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Introduction

The year two thousand and twenty-one marks the thirty-fifth year of the Assisted Reproduction Program at Queen Mary Hospital.

A total of 890 assisted reproduction treatment cycles were initiated in 780 couples during this period. The numbers of treatment cycles and of patients were more than those in previous years in view of the stabilization of the COVID pandemic. The number of frozen embryo transfer cycles also increased in 2021. The mean number of embryos replaced remained at 1.0 per transfer in both conventional IVF and ICSI cycles as we continued to promote elective single embryo transfer. The mean number of embryos replaced in frozen embryo transfer cycles was also 1.0 per transfer because most of our patients agreed to replace a single frozen embryo. This year, we encountered one triplet after replacement of a frozen embryo.

This year we continued to implement a strict single embryo transfer policy for all women unless for those older than or equal to 38 years old or not pregnant after 2 cycles of IVF. The ongoing pregnancy rate per transfer cycle were 20.5% and 32.3% respectively in Day 2 and Day 5 elective single embryo transfer whereas the corresponding rates in non-elective single embryo transfer cycles were 11.6% and 13.0% respectively.

In 2021, preimplantation genetic testing was performed in 140 stimulated cycles, 1 oocyte warming and 3 frozen embryo transfer cycles in 117 women at risk of having babies with serious chromosomal or genetic disorders.

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Work-Load Statistics

Table 1: Workload Statistics I

No. of Cycles	IVF	IVM	Oocyte Donation	Sperm donation	Vitrified oocyte	ICSI	MESA	TESE	PGT	TOTAL
Initiated	443	0	0	2	3	280	11	7	140 Fresh OPU + 1 VO + 3 FET	890
Cancelled	15 (3.4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (1.1%)	0 (0%)	0 (0%)	1 (0.7%)	19 (2.1%)
With Oocyte Retrieval	428 (96.6%)	0 (0%)	0 (0%)	2 (100%)#	0 (0%)	277 (98.9%)	11 (100%)	7 (100%)	139 (99.3%)##	864 (97.5%)##
With Fresh Embryo Transfer	187 (42.2%)	0 (0%)	0 (0%)	1 (50.0%)	2 (66.7%)	107 (38.2%)	0 (0%)	0 (0%)	0 (0%)	297 (33.4%)

(“IVF”: Conventional IVF-ET; NC-ICSI : Natural cycle IVF + ICSI; “IVM”: In vitro maturation; “ICSI”: ICSI with ejaculated sperm; “MESA”: MESA + ICSI; “TESE”: TESE + ICSI; “PGT”: Preimplantation genetic testing; “FET”: frozen embryo transfer)

(): % of initiated cycle, *: denominator does not include FET cycle; #: vitrified-oocyte (VO) cycles are excluded

Table 2: Workload Statistics II

No. of cycles	IVF	IVM	Oocyte donation	Sperm Donation	Vitrified oocyte	ICSI	MESA	TESE	Fresh-PGT	Total
Without Oocyte Retrieved	4 (0.9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (1.1%)	0 (0%)	0 (0%)	1 (0.7%)	8 (0.9%)
Without insemination	1 (0.2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	17 (6.1%)	0 (0%)	2 (28.6%)	1 (0.7%)	21 (2.4%)
Without Normal Fertilization	20 (4.7%)	0 (0%)	0 (0%)	0 (0%)	1 (33.3%)	17 (6.1%)	0 (0%)	0 (0%)	5 (3.6%)	43 (5.0%)
Without Normal Cleavage	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0.4%)	0 (0%)	0 (0%)	1 (0.7%)	2 (0.2%)
Without embryos suitable for transfer	7 (1.6%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (1.4%)	0 (0%)	0 (0%)	40 (28.6%)	51 (5.9%)
With ET Postponed	209 (48.8%)	0 (0%)	0 (0%)	1 (50.0%)	0 (0%)	127 (46.6%)	11 (100%)	5 (71.4%)	92 (65.7%)	466 (51.6%)
Without Fresh Embryo Transfer	241 (56.3%)	0 (0%)	0 (0%)	1 (50.0%)	1 (33.3%)	169 (61.2%)	11 (100%)	7 (100%)	140 (100%)	571 (66.0%)

() % of oocyte retrieval cycle (including vitrified-oocyte cycles)

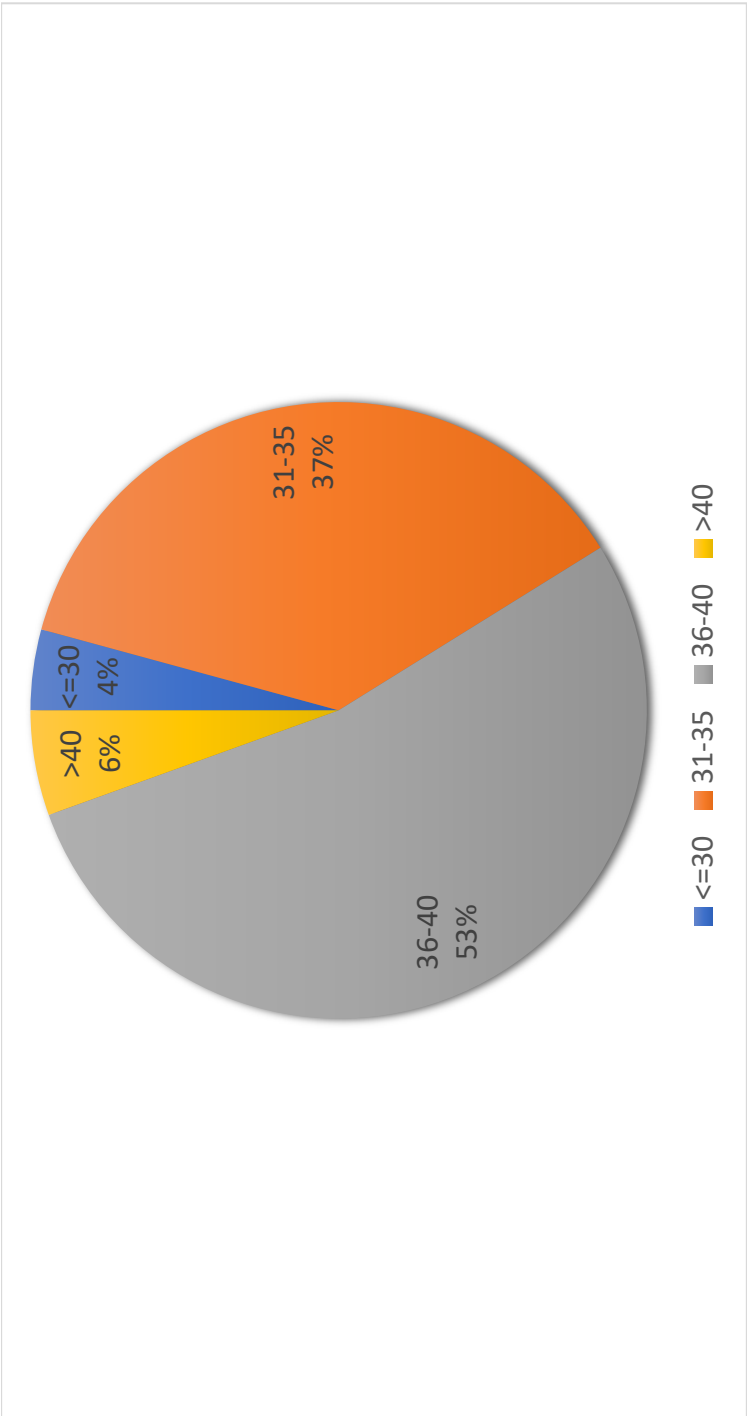


Figure 1: Age (years) Distribution of Patients

Table 3: Ongoing Pregnancy Rates in Different Age Groups

Age (yrs)	IVF	ICSI	IVM	Sperm donation	Vitrified oocyte	MESA	TESE	Total
<= 30	1/2 (50.0%)	1/2 (50.0%)	0/0 (-)	0/0 (-)	0/0 (-)	0/0 (-)	0/0 (-)	2/4 (50.0%)
31 – 35	15/52 (28.8%)	7/35 (20.0%)	0/0 (-)	1/1 (100%)	1/2 (50.0%)	0/0 (-)	0/0 (-)	24/90 (26.7%)
36 – 40	25/118 (21.2%)	10/56 (17.9%)	0/0 (-)	0/0 (-)	0/0 (-)	0/0 (-)	0/0 (-)	35/174 (20.1%)
> 40	2/15 (13.3%)	0/14 (0%)	0/0 (-)	0/0 (-)	0/0 (-)	0/0 (-)	0/0 (-)	2/29 (6.9%)
Total	43/187 (23.0%)	18/107 (16.8%)	0/0 (-)	1/1 (100%)	1/2 (50.0%)	0/0 (-)	0/0 (-)	63/297 (21.2%)

() % of transfer cycles

In Vitro Fertilization and Embryo Transfer~ IVF-ET

Stimulated cycle IVF-ET

During 2021, 410 couples underwent a total of 443 conventional stimulated IVF cycles at our center. Unexplained cause (41.5%) was the commonest indication, which was followed by male problem (15.3%), tuboperitoneal factor (15.1%) and endometriosis (10.8%). (Table 4)

Table 4: Indications for IVF-ET

Indications	No of Initiated cycles	No of Pregnancies	Ongoing pregnancies	Pregnancy Rate*	Ongoing Pregnancy Rate*
Tuboperitoneal	67 (15.1%)	8	6	38.1%	28.6%
Endometriosis	48 (10.8%)	7	4	33.3%	19.0%
Male Factor	68 (15.3%)	8	7	25.0%	21.9%
Anovulation	35 (7.9%)	6	5	46.2%	38.5%
Unexplained	184 (41.6%)	29	21	33.0%	23.9%
Others/Mixed	37 (8.4%)	4	0	33.3%	0%
Fertility preservation	4 (0.9%)	-	-	-	-
Total	443 (100%)	62	43	33.2%	23.0%

* Per transfer cycle

A total of 15 cycles (3.4%) were cancelled: 11 due to poor ovarian response, 3 due to premature ovulation and 1 due to other reason. No normal oocytes were obtained in 5 planned retrieval cycles. There were 20 cycles without normal fertilization and 7 cycles with only embryos not suitable for transfer. Therefore, no embryo was transferred in these 32 cycles. Embryo transfer was postponed in 209 cycles because of the risk of developing ovarian hyperstimulation syndrome (OHSS), high serum progesterone level or other reasons.

The **oocyte retrieval rate** was 72.1% with an average of 10.3 oocytes obtained per retrieval cycle. The **fertilization rate** was 67.4% and the **cleavage rate** was 96.3%. The oocyte retrieval rate, fertilization rate and cleavage rate were similar to the figures in previous years. The results are summarised in Table 5.

Table 5: Results of Conventional IVF-ET

		per Oocyte Retrieval Cycle	per Follicle Aspirated (Oocyte Retrieval Rate)	per Oocyte Retrieved (Fertilization Rate)	per Fertilized Oocyte (Cleavage Rate)
Number of Oocyte Retrieval Cycles	428				
Number of Follicles Aspirated	6116	14.3			
Number of Oocytes Retrieved	4411	10.3	72.1%		
Number of Oocytes Fertilized	2975	7.0		67.4%	
Number of Fertilized Oocytes Cleaved	2864	6.7			96.3%
Number of Embryos Transferred	188	0.4 (1.0 / ET)			
Number of Pregnancies	62				
Number of Embryos Frozen	1060	2			

Most (98.0%) of patients used GnRH antagonist protocol. (Table 6)

Table 6: Ovarian Stimulation Protocols Used

Protocol	No. of Initiated Cycles	No. of Pregnancies	Pregnancy Rate*	Ongoing Pregnancy Rate*
GnRH antagonist	434 (98.0%)	62	33.7%	23.4%
GnRHa (long)	0 (0%)	0	-	-
Progestin-primed	3 (0.7%)	0	-	-
Others	6 (1.4%)	0	0%	0%
Total	443 (100%)	62	33.2%	23.0%

* Per transfer cycle

All oocyte retrievals were successfully performed under transvaginal ultrasound guidance using intravenous sedation and analgesia. The degree of difficulty of embryo transfer and the corresponding pregnancy rate are shown in Table 7.

Table 7: Difficulty of Transfer

Difficulty	No. of ET Cycles	No. of Pregnancies	Ongoing pregnancies	Pregnancy Rate#	Ongoing Pregnancy Rate#
Easy	187 (100%)	62	43	33.2%	23.0%
Vulsellum	0 (0%)	0	0	-	-
Vulsellum & Sound Dilatation	0 (0%)	0	0	-	-
	0 (0%)	0	0	-	-
Total	187 (100%)	62	43	33.2%	23.0%

Per transfer cycle

Among the 428 oocyte retrieval cycles, 2 had infection and 2 had moderate to severe OHSS. (Table 8)

Table 8: Complications of Conventional IVF-ET Treatment

Complications	No of Retrieval* Cycles
Nil	424 (99.1%)
Infection	2 (0.5%)
Significant haemoperitonem	0 (0%)
Moderate to severe OHSS	2 (0.5%)

There were 62 pregnancies resulting from stimulated IVF-ET cycles. The **pregnancy rate** was 14.0% per initiated cycle and 33.2% per transfer cycle (Table 9). The **miscarriage rate** was 29.1%. The **ongoing pregnancy rate** was 9.7% per initiated cycle and 23.0% per transfer cycle. The average number of fresh embryos transferred was 1.0 per transfer. The **multiple pregnancy rate** was 3.2%. The **implantation rate** was 30.9%.

Table 9: Pregnancy Rates of Conventional IVF-ET

	Pregnancy Rate	Ongoing pregnancy Rate
per Cycle Initiated	62/443 (14.0%)	43/443 (9.7%)
per Oocyte Retrieval Cycle	62/428 (14.5%)	43/428 (10.0%)
per Transfer Cycle	62/187 (33.2%)	43/187 (23.0%)

Table 10: Outcome of Pregnancies

Outcome	Number of Cycles
Preclinical abortion	5 (8.1%)
Clinical abortion	13 (21.0%)
Ectopic Pregnancy	1 (1.6%)
Lost to follow up	0 (0%)
Ongoing Pregnancy	43 (69.4%)
Total Pregnancies	62
No. of Fetuses	45
No. of Multiple Pregnancies	2

The outcome in relation to the number of embryos transferred is shown in Tables 11 and 12.

Table 11: Number of Embryos Transferred & the Outcome

No. of Embryos	No. of ET Cycles	No. of Pregnancies	No. of Ongoing pregnancies	Pregnancy Rate [#]	Ongoing Pregnancy Rate [#]	Multiple Pregnancy Rate ⁺
1	189 (99.5%)	62	43 (2)	33.3%	23.1%	3.2%
2	1 (0.5%)	0	0 (0)	0%	0%	-
Total	187 (100%)	62	43 (2)	33.2%	23.0%	3.2%

#Per transfer cycle
+Per pregnancy cycle

Table 12: Outcome of Single Embryo Transfer

Elective	Day of ET	Average Age of Women (years)	No. of ET cycles	Pregnancy Rate [#]	Ongoing Pregnancy Rate [#]	Multiple Pregnancy Rate ⁺
Yes	2	36.9	55	20 (36.4%)	13 (23.6%)	1 (5.0%)
	5	36.3	61	26 (42.6%)	20 (32.8%)	1 (3.8%)
No	2	37.1	59	14 (23.7%)	8 (13.6%)	0 (0%)
	5	37.3	11	2 (18.2%)	2 (18.2%)	0 (0%)

#Per transfer cycle
+Per pregnant cycle

Intracytoplasmic Sperm Injection~ICSI (with ejaculated sperm)

Two hundred and eighty treatment cycles were initiated in two hundred and forty-five couples (excluding preimplantation genetics testing). ICSI was decided in 231 treatment cycles because of severe male factor infertility. It was also performed in those who had either failed fertilization or poor fertilization rate (less than 30%) in a previous conventional IVF cycle. This latter group accounted for 31 of the cycles initiated (Table 13).

Table 13: Indications for ICSI

Indications	No. of Initiated Cycles	No. of Pregnancies	Pregnancy Rate*	Ongoing Pregnancy Rate*
Severe male factor	233 (83.2%)	22	24.2%	16.5%
Fertilization problem	31 (11.1%)	3	21.4%	21.4%
Others	16 (5.7%)	2	100%	0%
Total	280 (100%)	27	25.2%	16.8%

*Per transfer cycle

GnRHa antagonist protocol for ovarian stimulation was used in 274 cycles (98.6%) (Table 14)

Table 14: Ovarian Stimulation Protocols Used

Protocol	No. of Initiated Cycles	No. of Pregnancies	Pregnancy Rate*	Ongoing Pregnancy Rate*
GnRH antagonist	276 (98.6%)	27	25.5%	17.0%
GnRHa (long)	1 (0.4%)	0	-	-
Progestin-primed	2 (0.7%)	0	-	-
Others	1 (0.4%)	0	-	-
Total	280 (100%)	27	25.2%	16.8%

*Per transfer cycle

The results are summarized in Table 15.

Table 15: Results of ICSI

		per Oocyte Retrieval Cycle	per Follicle Aspirated (Oocyte Retrieval Rate)	per Oocyte Retrieved (Fertilization Rate)	per Fertilized Oocyte (Cleavage Rate)
No. of Oocyte Retrieval Cycles	276				
No. of Follicle Aspirated	3994	14.5			
No. of Oocytes Retrieved	2941	10.7	73.6%		
No. of Oocytes Fertilized	1467	5.3		49.9% (67.0% per oocyte injected)	
No. of Fertilized Oocytes Cleaved	1430	5.2			97.5%
No. of Embryos Transferred	108	0.4 (1.0/ET)			
No. of Pregnancies	27				
No. of Embryos Frozen	757	2.7			

Oocytes were not obtained in 3 planned retrieval cycles. Insemination was not performed in 17 cycles. Normal fertilization was not achieved in 17 cycles, 1 did not have normal cleavage and 4 did not have embryos suitable for transfer. Therefore, no embryo was transferred in these 42 cycles. Embryo transfer was postponed in another 127 cycles because of the risk of developing OHSS, high serum progesterone concentration or other reasons. The fertilization rate was 67.0% per oocyte injected this year and was similar to that of last year. The mean number of embryos transferred was only 1.0 per transfer and was comparable to that of conventional stimulated IVF cycles. The degree of difficulty of embryo transfer is shown in Table 16.

Table 16: Difficulty of Transfer

Difficulty	No. of ET Cycles	No. of Pregnancies	Pregnancy Rate#	Ongoing Pregnancy Rate#
Easy	107 (100%)	27	25.2%	16.8%
Vulsellum	0 (0%)	0	-	-
Vulsellum + Sound	0 (0%)	0	-	-
Total	107 (100%)	27	25.2%	16.8%

Per transfer cycle

There were 27 pregnancies and 18 were ongoing (Tables 17 & 18). The **multiple pregnancy rate** was 3.7%. The **implantation rate** was 21.3%. Two had moderate or severe OHSS.

Table 17: Pregnancy Rates of ICSI

	Pregnancy Rate	Ongoing Pregnancy rate
per Cycle Initiated	27/278 (9.7%)	18/278 (6.5%)
per Oocyte Retrieval Cycle	27/276 (9.8%)	18/276 (6.5%)
per Transfer Cycle	27/107 (25.2%)	18/107 (16.8%)

Table 18: Outcome of Pregnancies

Outcome	Number of Cycles	
Miscarriage	9	(33.3%)
Ectopic Pregnancy	0	(0%)
Ongoing Pregnancy	18	(66.7%)
Total Pregnancies	27	
No. of Fetuses	19	
No. of Multiple Pregnancies	1	(3.7%)

The outcome in relation to the number of embryos transferred is shown in Table 19 and Table 20.

Table 19: Number of Embryos Transferred & the Outcome

No. of Embryos	No. of ET Cycles	No. of Pregnancies	Pregnancy Rate#	Ongoing Pregnancy Rate#	Multiple Pregnancy Rate⁺
1	106 (99.1%)	27	25.5%	17.0%	3.7%
2	1 (0.9%)	0	0%	0%	0%
Total	107 (100%)	27	25.2%	16.8%	3.7%

Per transfer cycle
+ Per pregnant cycle

Table 20: Outcome of Single Embryo Transfer

Elective	Day of ET	Average Age of Women (years)	No. of ET cycles	Pregnancy Rate[#]	Ongoing Pregnancy Rate[#]	Multiple Pregnancy Rate⁺
Yes	2	35.5	23	4 (17.4%)	3 (13.0%)	0 (0%)
	5	36.5	35	13 (37.1%)	11 (31.4%)	1 (7.7%)
No	2	37.6	36	8 (22.2%)	3 (8.3%)	0 (0%)
	5	37.9	12	2 (16.7%)	1 (8.3%)	0 (0%)

#Per transfer cycle
+Per pregnant cycle

Microsurgical Epididymal Sperm Aspiration - MESA

Eleven couples underwent 11 treatment cycles in 2021. The urological team at Queen Mary Hospital performed a total of 13 MESA procedures, which were arranged before ovarian stimulation or the oocyte retrieval. Indications for MESA cycles are given in Table 21.

Table 21: Indications for MESA

Indications	No. of OPU Cycles	No. of Pregnancies	Pregnancy Rate*	Ongoing Pregnancy Rate*
Congenital Absence of Vas deferens	1 (9.1%)	0	-	-
Obstructive Azoospermia	8 (72.7%)	0	-	-
Severe male factor	1 (9.1%)	0	-	-
Ejaculatory problem	1 (9.1%)	0	-	-
Total	11 (100%)	0	-	-

*Per transfer cycle

The antagonist protocol was used in all 11 cycles. Oocyte retrieval was performed under transvaginal ultrasound guidance in all 11 cycles and oocytes were obtained in the retrieval cycles. An average of 15.4 oocytes was retrieved in these 11 cycles. The fertilization rate was 75.3% per oocyte injected (Table 22). Embryo transfer was postponed in all 11 cycles.

Table 22: Results of MESA+ ICSI

		per Oocyte Retrieval Cycle	per Follicle Aspirated (Oocyte Retrieval Rate)	per Oocyte Retrieved (Fertilization Rate)	per Fertilized Oocyte (Cleavage Rate)
Number of Oocyte Retrieval Cycles	11				
Number of Follicles Aspirated	221	20.1			
Number of Oocytes Retrieved	169	15.4	76.5%		
Number of Oocytes Fertilized	113	10.3		66.9% (75.3% per oocyte injected)	
Number of Fertilized Oocytes Cleaved	112	10.2			99.1%
Number of Embryos Transferred	0	0.0 (0/ET)			
Number of Pregnancies	0				
Number of Embryos Frozen	44	4.0			

No patient developed complications.

Table 23: Pregnancy Rates of MESA + ICSI

	Pregnancy Rate	Ongoing pregnancy rate
per Cycle Initiated	0/11 (0%)	0/11 (0%)
per Oocyte Retrieval Cycle	0/11 (0%)	0/11 (0%)
per Transfer Cycle	0/0 (-)	0/0 (-)

Table 24: Outcomes of Pregnancies

Outcome	Number of cycles
Miscarriage	0 (-)
Ectopic Pregnancy	0 (-)
Ongoing Pregnancy	0 (-)
Total Pregnancies	0 (-)
No. of Fetuses	0 (-)
No. of Multiple Pregnancies	0 (-)

The pregnancy rate in relation to the number of embryos transferred is shown in Table 25.

Table 25: Number of Embryos Transferred & the Outcome

#Per transfer cycle

No. of Embryos	No. of ET Cycles	No. of Pregnancies	Pregnancy Rate#	Ongoing Pregnancy Rate#	Multiple Pregnancy Rate+
1	0 (0%)	0	-	-	-
2	0 (0%)	0	-	-	-
Total	0 (0%)	0	-	-	-

+Per pregnancy cycle

Testicular Sperm Extraction - TESE

During 2021, seven treatment cycles were initiated in seven couples (Table 26). The urological team at Queen Mary Hospital carried out eighteen testicular sperm biopsies. Sperm was found in 6 testicular biopsies and frozen in 4 testicular biopsies prior to start of ovarian stimulation. Frozen sperm was used in 5 TESE cycles.

Table 26: Indications for TESE

Indications	No. of OPU Cycles	No. of Pregnancies	Pregnancy Rate*	Ongoing Pregnancy Rate*
Non-obstructive Azoospermia	3 (42.9%)	0	-	-
Obstructive Azoospermia	3 (42.9%)	0	-	-
Severe male factor	1 (14.3%)	0	-	-
Total	7 (100%)	0	-	-

* Per transfer cycle

Seven IVF-TESE cycles were initiated. The antagonist protocol was used in 6 cycles and progestin-primed protocol in 1 cycle. No cycle was cancelled before oocyte retrieval. Oocyte retrieval was performed in 7 cycles under transvaginal ultrasound guidance and oocytes were obtained in all cycles. An average of 12.6 oocytes were retrieved. The overall fertilization rate was 59.0% per oocyte injected (Table 27). Two cycles were without insemination and embryo transfer was postponed in 5 cycles.

Table 27: Results of TESE+ ICSI

		per Oocyte Retrieval Cycle	per Follicle Aspirated (Oocyte Retrieval Rate)	per Oocyte Retrieved (Fertilization Rate)	per Fertilized Oocyte (Cleavage Rate)
No. of Oocyte Retrieval Cycles	7				
No. of Follicles Aspirated	125	17.9			
No. of Oocytes Retrieved	88	12.6	70.4%		
No. of Oocytes Fertilized	36	5.1		40.9% (59.0%per oocyte injected)	
No. of Fertilized Oocytes Cleaved	34	4.9			94.4%
No. of Embryos Transferred	0	0.0 (0/ET)			
No. of Pregnancies	0				
No. of Embryos Frozen	32	4.6			

There were no complications.

Preimplantation Genetic Testing - PGT

We continue to provide preimplantation genetic testing (PGT) to women at risk of having babies with serious chromosomal or genetic disorders. In 2021, PGT was performed in 140 stimulated cycles for 116 couples and indications for PGT were shown in Table 28.

Table 28: Summary of PGT cycles

Indication	No. of patients	No. of cycles	No. of embryo	
			PGT	Normal
Numerical chromosomal abnormalities	0	0	0	0
Reciprocal translocation	21	26	65	26 (40.0%)
Robertsonian translocation	1	1	1	0 (0%)
α Thalassaemia	12	13	58	33 (56.9%)
β Thalassaemia	8	10	33	22 (66.7%)
Others single gene defects	27	34	99	51 (51.5%)
Others single gene defects + HLA typing	2	3	1	1 (100%)
PGT-A#	50	53	155	99 (63.9%)
Total	121	140	412	232 (56.3%)

#PGT for aneuploidy (PGT-A) is done for advanced maternal age, repeated implantation failure or recurrent miscarriage. PGT-A was also performed in suitable blastocysts following PGT-M (monogenic diseases).

Frozen embryo transfer after PGT

All blastocysts for PGT were frozen after biopsy and transfer of the frozen blastocysts was arranged after the results were available for counselling. Next generation sequencing was used in PGT-A (aneuploidy) and PGT-SR (structural rearrangement). Each blastocyst was frozen in one straw after biopsy and patients were allowed to replace one blastocyst each time following PGT.

A total of 126 thaw cycles after PGT were initiated. 126 frozen blastocysts were thawed and 126 frozen blastocysts were replaced.

There were altogether 78 **pregnancies** (61.9% per transfer) and 64 **ongoing pregnancies** (50.8% per transfer) resulting from transfer of frozen blastocysts. The overall **miscarriage rate** was 16.6%. The **multiple pregnancy rate** was 2.6%. The **implantation rate** was 57.1%.

Embryo Cryopreservation and Frozen Embryo Transfer

The results of embryo cryopreservation are summarized in Table 29. As was our experience from previous years, there were excess embryos suitable for cryopreservation in 642* / 868 (74.0%) of the retrieval cycles in 2021.

Table 29: Results of Embryo Cryopreservation

Method of Treatment	IVF	ICSI	MESA	TESE	Others	PGT	Total
No. of Oocyte Retrieval Cycles	428	276	11	7	6	140	868
No. of Cycles with Embryo Cryopreservation	326*	200*	11	7*	5	93*	642*#
Total No. of Embryos Cryopreserved	1060*	757*	44	32*	10	256*	2159*
Average No. of Embryos Cryopreserved	3.3*	3.8*	4.0	4.6*	2.0	2.8*	3.4*
Range of Embryos Cryopreserved	1-14*	1-35*	1-10	2-7*	1-4	1-19*	1-35*

* with oocyte freezing #623 embryo- and 19 oocyte-freezing cycles

Seven hundred and ninety-six women planned to have replacement of frozen embryos (FET). A total of 1000 thaw cycles were initiated. Embryo transfer was not done in 4 cycles because of lysis of all frozen embryo(s) or blastocysts during thawing. Seven hundred thirty frozen embryo replacements were performed in natural (spontaneous ovulatory) cycles, two hundreds and eighteen were in letrozole-induced cycles, forty-seven were in total hormone replacement artificial cycles and one was in a stimulated cycle.

The pregnancy rates of these different types of transfer cycles are shown in Table 30.

Table 30: Outcome of FET Cycles

Cycle Type	Number of Cycles		Number of Pregnancies	Pregnant Rate	Ongoing pregnancy rate
Natural	730	73.3%	317	43.4%	34.1%
Artificial	47	4.7%	19	40.4%	23.4%
Letrozole	218	21.9%	116	53.2%	42.2%
Stimulated	1	0.1%	0	0%	0%
Total	996	100.0%	452	45.4%	35.3%

Table 31: Outcome of Pregnancies in FET

Outcome	No. of Pregnancies	Natural	Artificial	Letrozole	Stimulated
Miscarriage	96 (21.2%)	65	8	23	0
Ectopic Pregnancy	4 (0.9%)	3	0	1	0
Molar Pregnancy	0 (0%)	0	0	0	0
Lost to follow up	0 (0%)	0	0	0	0
Ongoing Pregnancy	352 (77.9%)	249 (78.5%)	11 (57.9%)	92 (79.3%)	0 (-)
Total Pregnancies	452	317	19	116	0
No. of Fetuses	359	256	11	92	0
No. of Multiple Pregnancies	6 (1.3%) 5 twin-pregnancies and 1 triplet	6	0	0	0

The average number of embryos/blastocysts transferred per FET cycles was 1.0. There were altogether 452 pregnancies resulting from transfer of frozen embryos/blastocysts. The overall **miscarriage rate** was 21.2%. The **multiple pregnancy rate** was 1.3% (Table 31). The **implantation rate** was 44.3%.

Table 32: Number of Embryos Transferred & the Outcome

No. of Embryos	No. of FET Cycles	No. of Pregnancies	Pregnancy Rate#	Ongoing Pregnancy rate#	Multiple Pregnancy Rate⁺
1	994	(99.8%)	45.5%	35.4%	1.3%
2	2	(0.2%)	0%	0%	0%
Total	996 (100%)	452	45.4%	35.3%	1.3%

Per transfer cycle
+ Per pregnant cycle

Ovulation Induction and Ovarian Stimulation & Intrauterine Insemination

Ovulation Induction

No patient underwent ovulation induction by gonadotrophin therapy this year.

Table 33: Characteristics of Ovulation Induction Cycles

Parameters	Mean \pm Standard Deviation
Amount of gonadotrophin used (IU)	-
Number of follicles \geq 14mm	-
Number of follicles \geq 16mm	-
Number of follicles \geq 18mm	-
Oestradiol on the day of hCG (pmol/l)	-

Ovarian Stimulation & Intrauterine Insemination

Seventy-five women underwent 161 cycles of ovarian stimulation by letrozole or clomiphene citrate in conjunction with intrauterine insemination. Thirteen cycles were cancelled: 11 cycles for excessive response and 2 for other reasons.

The mean age of patients was 33.6 years. The indications and cycle characteristics are shown in Tables 34 and 35 respectively. Thirteen pregnancies were achieved and the **pregnancy rate** was 8.1% per cycle initiated.

**Table 34: Indications for Ovarian Stimulation
& Intrauterine Insemination**

Indications	Number of Cycles
Male factors	57
Unexplained	65
Endometriosis	0
Coital	12
Anovulation	20
Miscellaneous	7

**Table 35: Cycle Characteristics of Ovarian Stimulation & Intrauterine
Insemination**

Parameters	Mean ± Standard Deviation
Amount of gonadotrophin used (IU)	3000 (one patient only)
Number of follicles ≥ 12mm	1.7 ± 0.7
Number of follicles ≥ 14mm	1.5 ± 0.6
Number of follicles ≥ 16mm	1.3 ± 0.5
Number of follicles ≥ 18mm	1.1 ± 0.4
Number of follicles ≥ 20mm	1.0 ± 0.7

NA = not applicable

Natural Cycle Intrauterine Insemination

Twenty-four patients underwent 58 cycles of intrauterine insemination during natural cycles because of coital problems.

The mean age of patients was 36.9 years. Seven pregnancies were achieved and the **pregnancy rate** was 12.1% per cycle initiated. There were six ongoing singleton pregnancies.

Miscellaneous Statistics

	Number
Diagnostic laparoscopy +/- chromotubation	33
Laparoscopic ovarian cystectomy	11
Laparoscopic salpingostomy	4
Laparoscopic adhesiolysis	14
Laparoscopic salpingectomy	11
Laparoscopic segmental resection	5
Laparoscopic ovarian drilling	0
Laparoscopic ablation of endometriosis	3
Myomectomy	4
Diagnostic hysteroscopy	52
Hysteroscopic polypectomy	54
Hysteroscopic adhesiolysis	6
Hysteroscopic lysis of uterine septum	1
Hysteroscopic myomectomy	4
Hysteroscopic proximal tubal cannulation	5
Uterine curettage and insertion of Mirena	4
Others	3

Outpatient Clinics

	New	Follow-up
Infertility Clinics	548	504
Nurse Triage Clinic	251	0
Male infertility Clinics*	10	13
Reproductive Genetic Clinic	68	54
Recurrent Miscarriage Clinic	67	63
Sexual Counselling	76	126
Fertility Preservation Clinic	46	0
Private Clinic – Reproductive Medicine	261	147

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Cumulative Statistics

Table 36: Comparative Results of Conventional IVF-ET

	2021	2020	2019	2018	2017
Number of Patients	410	357	415	419	304
Number of Cycles Initiated	443	383	448	444	326
Number of Cycles Cancelled	15	8	14	11	17
Number of Cycles with Oocyte Retrieval	428	375	434	433	309
Number of Oocyte Retrieved	4411	4171	3872	4572	3142
Mean No. of Oocytes / Oocyte Retrieval	10.3	11.1	8.9	10.6	10.2
Number of Oocyte Fertilized	2975	2646	2600	3282	2317
Fertilization Rate	67.4%	63.4%	72.4%	71.8%	73.7%
Number of Cleaving Embryos	2864	2530	2476	3150	2231
Mean No. of Cleaving Embryos/ Retrieval	6.7	6.7	5.7	7.3	7.2
Number of Cycles with Transfer	187	178	230	250	201
Number of Embryos Transferred	188	180	231	287	277
Mean No. of Embryos / Transfer	1.0	1.0	1.0	1.1	1.4
Range	1-2	1-2	1-2	1-2	1-2
Number of Pregnancies	62	62	91	97	74
Pregnancy Rate / Transfer	33.2%	34.8%	39.6%	38.8%	36.8%
Ongoing Pregnancy Rate / Transfer	23.0%	27.0%	30.4%	30.4%	33.3%
Number of Embryos Frozen	1060	961	1050	1303	839

Table 37: Comparative Results of ICSI (Ejaculated sperm), excluding PGT

	2021	2020	2019	2018	2017
Number of Patients	245	198	236	236	197
Number of Cycles Initiated	278	209	255	264	214
Number of Cycles Cancelled	2	0	1	0	0
Number of Cycles with Oocyte Retrieval	276	209	254	264	214
Number of Oocytes Retrieved	2941	2203	2643	3714	2094
Mean No. of Oocytes / Retrieval	10.7	10.5	10.4	10.0	9.8
Number of Oocyte Fertilized	1467	1157	1504	1541	1268
Fertilization Rate	67.0%	68.3%	70.4%	74.3%	74.4%
Number of Cleaving Embryos	1430	1129	1472	1503	1268
Mean No. of Cleaving embryos/ Retrieval	5.2	5.4	5.8	5.7	5.9
Number of Cycles with Transfer	107	96	126	153	147
Number of Embryos Transferred	108	97	129	187	200
Mean No. of Embryos / Transfer	1.0	1.0	1.0	1.2	1.4
Number of Pregnancies	27	32	40	47	61
Pregnancy Rate / Transfer	25.2%	33.3%	31.7%	30.7%	41.5%
Ongoing Pregnancy Rate / Transfer	16.8%	28.1%	26.2%	21.6%	32.0%
Number of Embryos Frozen	757	476	656	719	580

Table 38: Comparative Results of Frozen Embryo Transfer (FET)

	2021	2020	2019	2018	2017
Number of Patients	796	558	693	636	513
Number of Thaw Cycles	1000	736	936	885	670
Number of Transfer Cycles	996	732	925	874	659
Total Number of Embryos Thawed	1044	791	1015	1090	1000
Number of Embryos Replaced	998	739	936	992	852
Mean Number Replaced	1.0	1.0	1.0	1.1	1.3
Type of Transfer Cycle:					
Natural	730	539	685	602	482
Clomid-/ Letrozole-Induced	218	164	1	1	6
Hormone Replacement	47	28	152	266	170
Stimulated	1	1	2	2	1
Number of Pregnancies	452	319	383	364	265
Pregnancy Rate / Transfer	45.4%	43.6%	41.4%	41.6%	40.2%
Ongoing Pregnancy Rate / Transfer	35.3%	33.2%	33.3%	29.2%	31.3%