decline. *Reproductive BioMedicine Online*, 41(2): 271-278.
13. **Wernhart A, Gahbauer S, Haluza D (2019):** eHealth and telemedicine: Practices and beliefs among healthcare professionals and medical students at a medical university. *PloS one*, 14(2): e0213067.
14. **Dahodwala M, Geransar R, Babion J et al. (2018):** The impact of the use of video-based educational interventions on patient outcomes in hospital settings: A scoping review. *Patient Education and Counseling*, 101(12): 2116-2124.
15. **Kyweluk M (2020):** Quantifying fertility? Direct-to-consumer ovarian reserve testing and the new (in) fertility pipeline. *Social Science & Medicine*, 245: 112697.
16. **Meissner C, Schippert C, von Versen-Höynck F (2016):** Awareness, knowledge, and perceptions of infertility, fertility assessment, and assisted reproductive technologies in the era of oocyte freezing among female and male university students. *Journal of Assisted Reproduction and Genetics*, 33: 719-729.
17. **Yu L, Peterson B, Inhorn M et al. (2016):** Knowledge, attitudes, and intentions toward fertility awareness and oocyte cryopreservation among obstetrics and gynecology resident physicians. *Human reproduction*, 31(2): 403-411.
18. **Daniluk J, Koert E (2015):** Fertility awareness online: the efficacy of a fertility education website in increasing knowledge and changing fertility beliefs. *Human Reproduction*, 30(2): 353-363.
19. **Wantland D, Portillo C, Holzemer W et al. (2004):** The effectiveness of Web-based vs. non-Web-based interventions: a meta-analysis of behavioral change outcomes. *Journal of medical Internet research*, 6(4): e40.
20. **Wojcieszek A, & Thompson R (2013):** Conceiving of change: a brief intervention increases young adults' knowledge of fertility and the effectiveness of in vitro fertilization. *Fertility and sterility*, 100(2): 523-529.
21. **Mesen T, Mersereau J, Kane J et al. (2015):** Optimal timing for elective egg freezing. *Fertility and sterility*, 103(6): 1551-1556.
22. **Stoop D (2016):** Oocyte vitrification for elective fertility preservation: lessons for patient counseling. *Fertility and sterility*, 105(3): 603-604.
23. **Hirshfeld-Cytron J, Grobman W, Milad M (2012):** Fertility preservation for social indications: a cost-based decision analysis. *Fertility and sterility*, 97(3): 665-670.
24. **Pai H, Baid R, Palshetkar N et al. (2021):** Oocyte cryopreservation-current scenario and future perspectives: A narrative review. *Journal of Human Reproductive Sciences*, 14(4): 340.