

Knowledge, Attitude and Barriers of unmarried female bridging program Nurse regarding Egg Frozen at South Valley University

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Abstract

Background: Egg Freezing (EF) technology has improved significantly over the last decade, giving women more choice over their reproductive futures. Knowledge on EF varies widely, even amongst health care providers. **Aim:** this study aims to assess knowledge Attitude, and Barriers of unmarried female bridging program nurses' regarding egg frozen at South Valley University. **Methods:** Descriptive research design was used, study was conducted at Technical Institute of Nursing, South Valley University, sample involved 60 unmarried female bridging program-nursing students, a structured interview questionnaire used as a tool to collect data that involved four parts; personal, EF knowledge assessment, EF attitude assessment and barriers of EF application. **Results:** 60%, of studied bridging program, nursing students had inadequate knowledge and 61.7% have a positive attitude regarding EF. And about 75% and 73.3% of studied bridging program nursing students consider fear of future husband refusing and culture believes are barriers to perform EF. **Conclusion:** There are a big percent of studied bridging program nursing students have inadequate knowledge, positive attitude, and fear of future husband refuse are majority barriers about EF **Recommendations:** Encourage bridging program nurses to update their education in the form of attending workshops, conferences related to infertility issues and EF and implement a study to evaluate effect of educational program about EF on improving nurses' knowledge.

Keywords: Knowledge, Attitude, Barriers, Egg Frozen, bridging program Nurse Students

Introduction:

The delay in childbearing is thought to stem from social and economic factors (**Mesen et al, 2015**). With the presence of egg freezing and process of vitrification, women who desire to postpone her pregnancy, they can avoid needing for donor oocytes and can use their own oocytes at a later age (**Mahesan et al., 2019**). Egg freezing (EF) is a method of fertility preservation that may extend fertility beyond the natural time of woman fertility. Eggs are collected using Assisted Reproductive Technology (ART), cryopreserved by vitrification and placed in storage until a later time when they can be used to create embryos through in vitro fertilization (IVF) (**Baldwin et al, 2019**).

The freezing process halts the aging of eggs and enables women to consider pregnancies later. Initially EF was only offered to women at risk of infertility from medical treatments such as chemotherapy, or from illness such as premature ovarian failure (referred to as "medical" EF). However, more recently EF has become an option for women faced with the prospect of age-related infertility (referred to as "non-medical" EF). The majority of women who access non-medical EF, reported that, the main reason for choosing to freeze their eggs is due to absence of a partner with whom to have children (**Inhorn et al., 2018**) and (**Pritchard et al, 2017**). C Chen in 1986 reported the first successful human EF and fertilization process, during which he achieved a successful twin pregnancy (**Nasab et al., 2020**).

In the past, EF was offered in fertility clinics mainly for women diagnosed with cancer and that exposed to fertility impairing as a consequence of radiation treatments or chemotherapy. However, recent trends make infertility clinics to offer elective EF to accommodate unready women to have children and want to preserve their reproductive potential by postponing childbearing (**Hong et al., 2019**).

Ethics Committee of the American Society for Reproductive Medicine (ASRM) in 2018 reported that elective EF is a medical therapy that is ethically permissible, with the only purpose to preserve reproductive potential of healthy women (**Ethics Committee of the American Society for Reproductive Medicine, 2018**).

To have a greater than 50% chance of live birth at age < 35, a woman must freeze at least 10 oocytes. At age 40, this number increases to 40 oocytes (**Mahesan et al., 2019**)

The ASRM and the Society for Assisted Reproductive Technology (SART) practice guideline estimates that the survival rate of oocytes after Vitrification and thawing is 90%–97%, the fertilization rate is 71%–79% and the implantation rate is 17%–41%. The clinical pregnancy rate per vitrified and thawed oocyte is 4.5%–12% (**Petropanagos et al., 2015**).

There are different factors affect the success of oocyte freezing technology that include costs, culture & attitudes, delay in synchronization, and increasing age of the woman when the eggs were frozen. The highest success rates are for women aged below 35 years old. (**Nagy et al., 2019**). Many objections to age-related egg freezing are masked as legitimate worries about the associated risks with this reproductive technology and, surprisingly (**Johnston et al., 2020**).

Nurses play an important role in educating patients about the relationship between age and fertility. They are also in a position to discuss the implications of Egg freezing such as cost, risk, and the estimated number of eggs needed to give women a reasonable chance of having a baby as a result. Currently, nursing students should be integrated into new evidence-based medicine and technologies and be up to date by new practices (**Yu et al., 2016**). So their knowledge should be assessed and identified through study performed on them.

Significance of the study:

Knowledge on elective egg freezing varies widely, even among health care providers (**Mahesan et al., 2019**). A study of 410 Israeli undergraduate students, students overrate women's chances of spontaneous pregnancy in all age groups. Only 11% of students knew that genetic motherhood is unlikely to be achieved from mid-40s onwards (**De Groot et al., 2016**). In another study done in Northern California of 328 university students, about 79% of students were interested in learning about the current status of ovarian reserve (**Bavan et al., 2017**).

Postgraduate students are at a stage in their lives where they consider their future and career goals. Given the currently increased visibility and feasibility of elective EF technology, these students are increasingly faced with EF as an option that may influence their life and career decisions (**Mahesan et al., 2019**).

Also Most women who want children report that their health care provider is the preferred and most reliable source of information about reproductive health, rather than other sources such as the media, peers, and the Internet (**Lundsberg et al., 2014**) and (**Yu et al., 2016**). However, women typically wait to

seek information from their health care providers on fertility and conception until they are older, when their fertility may already be declining or compromised. Furthermore, not all health care providers are familiar with or comfortable counseling their patients about age-related fertility decline (**Mahesan et al., 2019**). So the current study aimed to assess knowledge of unmarried diploma nurses' students' regarding egg frozen as a member of health care providers.

Aim of the study:

This study aimed to

Assess knowledge, attitude, and barriers of unmarried female bridging program nurses' students' regarding egg frozen.

Research question:

What the unmarried female bridging program nurse' students' knowledge, attitude and barriers regarding Egg frozen.

Subjects and methods:

Subjects and methods of this study are delivered into four designs technical, operational, administrative, and statistical design.

I. Technical Design:

Which included study design, setting, study sample, and tools of data collection.

Research Design:

Descriptive research design was used in this study

Setting:

This study was conducted at Technical Institute of Nursing, South Valley University, Egypt. A building has two halls, two classes and one clinical lab. In addition to administrative offices, it service Qena governorate only.

Sample:

Sample involved all unmarried female bridging nursing students who study a special diploma in nursing.

Tool of the study:

A structured interview questionnaire was designed by the researchers. Questionnaire was translated into Arabic language to avoid unobvious words regarding egg freezing, it involved four parts.

Part one: included Sociodemographic data of bridging program-nursing students as (age, residence, employment place).

Part two: included 11 multiple choice questions to assess knowledge about egg freezing as definition, suitable age for freezing live span, indications, number of eggs would you like to freeze, factors affect egg freeze, advantages and complications and methods of egg freezing.

Knowledge scoring system:

Each question was scored as 2 for a correct answer, 1 for correct incomplete and zero for an incorrect answer. While the total knowledge score was graded as the following: knowledge was considered inadequate if the percent score was <60% and considered adequate if percent was 60% and more.

Part three: included 7 sentences to identify bridging program nursing students' attitude toward egg freezing as worried about (eggs frozen missed used, bad storage of eggs frozen, longtime storage and infection control precautions), importance of eggs frozen knowledge to health care provider and freezing and storing should be followed up. And egg frozen banks should be accredited and standards.

Attitude scoring system:

Each sentence was scored 1 for correct agree answer and zero for disagree answer. Attitude was considered to be positive if the percent score was 70% or more and consider negative if less than 70%.

Part four: included a one questions directed to bridging program-nursing students to assess barriers of applying egg frozen process.

Tools Validity:

Tools were reviewed by a panel of 3 experts in the field of maternity and newborn health nursing staff, faculty of nursing, South Valley University for clarity and comprehensive of the study tool.

Tools Reliability:

Ratability coefficient of the study tool was calculated by using Cronbach's Alpha; and it was 0.764.

II. Operational design:

It was displayed in two phases' pilot study and fieldwork.

Ethical consideration

To achieve this study after obtaining official permission from Technical Institute of Nursing, South Valley University. Informed consent was obtained from every postgraduate nursing student individually and explained to her the nature and aim of the study. In addition, confidentiality was maintained during the research process. .

Pilot study:

Pilot study was included 10% of the study sample and included in the study. According to inclusion of the sample size (6 bridging program nursing students) to test comprehensive, accuracy and clarity of the tool used in the study.

Fieldwork:

Tool contained was explained to the includes study sample them data was collected. It included the following:

After obtaining official permission from Technical Institute of Nursing, South Valley University, the researcher interviewed with bridging program nursing student and explained to them the nature and aim of the study, divided into small groups each group (15 student nurse), then obtained informed consent to participate in the study, after that the researcher asked the student to fill data regarding socio demographic characteristics, and data regarding knowledge, attitude and barriers about egg frozen. Explanation of session lasted 2hours included 20 mints for discussion, Because of the eventuality of the topic and the lack of knowledge and awareness of it, there were many questions Suitable age for egg freezing (Live span of egg freezing, Number of eggs must be freeze, and barriers). Then each nursing students was given a lecture contained all information regarding egg frozen and covered all point that asked in the questionnaire and any question regarding the subject.

III- Administrative design:

This study was achieved under the approval of faculty of nursing's Ethical committee, faculty of nursing South Valley University, each bridging program (diploma) was informed about purpose of the study, agreement was taken from her to participate in the study, ensuring of confidentiality of the data collected.

IV-Statistical design:

The collected data were organized, categorized, coded, tabulated and analyzed using the Statistical Package for social sciences (SPSS) version 18. Data were presented, tables, and charts using numbers, percentages, means, and standard deviation. Chi-square test was

used to identify correlation between variables statistical significance was considered at P-value ≤ 0.05 .

Results:

Table (1): Distribution of studied bridging program nursing students regarding personal data: (n=60)

personal data	No. (60)	%
Age: (years)		
< 25	31	51.7
≥ 25	29	48.3
Mean \pm SD	25.23 ± 4.25 (20.0-44.0)	
Residence:		
Rural	33	55.0
Urban	27	45.0
Place of work:		
University hospital	28	46.7
MOH hospital	32	53.3

Table (2): Distribution of studied bridging program nursing students regarding knowledge about EF : (n=60)

Item	No. (60)	%
Definition of egg frozen:		
Correct	17	28.3
Incorrect	43	71.7
Suitable age for egg freezing:		
Correct	29	48.3
Incorrect	31	51.7
Live span of egg freezing:		
Correct	21	35.0
Incorrect	39	65.0
Indications of egg frozen:		
Correct	19	31.7
Incomplete	23	38.3
Incorrect	18	30.0

Item	No. (60)	%
Number of eggs must be freeze:		
Correct	26	43.3
Incorrect	34	56.7
Factors affecting egg freezing:		
Correct	12	20.0
Incomplete	23	38.3
Incorrect	25	41.7
Advantages of egg freezing:		
Correct	10	16.6
Incomplete	31	51.7
Incorrect	19	31.7
Egg retrieval procedures:		
Correct	12	20.0
Incomplete	14	23.3
Incorrect	34	56.7
Emotional risks:		
Correct	46	76.7
Incorrect	14	23.3
Steps of egg freezing:		
Correct	13	21.7
Incomplete	18	30.0
Incorrect	29	48.3
Methods of egg freezing:		
Correct	15	25.0
Incorrect	45	75.0

Figure (1): Distribution of studied bridging program nursing students according to total knowledge score about EF

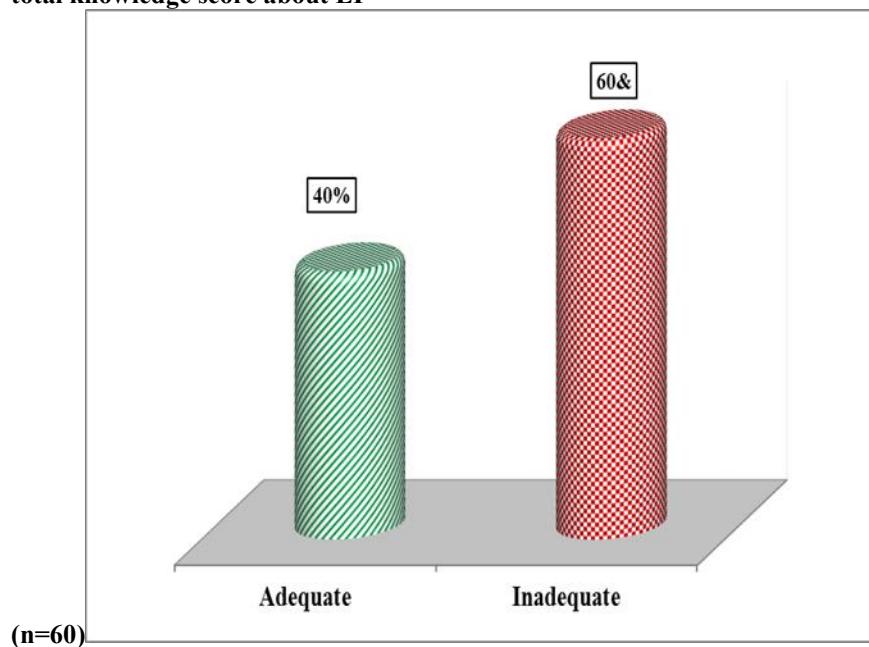


Figure (2): Distribution of studied bridging program nursing students according to source of information (n=60)

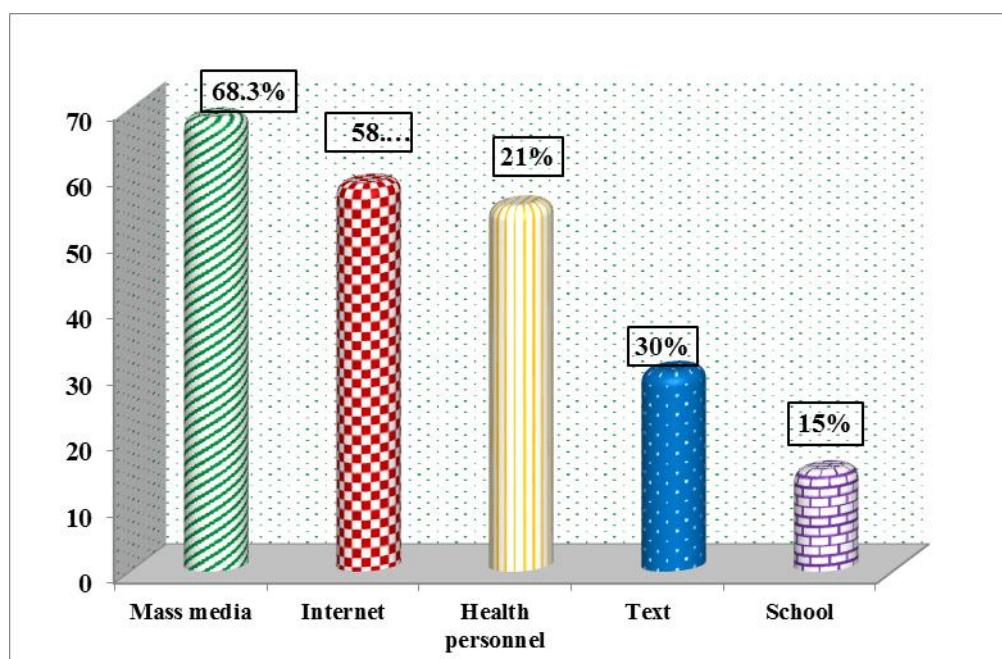


Table (3): Distribution of studied bridging program nursing students according to these attitude toward EF (N =60):

Item	Agree		Disagree	
	No.	%	No.	%
worried about missed used of frozen eggs	49	81.7	11	18.3
worried about bad storage of frozen eggs	51	85.0	9	15.0
worried of long-time storage	36	60.0	24	40.0
Eggs frozen knowledge is important for me as a health care provider	42	70.0	18	30.0
Freezing and storing should be followed up	33	55.0	27	45.0
Egg frozen banks should be accredited and standards	25	41.7	35	58.3
Infection control precautions must be used	29	48.3	31	51.7

Figure (3): Distribution of studied bridging program nursing students according to total attitude score about EF :(n=60_)

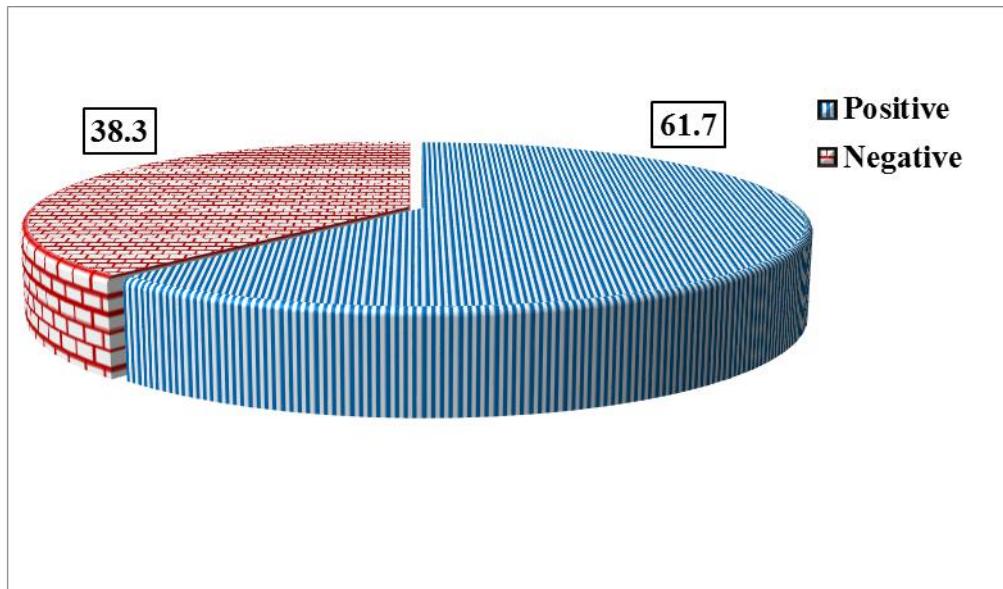
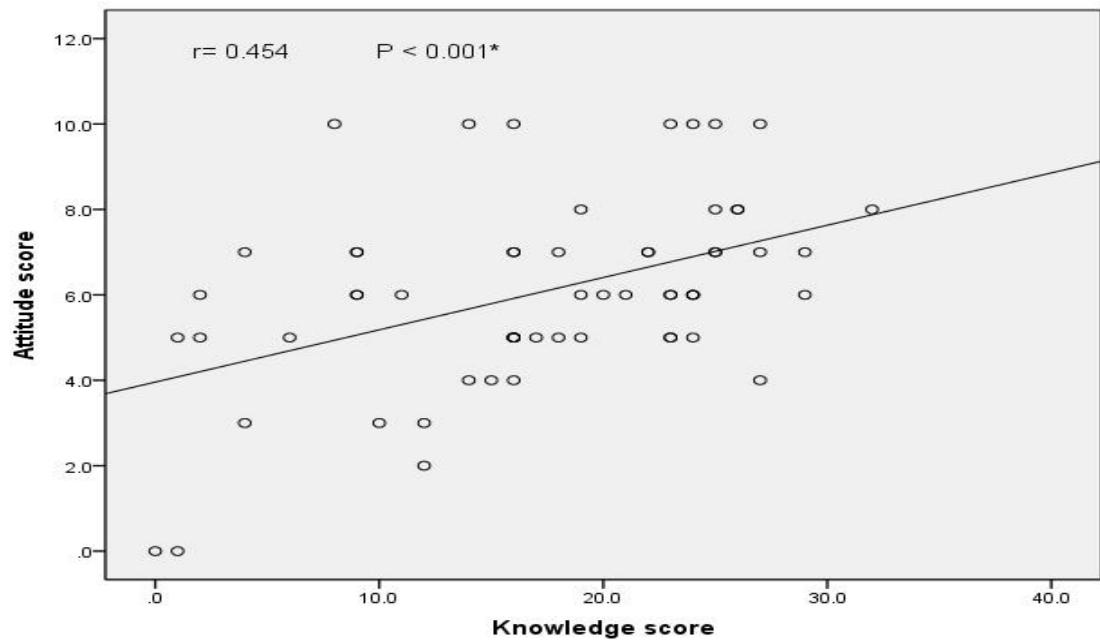


Figure (4): Correlation between knowledge score and attitude score:**Table (4): Relationship between total knowledge and personal data : (n=60)**

	Knowledge level				P-value	
	Inadequate		Adequate			
	No.	%	No.	%		
Age: (years)						
< 25	21	67.7	10	32.3	0.206	
≥ 25	15	51.7	14	48.3		
Residence:						
Rural	19	57.6	14	42.4	0.672	
Urban	17	63.0	10	37.0		
Place of work:						
University hospital	12	42.9	16	57.1	0.011**	
MOH hospital	24	75.0	8	25.0		

(**) highly statistically significant $p < 0.01$

Table (5): Relationship between level of attitude and personal:

Personal data	Attitude level				P-value	
	Negative		Positive			
	No.	%	No.	%		
Age: (years)						
< 25	15	48.4	16	51.6	0.096	
≥ 25	8	27.6	21	72.4		
Residence:						
Rural	14	42.4	19	57.6	0.471	
Urban	9	33.3	18	66.7		
Place of work:						
University hospital	11	39.3	17	60.7	0.887	
MOH hospital	12	37.5	20	62.5		

Table (6): Distribution of studied bridging program nursing students according to barriers of eggs frozen :(n=60)

Barriers of eggs frozen	No. (60)	%
Parent's responsibility		
• Yes	42	70.0
• No	18	30.0
Fear for future haspant refuse		
• Yes	45	75.0
• No	15	25.0
Cost of eggs frozen banks		
• Yes	30	50.0
• No	30	50.0
Lack of ' knowledge about eggs frozen		
• Yes	18	30.0
• No	42	70.0
Cultural believes of the eggs frozen		
• Yes	44	73.3
• No	16	26.7
Adolescent is a difficult time to make decisions		
• Yes	8	13.3
• No	52	86.7
Religious barriers		
• Yes	43	71.7
• No	17	28.3

Table (7): Distribution of studied bridging program nursing students according to their opinion regarding eggs frozen and its practice in the future:(n=60)

Item	No. (60)	%
What's your opinion about egg freezing?		
Good	18	30.0
Good but not applicable	28	46.7
Bad	14	23.3
Do you like to practice egg freezing?		
Yes	18	30.0
No	42	70.0

Table (1): illustrates personal data of studied bridging program nursing students, and reports that 51.7% of them have an age less than 25 years with a mean \pm SD of 25.23 ± 4.25 , about 55% lives in rural areas, 53.3% works at MOH.

Table (2): shows knowledge of studied bridging program nursing students about EF, and clarifies that 28.3%, 51.7% and 65% don't know definition, suitable age and live span of EF respectively. About 30%, 41.7%, and 31.7% don't know the correct answer regarding indications, factors affecting, and advantages of EF respectively. 65.7% of studied nurses don't know number of eggs must be freeze and egg retrieval procedures. About 23.3%, 48.3% and 75% don't know emotional risks, steps and methods of EF respectively.

Figure (1): shows total knowledge of studied bridging program nursing students regarding EF, and reports that 60% of them had inadequate knowledge.

Figure (2): displays that 68.3% of studied bridging program nursing students have their information from mass media.

Table (3) reflects attitude of studied bridging program nursing students regarding EF, and illustrates that 81.7%, 85% and 60% are worried about missed used, bad storage, and longtime storage of EF respectively. About 70% of them agreed on importance of knowledge about

EF for them as a health care provider. Also 55%, 41.7 and 48.3% agreed on follow up of freezing process, accreditation & standard of EF bank and using of infection control precautions.

Figure (3): demonstrates total attitude score of studied bridging program nursing students and clarifies that 61.7% have a positive attitude regarding EF.

Figure (4): reports that there is positive relationship between total knowledge score regarding EF and total attitude score regarding EF of studied bridging program nursing students' p-value 0.001.

Table (4): represents that, there is positive relationship between total knowledge score and place of work of studied bridging program nursing students p-value 0.001 and there is no relation between total knowledge score and age, residence of studied bridging program nursing students p-value (0.206, 0.672, and 0.457) respectively.

Table (5): indicates that, there is no relation between total attitude score and age, residence, and place of work of studied bridging program nursing students p-value value (0.096, 0.471, 0.887 and 0.240) respectively

Table (6): shows barriers of EF and reports that 75% and 73.3% of studied bridging program nursing students consider fear of future husband refusing

and culture believes are barriers to perform EF.

Table (7): demonstrates that 30% of studied bridging program nursing students report that EF is a good process and would like to practice EF process.

Discussion:

The knowledge about the different religious perceptions related to the reproduction health problem, especially fertility preservation is important for a practitioner who practices reproduction techniques. Dilemmas associated with fertility therapies and ethical considerations should be explored because this field continues to develop **Harzif et al., 2020**. This study aimed to assess knowledge, attitude, and barriers of unmarried female bridging program nurses' students' regarding egg frozen. Regarding total knowledge about EF, present study shows that more than one third of studied bridging program nursing students have adequate level of knowledge.

On the same line **Daniluk et al., 2012**, who applied their study in Canada on a large sample of childless women to assess their knowledge about fertility and assisted human reproduction (AHR) treatments, and reported that nearly one third of studied women had adequate knowledge about EF.

Also **Em Borrow, 2018**, who performed their study on women to identify knowledge of EF & Associated Financial Barriers, and found that around one third of studied women had adequate knowledge about EF.

On the other hand, **Greenwood et al., 2018**, who achieved their study in California to characterize the degree of decision regret following elective EF for social indications, and identify factors associated with regret, and illustrated that the majority of studied women had adequate knowledge about EF. This difference back to **Greenwood et al., 2018** applied their study on women intended to perform EF, so they were had a good knowledge about it.

According to questions directed to study bridging program nursing students, current study shows that the majority of them know the correct answer for one question from 11 questions directed to them.

This was on the same line with **Hong et al., 2019**, who carried out their study in Korea on unmarried women of reproductive age to investigate the level of awareness and knowledge regarding elective oocyte cryopreservation (EOC), and represented that the majority of studied women indicated the correct answer for one question from 6 questions directed to them to assess knowledge regarding EF.

On the other side, **Mahesan et al., 2019**, who performed their study in Eastern Virginia to assess knowledge and attitudes regarding EOC among female undergraduate students and medical students, and showed that only one quarter of students know the correct number of egg be free zed as a question directed to them to assess their knowledge regarding EF. But current study reports that less than one-half answered the same question correctly. This difference back to difference in the study sample between **Mahesan et al., 2019** (undergraduate students) and current study (postgraduate students).

Hashiloni-Dolev et al., 2020 was agreed with previous results, who achieved their study in Danish and Israeli to assess knowledge, concerns and intentions of Israeli and Danish students regarding egg and sperm freezing, and clarified that the majority of them had information about EF. Also **Nasab et al., 2019**, who achieved their study in USA on Physicians to assess their attitudes towards using EOC, and reported that the great majority of them were aware of EF as a fertility option.

But, **Tozzo et al., 2019**, who implemented their study in Italy to assess female students' awareness and attitudes regarding social oocyte freezing, and found that around one third of female students had information about EF. Also, **Meissner et al., 2016**, who applied their study in New York on university students to identify their knowledge and attitude towards parenthood, female fertility, fertility assessment, and oocyte freezing, and clarified that more than half of all studied sample had information about EF. Difference back to dissimilarity in study sample between both studies, as current study applied on nursing student, but other studies applied on general students.

When refer to total attitude toward EF and its relation to personal data, actual study reports that less than two thirds of studied postgraduate students have a positive attitude toward EF. In addition, there is no relation between total attitude and personal data (age, residence).

The same opinion was reported by **Johnston et al., 2020**, who carried out their study in Australia to explore attitudes on access to EF, and illustrated that less than two thirds (65%) of studied sample had a positive attitude toward EF. And there was no significant relation between educational level& age and attitude toward EF.

Also a study performed in Japan by **Shimizu et al., 2013** to identify fertility-related practice for young breast cancer patients and to assess healthcare provider factors that contribute to physicians' behavior towards fertility preservation, and reported that breast cancer specialist were more positive attitude toward fertility preservation.

Different from previous results, **Yu et al., 2016**, who achieved their study in USA on Obstetrics & Gynecological resident physicians to identify knowledge, attitudes, and intentions toward fertility awareness and oocyte cryopreservation, and showed that only one quarter of them

were had a positive attitude toward EF. This may be back to difference between them in setting.

Egg freezing is something done routinely in all labs worldwide. There are still many factors impeding its widespread practice in the Middle East. Namely lack of awareness and cost by patients and doctors alike **Abdelwahab and Samy, 2017**.

According to barriers of EF, present study shows that lack of knowledge, culture, believes, and religion barriers carry more than two thirds for all as a barrier for EF.

Abdelwahab and Samy, 2017, who applied their study in Egypt to assess obstacles that faced EF in the Middle East, and demonstrated that the great majority of studied sample reported lack of awareness, doubt of success, and excess cost acted as a barrier for EF.

Referring to intention to practice EF, actual study reported that nearly one third of studied postgraduate students have a desire to practice EF in future.

On the same line **Stoop et al., 2011**, who implemented their study in Belgium on women of reproductive age to identify their attitudes towards EF for non-medical reasons, and found that around one third of studied women accepted to freeze their egg in the future.

On the other hand, **Ikhena-Abel et al., 2017**, who carried out their study in New York to identify knowledge, intentions, and attitudes of medical students towards EF and employer coverage of such treatment, and represented that more than two thirds of studied sample would consider EF as a future desire.

Therapy of fertility should consider the age and marital status, religion or ethical objection to freezing of embryo, treatment, and type of cancer, the risk to benefit ratio of delaying treatment, and

prognosis after treatment **Harzif et al., 2020.**

Regarding personal data of studied bridging program nurse students, present study illustrates that more than one-half of them have age of less than 25 years old with a mean age of 25.23 ± 4.25 and lives in rural areas. Less than half of them worked at university hospitals and less than one sixth are Christians.

This was agreed with (**Hashiloni-Dolev et al., 2020**), who found that mean age of studied students was 25.7 ± 5.6 and around one sixth of them were Christians.

These differences can be explained by inadequate knowledge, education, and culture and nature of society in Upper Egypt, Qena society consider arigide and fanatical society.

Conclusion: there are a big percent of studied bridging program nursing students have inadequate knowledge, positive attitude, and fear of future husband refuse are majority barriers about EF.

Recommendations:

- Generalization of the study should be achieved on all health care providers.
- Encourage bridging program nurses student and all nurse to update their education in the form of attending workshops, conferences related to infertility issues and EF.
- Provide an instructional booklet regarding EF to enhance nursing knowledge about EF.
- Implement a study to evaluate effect of educational program about EF on improving nurses' knowledge.

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References:

1. **Abdelwahab, samar and M. S. (2017).** Obstacles Facing Oocyte Cryopreservation in the Middle East.
- Obstetrics & Gynecology International Journal, 7(2), 2–4. <https://doi.org/10.15406/ogij.2017.07.00238>
2. **Baldwin K, Culley L, Hudson N, Mitchell H. (2019).** Running out of time: exploring women's motivations for social egg freezing. J Psychosom Obstet Gynaecol. Jun;40(2):166-173. doi: 10.1080/0167482X.2018.1460352.
3. **Bavan, B., Porzig, E., & Baker, V. L. (2017).** An assessment of female university students' attitudes toward screening technologies for ovarian reserve. Fertility and Sterility, 96(5), 1195–1199. <https://doi.org/10.1016/j.fertnstert.2018.01.018>
4. **Daniluk, J. C., Koert, E., & Cheung, A. (2012).** Childless women's knowledge of fertility and assisted human reproduction: Identifying the gaps. Fertility and Sterility, 97(2), 420–426. <https://doi.org/10.1016/j.fertnstert.2011.11.046>
5. **De Groot, M., Dancet, E., Repping, S., Goddijn, M., Stoop, D., van der Veen, F., & Gerrits, T. (2016).** Perceptions of oocyte banking from women intending to circumvent age-related fertility decline. Acta Obstetricia et Gynecologica Scandinavica, 95(12), 1396–1401. <https://doi.org/10.1111/aogs.13019>
6. **Em Borrow. (2018).** Knowledge of Egg Freezing & Associated Financial Barriers. Http://Emborrow-Wordpress-Assets.S3-Us-West-2.Amazonaws.Com/Uploads/2018/07/EM.Presentation.Fertility101_R2.Pdf.
7. **Ethics Committee of the American Society for Reproductive Medicine (2018).** Planned oocyte cryopreservation for women seeking to preserve future reproductive potential: An Ethics Committee opinion. Fertil Steril;110: 1022-8.

8. Greenwood, E. A., Pasch, L. A., Hastie, J., Cedars, M. I., & Huddleston, H. G. (2018). To freeze or not to freeze: decision regret and satisfaction following elective oocyte cryopreservation. *Fertility and Sterility*, 109(6), 1097-1104.e1. <https://doi.org/10.1016/j.fertnstert.2018.02.127>
9. Harzif, A. K., Maidarti, M., Silvia, M., Mariana, A., Mutia, H. D., & Wiweko, B. (2020). Knowledge, attitude, intention, and religion aspect toward fertility preservation among obstetrics and gynecology residents in indonesia: A cross-sectional study. *International Journal of Reproductive BioMedicine*, 18(1), 47-56. <https://doi.org/10.18502/ijrm.v18i1.6199>
10. Hashiloni-Dolev, Y., Kaplan, A., Rasmussen, C. A. W., & Krolokke, C. (2020). Gamete preservation: knowledge, concerns and intentions of Israeli and Danish students regarding egg and sperm freezing. *Reproductive BioMedicine Online*, 00(0), 1-9. <https://doi.org/10.1016/j.rbmo.2020.08.001>
11. Hong, Y. H., Park, J. W., Kim, H., Kim, S. K., Choo, C. W., Jee, B. C., Suh, C. S., & Kim, S. H. (2019). A survey on the awareness and knowledge about elective oocyte cryopreservation among unmarried women of reproductive age visiting a private fertility center. *Obstetrics and Gynecology Science*, 62(6), 438-444. <https://doi.org/10.5468/ogs.2019.62.6.438>
12. Ikhena-Abel, D. E., Confino, R., Shah, N. J., Lawson, A. K., Klock, S. C., Robins, J. C., & Pavone, M. E. (2017). Is employer coverage of elective egg freezing coercive?: a survey of medical students' knowledge, intentions, and attitudes towards elective egg freezing and employer coverage. *Journal of Assisted Reproduction and Genetics*, 34(8), 1035-1041. <https://doi.org/10.1007/s10815-017-0956-9>
13. Inhorn, M. C., Birenbaum-Carmeli, D., Birger, J., Westphal, L. M., Doyle, J., Gleicher, N., Meirow, D., Dirnfeld, M., Seidman, D., Kahane, A., & Patrizio, P. (2018). Elective egg freezing and its underlying socio-demography: A binational analysis with global implications. *Reproductive Biology and Endocrinology*, 16(1). <https://doi.org/10.1186/s12958-018-0389-z>
14. Johnston, M., Fuscaldo, G., Richings, N. M., Gwini, S. M., & Catt, S. (2020). Cracked open: exploring attitudes on access to egg freezing. *Sexual and Reproductive Health Matters*, 28(1). <https://doi.org/10.1080/26410397.2020.1758441>
15. Lundsberg, L. S., Pal, L., Gariepy, A. M., Xu, X., Chu, M. C., & Illuzzi, J. L. (2014). Knowledge, attitudes, and practices regarding conception and fertility: A population-based survey among reproductive-age United States women. *Fertility and Sterility*, 101(3), 767-774.e2. <https://doi.org/10.1016/j.fertnstert.2013.12.006>
16. Mahesan, A. M., Sadek, S., Ramadan, H., Bocca, S., Paul, A. B. M., & Stadtmauer, L. (2019). Knowledge and attitudes regarding elective oocyte cryopreservation in undergraduate and medical students. *Fertility Research and Practice*, 5(1), 1-7. <https://doi.org/10.1186/s40738-019-0057-9>
17. 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(6), 719–729.
<https://doi.org/10.1007/s10815-016-0717-1>
18. **Mesen TB, Mersereau JE, Kane JB, Steiner AZ.** (2015). Optimal timing for elective egg freezing. *Fertil Steril* Elsevier Inc.; 103: 1551–1556.e4.
19. **Nagy, Z. P., Chang, C. C., Shapiro, D. B., Bernal, D. P., Elsner, C. W., Mitchell-Leef, D., Toledo, A. A., & Kort, H. I.** (2019). Clinical evaluation of the efficiency of an oocyte donation program using egg cryobanking. *Fertility and Sterility*, 92(2), 520–526.
<https://doi.org/10.1016/j.fertnstert.2008.06.005>
20. **Nasab, S., Shah, J. S., Nurudeen, K., Jooya, N. D., Abdallah, M. E., & Sibai, B. M.** (2019). Physicians' attitudes towards using elective oocyte cryopreservation to accommodate the demands of their career. *Journal of Assisted Reproduction and Genetics*, 36(9), 1935–1947.
<https://doi.org/10.1007/s10815-019-01541-7>
21. **Nasab, S., Ulin, L., Nkele, C., Shah, J., Abdallah, M. E., & Sibai, B. M.** (2020). Elective egg freezing: What is the vision of women around the globe? *Future Science OA*, 6(5).
<https://doi.org/10.2144/fsoa-2019-0068>
22. **Petropanagos, A., Cattapan, A., Baylis, F., & Leader, A.** (2015). Social egg freezing: Risk, benefits and other considerations. *Cmaj*, 187(9), 666–669.
<https://doi.org/10.1503/cmaj.141605>.
23. **Pritchard N, Kirkman M, Hammarberg K, McBain J, Agresta F, Bayly C, Hickey M, Peate M, Fisher J.** (2017). Characteristics and circumstances of women in Australia who cryopreserved their oocytes for non-medical indications. *J Reprod Infant Psychol.*;35(2):108-118. doi: 10.1080/02646838.2016.1275533. Epub 2017 Jan 11. PMID: 29517357.
24. **Shimizu, C., Bando, H., Kato, T., Mizota, Y., Yamamoto, S., & Fujiwara, Y.** (2013). Physicians' knowledge, attitude, and behavior regarding fertility issues for young breast cancer patients: A national survey for breast care specialists. *Breast Cancer*, 20(3), 230–240.
<https://doi.org/10.1007/s12282-011-0328-8>
25. **Stoop, D., Nekkebroeck, J., & Devroey, P.** (2011). A survey on the intentions and attitudes towards oocyte cryopreservation for non-medical reasons among women of reproductive age. *Human Reproduction*, 26(3), 655–661.
<https://doi.org/10.1093/humrep/deq367>
26. **Tozzo, P., Fassina, A., Nespeca, P., Spigarolo, G., & Caenazzo, L.** (2019). Understanding social oocyte freezing in Italy: A scoping survey on university female students' awareness and attitudes. *Life Sciences, Society and Policy*, 15(1).
<https://doi.org/10.1186/s40504-019-0092-7>
27. **Yu, L., Peterson, B., Inhorn, M. C., Boehm, J. K., & Patrizio, P.** (2016). Knowledge, attitudes, and intentions toward fertility awareness and oocyte cryopreservation among obstetrics and gynecology resident physicians. *Human Reproduction*, 31(2), 403–411.
<https://doi.org/10.1093/humrep/dev308>