

A comparative study on fresh versus frozen embryo transfer at an infertility centre

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Abstract

Background: The usage of frozen embryo transfer (FET) has been on the rise for the last few years, and it is a widely accepted technique of assisted reproductive technique (ART). Studies have compared the benefits of FET to fresh embryo transfer, including cost-effectiveness and maternal complications during in vitro fertilization (IVF). Aims of this study was to determine the pregnancy outcomes following fresh embryo transfer and FET and to find out whether FET results in better outcomes compared to fresh transfer.

Methods: It was a cross-sectional study that took place at Hope Infertility Center, Dhaka, Bangladesh during the period of 2021-2023. 187 women candidates of IVF were divided into 2 groups of fresh (n = 106) and frozen (n = 81) embryo transfer. Demographic and clinical characteristics like age, BMI, cause and duration of infertility, number of IVF cycles and pregnancy outcomes like chemical and clinical pregnancy, ectopic pregnancy, abortion, intra uterine death (IUD), live birth were compared among these 2 groups. $p < 0.05$ was considered statistically significant.

Results: No significant difference was observed between these groups in terms of age, cause and duration of infertility and number of IVF cycles. BMI (26.06 ± 4.14 vs 27.44 ± 5.05 , $p = 0.04$) and live birth rates (13.21% vs 25.92%, $p = 0.02$) was significantly higher while, abortion (20.75% vs 9.88%, $p = 0.04$) was significantly lower in FET group compared to fresh embryo transfer group.

Conclusion: In this study, it was shown that FET method increases the success rate of IVF. So, this study recommends that infertility treatment centers should prioritize the use of frozen methods over fresh methods.

Keywords: Assisted reproductive technique, Fresh embryo transfer, Frozen embryo transfer, In vitro fertilization

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Introduction

The practice of embryo cryopreservation revolutionized assisted reproductive technique (ART). ART is a common option for infertility patients seeking pregnancy; however, women undergoing ART still face significant challenges between clinical pregnancy and live birth, including biochemical pregnancy loss, spontaneous abortion, and preterm delivery.¹ Over the past few years, to overcome these challenges, the use of frozen embryo transfer (FET) has increased significantly, and it is now a widely accepted method within ART.² Successful embryo implantation in ART hinges on 3 key elements: the embryo's quality, the endometrium's receptivity, and the precise embryo-endometrial interaction. The implantation window is a narrow, self-limited timeframe-typically 6-10 days after ovulation (or days 20-24 of a 28-day cycle)-during which the endometrium undergoes morphological and

functional changes (including pinopode formation, optimized hormone response, and expression of adhesion molecules) to become fully receptive, allowing blastocyst attachment and invasion.^{2,3}

Several studies have suggested that the timing of blastocyst formation is indicative of embryo viability in IVF. Embryos that reach more advanced developmental stages by day 5 have been associated with higher implantation and pregnancy rates, and blastocysts expanding on day 5 tend to yield better outcomes than those expanding on day 6. However, because these findings are based on fresh embryo transfers, it is difficult to separate the influence of embryo quality from the timing of endometrial receptivity.⁴

FET, where embryos are retrieved and then frozen to allow for transfer later, has seen an 82.5% increase in use in the US between 2006 and 2012.⁵ Studies have compared the benefits of

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FET to fresh embryo transfer, including cost-effectiveness and maternal complications during IVF.⁶ Some randomized trials suggest that freezing all embryos in a fresh IVF cycle followed by FET in subsequent cycles might improve pregnancy and live birth rates. FET may provide a more favorable intrauterine environment for embryo implantation and placentation by avoiding the supra-physiologic hormonal levels after ovarian stimulation.⁷

The objective of this study was to determine the pregnancy outcomes following fresh embryo transfer and FET and to find out if FET results in better outcomes compared to fresh transfer.

Materials and methods

Design, place and period of study

It was a cross-sectional study that was carried out over a period of 3 years from January 2021 to June 2023 at Hope Infertility Centre, Dhaka, Bangladesh.

Sample size

187 women were included in this study among which 106 women were in fresh embryo transfer group and 81 women were in FET group.

Inclusion criteria

- 1) Women < 40 years with any cause of infertility.
- 2) Those who gave consent and willingly participated in the study.

Exclusion criteria

- 1) Women > 40 years and those who refused to share information.
- 2) Women with physical diseases such as hypertension, diabetes mellitus, autoimmune disorders were excluded from the study.

Statistical analysis

Qualitative data were described by frequency distribution, while quantitative data were described by the mean and standard deviation. Difference of means between the two groups was tested by t test. Chi-square test or fisher exact test was applied for qualitative data. $p < 0.05$ was considered statistically significant for all tests.

Results

A total of 187 women were included in the study, divided into two groups: fresh embryo transfer ($n = 106$) and FET ($n = 81$). Demographic characteristics such as age and BMI were observed among these two groups (Table I). The mean age of fresh embryo transfer group was 32.68 ± 6.4 and FET group was 33.77 ± 5.94 . No significant difference was observed between the groups in terms of age. However, we observed significant difference (26.06 ± 4.14 vs 27.44 ± 5.05 , $p = 0.04$) between the groups in term of BMI. BMI was significantly higher in FET group compared to fresh embryo transfer group.

Table I: Demographic Characteristics of Participants

Variable	Fresh ($n = 106$) Mean $\pm$ SD	FET ($n = 81$) Mean $\pm$ SD	P value
Age	32.68 ± 6.4	33.77 ± 5.94	0.23 ^a
BMI	26.06 ± 4.14	27.44 ± 5.05	0.04 ^a

^a = t-test, SD = Standard Deviation

Clinical characteristics like cause of infertility, duration of infertility and no. of IVF cycles were compared between these two groups (Table II). The most common cause of infertility in both groups was due to ovarian factor. We did not find any significant differences between the groups in case of cause of infertility, duration of infertility and no. of IVF cycles.

Table II: Clinical Characteristics of Participants

Variable	Fresh (n = 106) n (%)	FET (n = 81) n (%)	P value
1. Causes of infertility			
Male factor	25 (23.58)	22 (27.16)	0.54 ^b
Ovarian factor	42 (39.62)	26 (32.10)	
Tubal factor	28 (26.42)	20 (24.69)	
Unexplained	11 (10.38)	13 (16.05)	
2. Duration of infertility			
< 5 years	28 (26.42)	19 (23.46)	0.87 ^b
5-10 years	45 (42.45)	37 (45.68)	
> 10 years	33 (31.13)	25 (30.86)	
3. No. of IVF cycles			
0 cycle	47 (44.34)	34 (41.98)	0.94 ^b
1-2 cycles	33 (31.13)	26 (32.10)	
> 2 cycles	26 (24.53)	21 (25.92)	

^b = Chi-square test

Pregnancy outcomes like chemical pregnancy, clinical pregnancy, ectopic pregnancy, abortion, IUD and live birth were observed among the groups in this study (Table III). Live birth rates (13.21% vs 25.92%, $p = 0.02$) were significantly higher while abortion (20.75% vs 9.88%, $p = 0.04$) was significantly lower in FET group compared to fresh embryo transfer group. No significant differences were observed between the groups in terms of chemical pregnancy, clinical pregnancy, ectopic pregnancy and IUD.

Table III: Pregnancy outcome of participants

Variable	Fresh ($n = 106$) n (%)	FET ($n = 81$) n (%)	P value
Chemical pregnancy	65 (61.32)	48 (59.26)	0.77 ^b
Clinical pregnancy	37 (34.91)	31 (38.27)	0.63 ^b
Ectopic pregnancy	4 (3.77)	2 (2.47)	0.61 ^c
Abortion	22 (20.75)	8 (9.88)	0.04 ^b
IUD	1 (0.94)	2 (2.47)	0.41 ^c
Live birth	14 (13.21)	21 (25.92)	0.02 ^b

^b = Chi-square test, ^c = Fisher's exact test

Discussion

Since the first birth from FET in 1984 in Australia, the number of FET cycles has steadily increased, driven by significant advancements in cryopreservation techniques.⁸ These developments encouraged us to introduce FET in IVF treatment at Hope Infertility Centre and to conduct a study comparing the clinical characteristics and pregnancy outcomes between the fresh embryo transfer and FET groups.

The present study observed significant difference in BMI between the groups. BMI (26.06 ± 4.14 vs 27.44 ± 5.05 , $p = 0.04$) was significantly higher in FET group compared to fresh embryo transfer group. Weiss et al. (2023) reported a significant difference in BMI between the groups, with BMI being significantly lower in the FET group compared to the fresh embryo transfer group (25.65 ± 0.15 vs. 24.76 ± 0.20 ; $p = 0.0001$)⁹. Shuai et al. (2022) also reported a significant difference in BMI ($p = 0.001$), with values notably higher in the FET group compared to the fresh embryo transfer group, consistent with our findings¹. Other studies reported no significant differences in BMI between the groups.^{2, 6, 7}

The findings of this study showed no significant differences between the groups in terms of the causes and duration of infertility. Similarly, Chen et al. (2022) also reported no significant differences between the groups regarding these factors⁷. Our study compared the number of IVF cycles between the fresh embryo transfer group and the FET group and found no significant difference. However, Shrivastava et al. (2024) reported a significant difference between the groups for this factor ($p = 0.001$)².

In this study it was observed that live birth rates (13.21% vs 25.92%, $p = 0.02$) were significantly higher while abortion (20.75% vs 9.88%, $p = 0.04$) was significantly lower in FET group compared to fresh embryo transfer group. Bagheri et al. (2023) also reported significant differences in case of live birth ($p = 0.003$) and abortion or pregnancy loss ($p = 0.038$) similar to our study.⁶ Other studies didn't find any significant difference between the groups in case of abortion or pregnancy loss.^{2, 10}

A meta-analysis of 31 studies revealed that FET is associated with improved pregnancy outcomes, including lower risks of placenta previa, placental abruption, low birth weight, preterm birth, and perinatal mortality. However, the FET group showed higher rates of pregnancy-induced hypertension and postpartum hemorrhage compared to the fresh embryo transfer group. No significant differences were observed between the two groups in terms of gestational diabetes mellitus, preterm premature rupture of membranes, or preterm birth.¹¹

The present study was a cross-sectional observational study, and the sample size obtained during the study period was insufficient to thoroughly investigate pregnancy complications such as

ectopic pregnancy and intrauterine death (IUD). Further research with larger sample sizes and randomized trials is recommended to draw more definitive conclusions.

Conclusion

In this study, it was shown that FET method increases the success rate of IVF. FET method increases the chances of live births while reducing the risks of abortion. Due to a significant reduction in risk of abortion and improvements in pregnancy outcomes, this study recommends that infertility treatment centers should prioritize the use of frozen methods than fresh methods.

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Conflict of interest

The authors declared that there was no conflict of interest.

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