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Original Research Article

Exploring the knowledge, awareness, and perceptions of reproductive-age women towards oocyte cryopreservation cross-sectional study in Saudi Arabia

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ABSTRACT

Background: Egg freezing, or oocyte cryopreservation, is a reproductive technology that allows women to preserve eggs for future childbearing via *in vitro* fertilization (IVF). It is beneficial for those delaying pregnancy due to medical or non-medical reasons, though success rates vary with age and cultural factors. However, the procedure carries risks like ovarian hyperstimulation syndrome and raises ethical concerns, particularly in Arab countries such as Saudi Arabia, where religious views may limit its use. This study explores knowledge, awareness, and perceptions of oocyte cryopreservation among reproductive-age women in Saudi Arabia.
Methods: A cross-sectional, questionnaire-based study was conducted with 105 Saudi women aged 18-39 in the Eastern province. Data was collected via an online survey. The sample size was calculated using Cochran's formula with a 95% confidence level and 5% margin of error.
Results: A total of 129 women participated. Most, (75.2%) believed doctors should inform women about egg freezing as part of health education, (71.3%) felt healthcare should cover the costs for women with cancer, and (46.6%) were aware of IVF. However, only 30.2% understood egg freezing well, and (24%) believe cryopreserved eggs are safe and successful for pregnancy at older ages. Key barriers to fertility preservation were the procedure's cost (60.5%) and potential side effects (52.7%). Younger women and those with a university or medical education showed better knowledge.
Conclusions: The study highlights limited knowledge of oocyte cryopreservation among women in Saudi Arabia, with financial costs and potential risks being significant barriers to the procedure.

Keywords: Oocyte cryopreservation, Egg freezing, Awareness, Saudi women

INTRODUCTION

Delayed conception can progressively decline oocytes' quantity and quality, but with the help of advanced reproductive technologies such as egg freezing, it becomes possible to save oocytes for future childbearing.[1] Oocyte freezing, medically known as oocyte cryopreservation, is an advanced reproductive technology. It's the process by which a woman's eggs are extracted, cryopreserved, and stored to be used in the future for fertilization by IVF.[2] Making childbearing possible for women who have delayed childbearing due to various reasons such as medical conditions (premature ovarian failure), treatments (cancer treatment), chemotherapy (especially alkylating

agents), and/or surgery that impair fertility.[3,4] However, most recently the target population of egg freezing has expanded and started to also include women who chose to delay their conception electively for non-medical reasons such as their financial, psychological, and personal life status including their career.[2] This is demonstrated by the fact that the average age of first-time mothers in the UK has risen from 26.7 years in 1970 to 30.7 years in 2019 (Statista, 2021).[5] Oocyte freezing technology is affected by several factors, including cost, and cultural and social attitudes. Age at the time of egg freezing is one of the most important factors to have a high success rate. thus, females under 35 have the highest success rate.[6] According to the American Society for Reproductive Medicine, oocyte freezing has been a successful procedure since 2012, and reported a 50% successful live birth in women aged <35 years old and 22.9% in those >36 years old.[4] On the other hand, egg freezing can carry some risks including Ovarian hyperstimulation syndrome which itself can lead to further unwanted outcomes such as multiple pregnancies, gestational hypertension, premature delivery, and low birth weight infants[2]. The side effects aren't the only concern in the case of egg freezing as it can have controversial ethical issues, especially in Arab countries.[4] Some fertility preservation methods may be restricted in Saudi Arabia for religious reasons. However, the exact restrictions are unclear because there has been no study on the relevant regulations or the current state of female fertility preservation in the country. Therefore, this study aims to explore knowledge, awareness and perception towards oocyte cryopreservation among reproductive-age women in Saudi Arabia.

METHODS

Study type, study place, and period

This is a cross-sectional, questionnaire-based study conducted in the Eastern Province of Saudi Arabia. The study targeted females of childbearing age, specifically those aged 18-39 years old. Data collection was carried out via an online questionnaire, which was provided by another study after obtaining the necessary approval.

Selection criteria of the patient

The inclusion criteria for participants were: female individuals aged 18-39 years, residing in the Eastern Province of Saudi Arabia

The exclusion criteria were: males, females outside the age range of 18-39 years and non-Saudi residents.

Procedure

The sample size was calculated using Cochran's formula, ensuring a sample of at least 105 participants, with a margin of error of 5% and a confidence level of 95%. The population size was derived from another study. Data was collected after obtaining informed consent from all participants, with no risks to their participation.

The collected data was then edited, coded, and entered into IBM SPSS version 22 for statistical analysis. Descriptive analysis was conducted on participants' bio-demographic information, education, and other relevant factors, based on frequency and percentage distribution.

Regarding knowledge and awareness of oocyte cryopreservation, the overall score was calculated by summing the scores of all individual items. Participants with a score of less than 60% of the maximum possible score were considered to have poor knowledge, while those with a score of 60% or more were classified as having high knowledge.

Ethical approval

The study was conducted following ethical guidelines, with informed consent obtained from all participants before data collection. The relevant institutional review board granted ethical approval for the study.

Statistical analysis

Data analysis was performed using IBM SPSS version 22. Descriptive statistics were used to analyze the participants' bio-demographic information and other variables. For knowledge and awareness, a score-based system was used to categorize participants. Factors influencing the decision to delay cancer treatment to preserve fertility were tabulated, and their associations with knowledge and awareness were assessed using cross-tabulation graphs.

Chi-square tests and exact probability tests were employed to assess the significance of factors influencing women's knowledge and awareness of oocyte cryopreservation. A $p<0.05$ was considered statistically significant.

RESULTS

A total of 129 eligible women completed the study questionnaire, with their ages ranged from 18 to 39 years with a mean age of 28.6±8.9 years old. A total of 77 (59.7%) were university educated or with a post-graduate degree. Only 25 (19.4%) women had education related to the medical field, but 97 (75.2%) were not employed. Considering marital status, 48 (37.2%) were single, 76 (58.9%) were married and 5 (3.9%) separated (Table 1).

Exact of 97 (75.2%) think doctors should provide women of reproductive age with information about egg freezing as part of health education, 92 (71.3%) think health care should cover the costs of egg freezing procedures for women with cancer, 79 (61.2%) think a woman who receives cancer treatment should have a greater chance of freezing her eggs, 70 (54.3%) consider freezing eggs if they were facing cancer treatments that could affect future fertility, and 61 (47.3%) think that egg freezing costs

should be covered by health care. Only 33 (25.6%) women think women should consider preserving their fertility through egg freezing and 37 (28.7%) consider freezing eggs if they are not personally ready to have a baby at the moment and 43 (33.3%) consider freezing eggs if your husband is not ready to have children (Table 2).

Table 3 shows knowledge and awareness among reproductive-age women regarding oocyte cryopreservation and its associated benefits and risks. A total of 65 (50.4%) women agreed that "for women over 30, overall health and fitness level is a better indicator of fertility than age", 60 (46.6%) have knowledge of IVF, 47 (36.4%) think that a woman's ability to get pregnant decreases after the age of thirty-seven, and 35 (27.1%) think that freezing eggs before the age of thirty-five can increase a woman's fertility in the future. Also, 31 (24%) believe in the safety and success of using frozen eggs to get pregnant at the age of forty or fifty but only 14 (10.9%) think that most frozen eggs will survive the thawing process and can be fertilized. When women asked to rate their overall current knowledge of fertility preservation, only 7 (5.4%) told they are very knowledgeable and 86 (66.7%) told they have some knowledge but 36 (27.9%) told they have no knowledge. In total, only 39 (30.2%) women had an overall good knowledge and awareness level while most of them (69.8%; 90) had poor knowledge and awareness about the procedure (Figure 1).

Table 4 reported factors likely influence decision to postpone the start of cancer treatments so that could preserve fertility through egg freezing. The most reported factors included the importance of becoming a mother in the future (59.7%), emotional support from my family and friends (57.4%), recommendation of my oncology team (46.5%), prognosis for a full recovery (32.6%), and how quickly the egg-freezing procedure could be done/completed (31.8%). The least reported factors were severity of cancer (17.1%), and whether or not I already had a child or children (24%).

Factors would influence decision about whether or not to preserve fertility for either social or medical reasons through egg freezing (Figure 2). The most reported factors were cost of the procedure (60.5%), possible discomfort or side effects from the hormone injections (52.7%), possible health risks to a child conceived using frozen eggs (49.6%), long-term risks to my health or future fertility from the hormones and egg retrieval process (48.1%), and Ethical or moral concerns about fertility preservation in general (43.4%). The least reported factors included concerns about having to decide what to do with any remaining frozen eggs once I completed my family (27.1%), and concerns about interfering with the “natural” fertility lifespan (25.6%).

Factors associated with study women knowledge and awareness about egg freezing. Exact of 39.6% of young aged women had an overall good knowledge level versus 20.7% of old aged women with a recorded statistical significance (p=0.049). A total of 37.7% of university educated women had an overall good knowledge level compared to 19.2% of low educated women (p=0.025). Good knowledge was detected among 92% of medical educated women in comparison to 15.4% of other at non-medical field (p=0.001). None of the other factors were significantly associated with women knowledge level (Table 5).

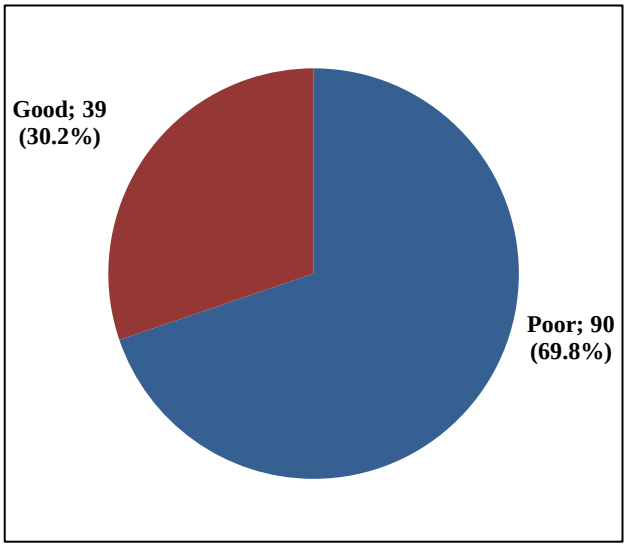

Figure 1: Overall knowledge and awareness among reproductive-age women regarding oocyte cryopreservation and its associated benefits and risks.

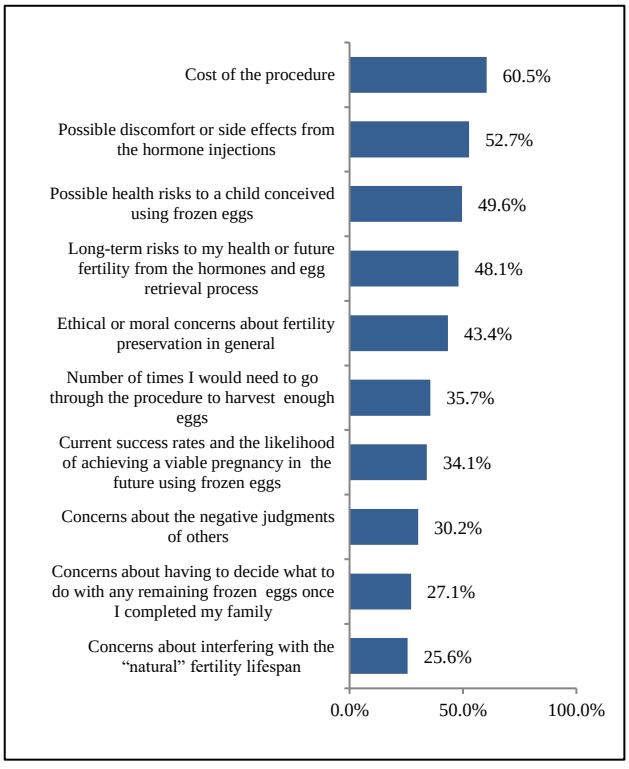

Figure 2: Factors would influence decision about whether or not to preserve fertility for either social or medical reasons through egg freezing.

Table 1: Bio-demographic characteristics of study reproductive-age women, Eastern province, Saudi Arabia, (n=129).

Bio-demographics	N	Percentages (%)
Age (in years)		
18-25	48	37.2
26-30	23	17.8
31-39	58	45.0
Education level		
Secondary/below	52	40.3
University/above	77	59.7
Education field		
Non-medical	104	80.6
Medical	25	19.4
Employment		
Unemployed	97	75.2
Employed	32	24.8
Marital status		
Single	48	37.2
Married	76	58.9
Separated	5	3.9

Table 2: The prevailing attitudes and perceptions of reproductive-age women towards oocyte cryopreservation as a method of preserving fertility.

Attitude and perception	Definitely		Maybe		Definitely not	
	N	%	N	%	N	%
Do you think women should consider preserving their fertility through egg freezing?	33	25.6	77	59.7	19	14.7
Do you think that egg freezing costs should be covered by health care?	61	47.3	54	41.9	14	10.9
Do you think a woman who receives cancer treatment should have a greater chance of freezing her eggs?	79	61.2	42	32.6	8	6.2
Based on the previous question, do you think health care should cover the costs of this procedure?	92	71.3	31	24.0	6	4.7
Do you think doctors should provide women of reproductive age with information about egg freezing as part of health education?	97	75.2	26	20.2	6	4.7
Would you consider freezing your eggs if you were not personally ready to have a baby at the moment?	37	28.7	61	47.3	31	24.0
Would you consider freezing your eggs if your husband is not ready to have children?	43	33.3	58	45.0	28	21.7
Would you consider freezing your eggs if you were facing cancer treatments that could affect your future fertility?	70	54.3	41	31.8	18	14.0

Table 3: Knowledge and awareness among reproductive-age women regarding oocyte cryopreservation and its associated benefits and risks.

Knowledge and awareness	Definitely sure		Not sure		Definitely not	
	N	%	N	%	N	%
For women over 30, overall health and fitness level is a better indicator of fertility than age	65	50.4	56	43.4	8	6.2
Do you have knowledge of IVF	60	46.5	59	45.7	10	7.8
Do you think that there are currently not enough studies on the long-term health effects of children born using frozen eggs?	40	31.0	82	63.6	7	5.4
Do you think that one attempt at treatment is usually enough to retrieve enough eggs for freezing?	19	14.7	92	71.3	18	14.0
Do you think that a woman's ability to get pregnant decreases after the age of thirty-seven?	47	36.4	55	42.6	27	20.9

Continued.

Knowledge and awareness	Definitely sure		Not sure		Definitely not	
	N	%	N	%	N	%
Do you think that the egg freezing procedure poses significant risks to a woman's health and future fertility?	21	16.3	82	63.6	26	20.2
Do you think that a woman's age at the time she chooses to use her frozen eggs to get pregnant is more important than her age at the time her eggs were frozen?	31	24.0	83	64.3	15	11.6
Do you think that freezing eggs before the age of thirty-five can increase a woman's fertility in the future?	35	27.1	85	65.9	9	7.0
Do you believe in the safety and success of using frozen eggs to get pregnant at the age of forty or fifty?	31	24.0	86	66.7	12	9.3
Do you think there are no side effects associated with the hormone injections required to freeze eggs?	21	16.3	80	62.0	28	21.7
Do you think that most frozen eggs will survive the thawing process and can be fertilized?	14	10.9	100	77.5	15	11.6
Overall, how would you rate your current knowledge of fertility preservation	**No knowledge**		**Some knowledge**		**Very knowledgeable**	
	36	27.9	86	66.7	7	5.4

Table 4: Reported factors likely influence decision to postpone the start of cancer treatments so that could preserve fertility through egg freezing.

Factors	Definitely		Maybe		Definitely not	
	N	%	N	%	N	%
Whether or not I already had a child or children	31	24.0	77	59.7	21	16.3
Severity of my cancer	22	17.1	75	58.1	32	24.8
My prognosis for a full recovery	42	32.6	72	55.8	15	11.6
Recommendation of my oncology team	60	46.5	59	45.7	10	7.8
How quickly the egg-freezing procedure could be done/completed	41	31.8	68	52.7	20	15.5
Concerns about the effects of the hormones or egg retrieval procedure on my health	38	29.5	77	59.7	14	10.9
The importance of becoming a mother in the future	77	59.7	45	34.9	7	5.4
Emotional support from my family and friends	74	57.4	47	36.4	8	6.2

Table 5: Factors associated with study women knowledge and awareness about egg freezing.

Factors	Overall knowledge and awareness level				P value
	Poor		Good		
	N	%	N	%	
Age (in years)					
18-25	29	60.4	19	39.6	0.049*
26-30	15	65.2	8	34.8	
31-39	46	79.3	12	20.7	
Education level					
Secondary/below	42	80.8	10	19.2	0.025*
University/above	48	62.3	29	37.7	
Education field					
Non-medical	88	84.6	16	15.4	0.001*
Medical	2	8.0	23	92.0	
Employment					
Unemployed	70	72.2	27	27.8	0.302
Employed	**20**	62.5	12	37.5	
Marital status					
Single	28	58.3	20	41.7	0.066^
Married	59	77.6	17	22.4	
Separated	3	60.0	2	40.0	

P: Pearson X^2 test, ^: Exact probability test, *p<0.05 05 (significant).

DISCUSSION

This study shed light on the knowledge, awareness, and perception of reproductive-aged females towards oocyte cryopreservation in Saudi Arabia. A total of 129 women completed a self-administered questionnaire. Most of the study population depicted a very poor level of knowledge and awareness regarding oocyte cryopreservation. Regarding its risk and benefits, only 30.2% of the participants showed an overall good level of knowledge. A similar study conducted in the United Arab Emirates indicated that most of the participants depicted a very poor knowledge regarding oocyte cryopreservation.[1]

Despite the poor knowledge level, most of the participants depicted a very good attitude and perception regarding oocyte cryopreservation. However, 59.7% of the participants were not sure about whether a woman should consider preserving their fertility through egg freezing. In comparison with existing literature, in a study conducted in Lebanon, the majority of the participants considered egg freezing.[2] In the same context, A study conducted in Hong Kong reported that 80.3% of the participants considered undergoing fertility preservation.

In terms of health education, most of the participants in this study (75.2%) believe that physicians should provide information about egg freezing for women of reproductive age as part of health education. This implementation can have a significant contribution to improving the overall knowledge in regard to oocyte cryopreservation based on a study conducted in Egypt, the presence of an educational program has resulted in a significant statistical difference in knowledge, attitudes, and intention of undergoing oocyte cryopreservation before and after the educational program.[3]

Since oocyte cryopreservation plays an essential role in preserving fertility for cancer patients, This study reported that the recommendations of the oncology team were the most influential factor in deciding to postpone cancer treatment to commence oocyte cryopreservation, which is similar to other findings in similar literature.[4]

The significance of becoming a mother one day, and receiving emotional encouragement from loved ones were also reported as factors that can influence the decision to postpone cancer treatment and commence oocyte cryopreservation.

It is important to acknowledge that the process of oocyte cryopreservation and IVF is considered to result in emotional and psychological distress before and during the procedure. While some studies reported that overall anxiety and stress reduced once commencing the IVF process, other studies also suggest that it has a substantial effect on overall sleep quality which can correlate to anxiety in some patients.[5,6]

Potential barriers that this study population reported that can influence the decision of oocyte cryopreservation correlate with other barriers reported in different literature. One of the most reported barriers in this study was the cost of the oocyte cryopreservation procedure, which is significantly associated with and influences the attitude toward oocyte cryopreservation as based on similar studies.[4,7,8]

Additional factors such as potential discomfort from the hormonal injections, and the long-term risks to their health or future fertility whether from the hormonal treatment or the egg retrieval process. Similarly, it was established in different studies that the long-term risks of hormonal treatments and oocyte retrieval is a significant barrier to women considering oocyte cryopreservation this study has shed light on the most significant factors associated with knowledge and awareness of oocyte cryopreservation. Both education field and education level showed a significant association with poor levels of knowledge and awareness.[9] However, most of the participants who were in the medical field demonstrated a very excellent level of knowledge represented by 92%. Moreover, participants who received a higher education (university level or above) demonstrated a very good level of knowledge in comparison to participants with a secondary or below education level. Similarly, many studies have indicated the presence of a positive relationship between education level, knowledge and awareness of oocyte cryopreservation.[1,4]

This research provided fundamental insights into the knowledge and awareness of oocyte cryopreservation. However, further analysis and investigation are required to establish and measure different factors and barrier's which is limiting the knowledge about oocyte cryopreservation. Additionally, further investigations among different education groups can help in implementing and directing education programs in order to increase the level of knowledge and awareness as well as to improve the attitude toward oocyte cryopreservation.

Limitations

This study demonstrated strength in adding a comprehensive understanding of the Knowledge and attitudes regarding oocyte cryopreservation in Saudi Arabia, it shed some light on the level of knowledge, attitudes, and potential barriers affecting them. The relationships between various risk factors and the participants' knowledge levels were also shown in this study.

Despite these strengths, this study included some limitations, the cross-sectional nature of the study applied difficulty in obtaining a direct cause-and-effect relationship between different factors. As well as the inability to justify those results in a broader population or a longer period of time. The self-reported questionnaire

also involved a risk of bias among reported results, and the distribution method can also involve some bias.

CONCLUSION

In summary, this research found that reproductive-age females in Saudi Arabia have low levels of knowledge and awareness about oocyte cryopreservation. Potential barriers can be the result of this poor level of knowledge such as financial cost, pain, and discomfort regarding the procedure, as well as the worry about the long-term risk factors associated with it. Some associations arose in the study that can significantly contribute to good knowledge and awareness such as higher education level and being in the medical field.

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REFERENCES

1. Sayegh L, Coussa A, Kadhom M, Neinavaei N, Hasan H. Knowledge and attitude of reproductive-aged women towards planned oocyte cryopreservation in the United Arab Emirates. J Assisted Reproduct Genetics. 2023;40(3):609-16.
2. Ghazeeri G, Beyrouthy C, El-Taha L, Abiad M, Fahs D. Knowledge and attitudes toward fertility preservation (Medical and social freezing) among Lebanese women between the ages of 18 and 39 years. PLoS One. 2023;18(9):e0291249.
3. Yeung SY, Ng EYL, Lao TTH, Li TC, Chung JPW. Fertility preservation in Hong Kong Chinese society: awareness, knowledge and acceptance. BMC Womens Health. 2020;20(1):10.
4. Aljaser F. Preservation of fertility in female: Indications, available options, and current status in Saudi Arabia. Seminars in Oncology. W. B. Saunders. 2020;47:390-7.
5. Kasaven LS, Mitra A, Ostrysz P, Theodorou E, Murugesu S, Yazbek J, et al. Exploring the knowledge, attitudes, and perceptions of women of reproductive age towards fertility and elective oocyte cryopreservation for age-related fertility decline in the UK: a cross-sectional survey. Human Reproduction. 2023;28(12):2478-88.
6. Fahmy SG, Mohamed MH. Knowledge, Attitude and Barriers of unmarried female bridging program Nurse regarding Egg Frozen at South Valley University. Egyp J Health Care. 2021;12(3):1304-19.
7. Akhondi MM, Ardakani ZB, Warmelink JC, Haghani S, Ranjbar F. Knowledge and beliefs about oocyte cryopreservation for medical and social reasons in female students: a cross-sectional survey. BMC Womens Health. 2023;23(1):336.
8. El-Adham AFM, Shaban RSES. Effect of Educational Program on Knowledge, Attitudes, and Intention of Unmarried Healthy Females regarding Oocyte Cryopreservation. Int Egyp J Nurs Sci Res. 2023;4(1):65-84.
9. Huang LH, Kuo CP, Lu YC, Lee MS, Lee SH. Association of emotional distress and quality of sleep among women receiving in-vitro fertilization treatment. Taiwan J Obstet Gynecol. 2019;58(1):168-72.
10. Massarotti C, Gentile G, Ferreccio C, Scaruffi P, Remorgida V, Anserini P. Impact of infertility and infertility treatments on quality of life and levels of anxiety and depression in women undergoing *in vitro* fertilization. Gynecol Endocrinol. 2019;35(6):485-9.
11. Hong YH, Park JW, Kim H, Kim SK, Choo CW, Jee BC, et al. A survey on the awareness and knowledge about elective oocyte cryopreservation among unmarried women of reproductive age visiting a private fertility center. Obstet Gynecol Sci. 2019;62(6):438-44.
12. Farrag RE, El-tohamy N. Oocyte Cryopreservation: Awareness and Perception of Infertile Couple Undergoing In-Vitro Fertilization. Egyp J Health Care. 2020;11(4):300-21.

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