International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 2, February 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.2.2025.142

ORIGINAL RESEARCH

Influence of paternal age in assisted reproductive technology (ART) outcomes

[1]Dr. Sushil Kumar Singh, [2]Dr. Waseem Andrabi, [3]Dr. Sonia Malik, [4]Tabassum Hashmi

[1]Assistant Professor, Department of Obstetric and Gynaecology, Rani Durgawati Medical College, Banda, UP, India
[2]ClusterHead Embryology Nova IVF Fertility Delhi (North Zone), India
[3]Cheif Clinical Mentor, PAN India, Nova IVF Fertility, India
[4]Trainee Embryologist Nova IVF Fertility, Vasant Vihar, Delhi, India

Corresponding Author
Dr. Waseem Andrabi
Cluster Head Embryology Nova IVF Fertility Delhi (North Zone), India
Email: wasiandrabi@gmail.com

Received: 22 January, 2025 Accepted: 15 February, 2025 Published: 26 February, 2025

ABSTRACT

Background: Infertility is the inability of a person to reproduce by natural means after puberty. The present study was conducted to assess the influence of paternal age in assisted reproductive technology (ART) outcomes. **Materials & Methods:** A total of 726 couples who have undergone IVF treatment in Southend were considered for retrospective study and 59 patients for prospective study. We categorized the patients according to the paternal age into three groups based on their age: Group 1: <30 years, Group 2: 30-40 years and Group 3: 40-55 years. We analysed the embryological parameters like Fertilization rate, Cleavage rate, Blastocyst formation rate along with reproductive outcomes like Pregnancy rate and Implantation rates. We further subcategorised the male based on Seminal Parameters. **Results:** In group I, II and III, mean fertilization rate was 84.8, 84.6and 83.9. Implantation rate was 37.6, 33.1 and 26.8. Cleavage rate was 98, 97.4 and 96.9, Blastocyst rate was 52.3, 50.6 and 50.5. Live birth rate was 34.8, 31.7 and 26.4 respectively. The difference was significant (P< 0.05). Clinical pregnancy rate for group 1 (<30 years) was 65.2%, for group 2 (30-40 years) was 59.1% and for group 3 (>40 years) was 53.7%. There was no correlation of father age <30 years, 30-40 years and >40 years with mother age <35 years, >35 years and fertilization rate, implantation rate, cleavage rate, blastocyst rate, and live birth rate. Despite varying success rates across clinical pregnancy rates, none of the comparisons within each age group reached statistical significance. **Conclusion:** Authors did not find any significant impact of paternal age on key ART outcomes, including fertilization rate, cleavage rate, blastocyst development rate, clinical pregnancy rate, and live birth rate. However, they observed a statistically significant negative impact of paternal age on implantation rate.

Keywords: blastocyst, Infertility, pregnancy

INTRODUCTION

Infertility is the inability of a person to reproduce by natural means after puberty. According to world health organization (WHO), infertility is a disease of male and female reproductive system to achieve a pregnancy after one year of unprotected and regular sexual intercourse.[1] There are many causes of infertility, including some that medical intervention can treat. Infertility can be due to maternal causes, paternal causes or both. WHO estimates that worldwide, for every six people (17.5%), one person experiences fertility issues during their reproductive age? Male infertility is equally responsible for infertility issues (20-30% solely and 25-40% combined with female factor), while 20-35% are due to female factor infertility only.[2]

Common female related infertility problems include menstrual disorders, obesity, thyroid diseases, diabetes, ovulation dysfunction, genetic, uterine factors, fallopian tubes, and cervical tubes dysfunction.[3] While male factors which causes infertility include, diabetes, hyperprolactinemia, injury to the testicle, insensitivity to androgens, swelling of the testicles from infections such as mumps, gonorrhea, or chlamydia, Thyroid problems, cryptorchidism, varicocele, and genetic defects like chromosomal disorder e.g., Klinefelter's syndrome.[4] Apart from all the above diagnosis, age plays an important role in human fertility.[5]The present study was conducted to assess the influence of paternal age in assisted reproductive technology (ART) outcomes.

MATERIALS & METHODS

The study was carried out on 726 couples who have

DOI: 10.69605/ijlbpr_14.2.2025.142

undergone IVF treatment in Southend were considered for retrospective study and 59 patients for prospective study. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Semen samples were collected by masturbation after 3-5 days of sexual abstinence. After collection of the semen sample, sample was allowed to liquefy and were evaluated for semen volume, sperm concentration, motility, and morphology using the Makler chamber and pre stained morphology slides.We categorized the patients according to the paternal age into three groups based on their age: Group 1: <30 years, Group 2: 30-40 years and Group 3: 40-55 years. We analysed the embryological parameters like Fertilization rate, Cleavage rate, Blastocyst formation rate along with reproductive outcomes like Pregnancy rate and Implantation rates. We further subcategorised the male based on Seminal Parameters. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I: Overall reproductive outcome between different paternal groups

Parameters	HUSBAND AGE						ANOVA test P value
	<30		30-40		>40		
	Mean	SD	Mean	SD	Mean	SD	
Fertilization rate	84.86	13.52	84.67	14.36	83.97	15.61	0.860
Implantation rate	37.64	34.67	33.18	38.00	26.83	31.55	**0.039**
Cleavage rate	98.09	5.17	97.44	6.92	96.97	7.23	0.325
Blastocyst rate	52.34	22.48	50.62	22.26	50.51	22.86	0.666
Live birth rate	34.83	35.18	31.76	37.97	26.42	30.92	0.140

Table I shows that in group I, II and III, mean fertilization rate was 84.8, 84.6 and 83.9. Implantation rate was 37.6, 33.1 and 26.8. Cleavage rate was 98, 97.4 and 96.9, Blastocyst rate was 52.3, 50.6 and 50.5. Live birth rare was 34.8, 31.7 and 26.4 respectively. The difference was significant (P< 0.05).

Table II Overall pregnancy rates between three paternal groups

Parameters		HUSBAND AGE						P value
		<30		30-40		>40		
		N	%	N	%	N	%	
Result	Positive	116	65.2%	251	59.1%	66	53.7%	0.126
	Negative	62	34.8%	174	40.9%	57	46.3%	

Table II shows that clinical pregnancy rate for group 1 (<30 years)was 65.2%, for group 2 (30-40 years)was 59.1% and for group 3 (>40 years)was 53.7%.

Table III Correlation between paternal groups when compared with maternal groups

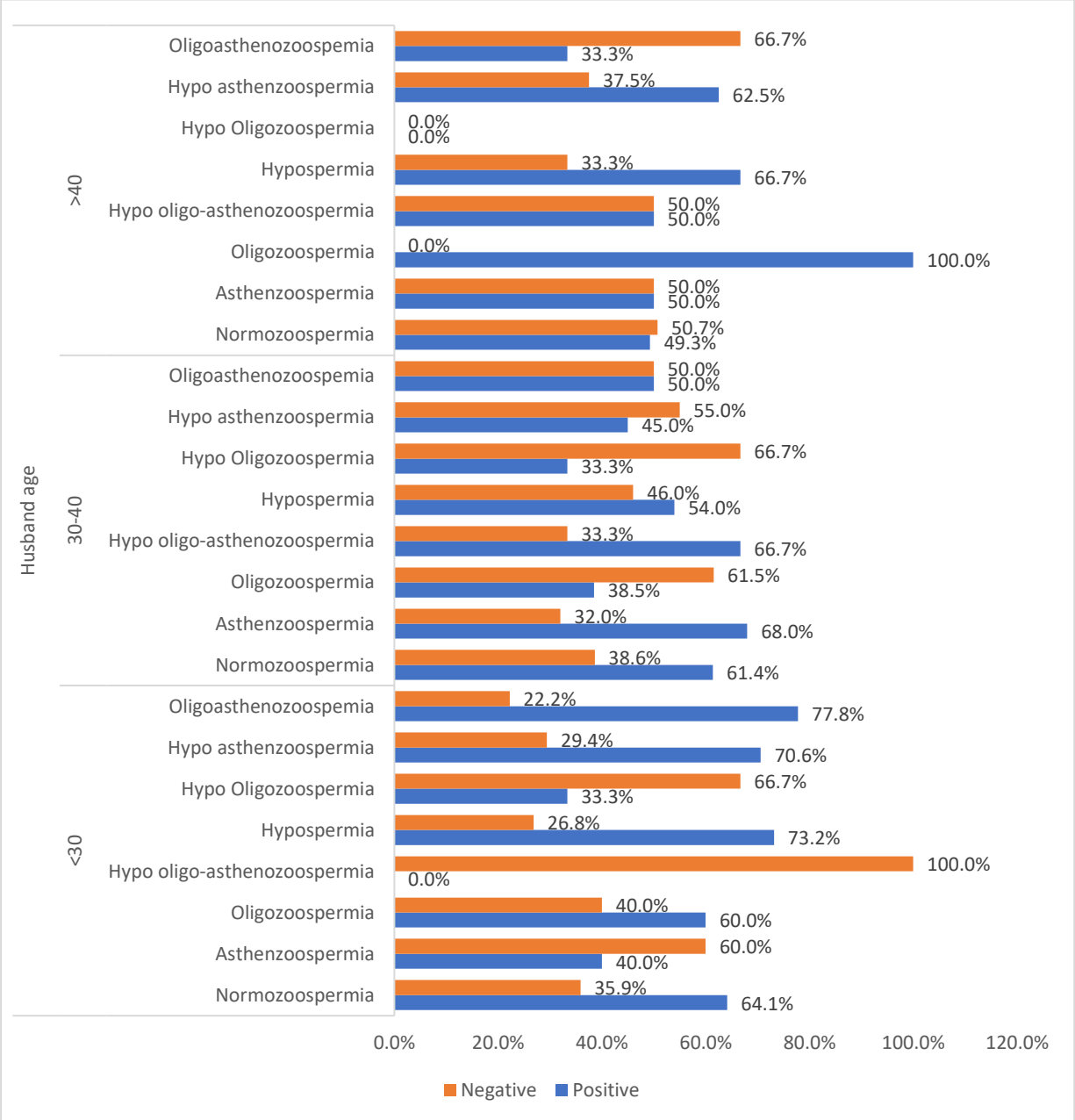
Husband age	Parameters	Wife age	N	Mean	SD	Unpaired t test P value
<30	Fertilization rate	</=35	178	84.8573	13.52278	Na
		>35	0[a]	.	.	
	Implantation rate	</=35	178	37.6404	34.67435	Na
		>35	0[a]	.	.	
	Cleavage rate	</=35	178	98.0926	5.17142	Na
		>35	0[a]	.	.	
	Blastocyst rate	</=35	178	52.3403	22.47514	Na
		>35	0[a]	.	.	
	Live birth rate	</=35	178	34.8315	35.17872	Na
		>35	0[a]	.	.	
30-40	Fertilization rate	</=35	394	84.5298	14.64289	0.486
		>35	31	86.4011	10.18901	
	Implantation rate	</=35	394	32.9949	37.27574	0.726
		>35	31	35.4839	46.89269	
	Cleavage rate	</=35	394	97.5096	6.82053	0.437
		>35	31	96.5058	8.09862	
	Blastocyst rate	</=35	394	51.1287	22.08279	0.096
		>35	31	44.2088	23.85713	
	Live birth rate	</=35	394	31.5990	37.20833	0.749
		>35	31	33.8710	47.23540	
>40	Fertilization rate	</=35	10	87.2711	12.70289	0.488

DOI: 10.69605/ijlbpr_14.2.2025.142

Husband age	Parameters	Wife age	N	Mean	SD	Unpaired t test P value
		>35	113	83.6778	15.85634	
	Implantation rate	</=35	10	25.0000	35.35534	0.849
		>35	113	26.9912	31.36436	
	Cleavage rate	</=35	10	96.6032	5.54330	0.866
		>35	113	97.0079	7.37767	
	Blastocyst rate	</=35	10	51.3106	20.13338	0.909
		>35	113	50.4390	23.16486	
	Live birth rate	</=35	10	25.0000	35.35534	0.880
		>35	113	26.5487	30.67019	

Table III shows that there was no correlation of father age <30 years, 30-40 years and >40 years with mother age <35 years, >35 years and fertilization rate, implantation rate, cleavage rate, blastocyst rate, and live birth rate.

Graph I Embryological and clinical outcomes between semen different parameters in all paternal groups



Graph I shows that despite varying success rates across clinical pregnancy rates, none of the comparisons within each age group reached statistical significance.

DOI: 10.69605/ijlbpr_14.2.2025.142

DISCUSSION

Over the last few decades, the trend towards delayed parenthood has become new normal. Delayed parenthood in urban areas is increasing due to the pressure of establishing socio economic security before starting family. The postponement of the decision about pregnancy means that both males and females wish to become pregnant at above 30 years of age, at a time when fertility begins to decline.[6]

As a higher number of couples pursue parenthood at an older age, it becomes important to shed light on the effect of advanced age on IVF and clinical outcomes.[7] The age-related effect on embryological outcomes can be divided into two groups: maternal and paternal age. As it is well known and researched that advanced maternal age can result in reduction of ovarian reserve and increases the probability of spontaneous abortion during pregnancy.[8] The role of paternal age in infertility is still understudied. Semen analysis is a gold standard test for male infertility check and any deficiencies in the semen, and semen quality is used as a surrogate measure of male fecundity. Male gametes contribute equally as that of female gamete in embryo development.[9]The present study was conducted to assess the influence of paternal age in assisted reproductive technology (ART) outcomes.

We found that in group I, II and III, mean fertilization rate was 84.8, 84.6 and 83.9. Implantation rate was 37.6, 33.1 and 26.8. Cleavage rate was 98, 97.4 and 96.9, Blastocyst rate was 52.3, 50.6 and 50.5. Live birth rate was 34.8, 31.7 and 26.4 respectively. Xin-Mei Lu et al[10]found that paternal age over 40 negatively influences pregnancy and implantation rates, with an increased miscarriage rate despite good semen parameters.

We found that clinical pregnancy rate for group 1 (<30 years) was 65.2%, for group 2 (30-40 years) was 59.1% and for group 3 (>40 years) was 53.7%. There was no correlation of father age <30 years, 30-40 years and >40 years with mother age <35 years, >35 years and fertilization rate, implantation rate, cleavage rate, blastocyst rate, and live birth rate. Despite varying success rates across clinical pregnancy rates, none of the comparisons within each age group reached statistical significance.Aurélie Chapuis et al[11] indicated in their study that sperm motility and oligospermia significantly impact fertilization rates and blastulation rates.This suggests that while paternal age may not directly influence fertilization or blastocyst development, the quality of semen parameters, as highlighted by Chapuis et al., plays a crucial role.

CONCLUSION

Authors did not find any significant impact of paternal age on key ART outcomes, including fertilization rate, cleavage rate, blastocyst development rate, clinical pregnancy rate, and live birth rate. However, they observed a statistically significant negative impact of paternal age on implantation rate.

REFERENCES

1. Walker MH, Tobler KJ. Female Infertility. [Updated 2022 Dec 19]
2. Leslie SW, Soon-Sutton TL, Khan MAB. Male Infertility. [Updated 2024 Feb 25]
3. WHO official site. https://www.who.int/publications/i/item/9789240030787
4. Whitcomb BW, Turzanski-Fortner R, Richter KS, Kipersztok S, Stillman RJ, Levy MJ, Levens ED. Contribution of male age to outcomes in assisted reproductive technologies. Fertility and sterility. 2011 Jan 1;95(1):147-51.
5. Ambartsumyan G, Surrey M, Danzer H, Hill D. Paternal Age Affects the Rate of Blastocyst Formation in Ovum Donation Cycles. Fertility Sterility. 2011;95 (4): S27.
6. Jimbo M, Kunisaki J, Ghaed M, Yu V, Flores HA, Hotaling JM. Fertility in the aging male: a systematic review. Fertility and sterility. 2022:118(6):1022-34.
7. Kovac JR, Addai J, Smith RP, Coward RM, Lamb DJ, Lipshultz LI. The effects of advanced paternal age on fertility. Asian journal of andrology. 2013 15(6), 723-28.
8. Alpha Scientists in Reproductive Medicine and ESHRE Special Interest Group of Embryology. The Istanbul consensus workshop on embryo assessment: proceedings of an expert meeting. Human reproduction (Oxford England). 2011:26(6):1270-83.
9. Bertoncelli Tanaka M, Agarwal A, Esteves SC. Paternal age and assisted reproductive technology: problem solver or trouble maker?. Panminerva medica. 2019;61(2):138-51.
10. Lu XM, Liu YB, Zhang DD, Cao X, Zhang TC, Liu M, Shi HJ, Dong X, Liu SY. Effect of advanced paternal age on reproductive outcomes in IVF cycles of non-male- factor infertility: a retrospective cohort study. Asian J Androl. 2023;25(2):245-51.
11. Chapuis A, Gala A, Ferrières-Hoa A, Mullet T, Bringer-Deutsch S, Vintejoux E, Torre A, Hamamah S. Sperm quality and paternal age: effect on blastocyst formation and pregnancy rates. Basic and clinical andrology. 2017;27;2.