

# Assisted reproductive technology in Japan: a summary report of 1992–2014 by the Ethics Committee, Japan Society of Obstetrics and Gynecology

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## Abstract

**Aim:** The Japan Society of Obstetrics and Gynecology implemented a registry report system for the clinical practice of assisted reproductive technology in 1986. The aggregated results from 1992 to 2014 are reported herein.

**Methods and Results:** The total number of registered treatments was 393 745 cycles, of which 66 550 were pregnancy cycles and 46 008 were cycles with a live birth. Compared to the number of registered treatments in 2008, when the cycle-based registry was newly introduced, there was a 2.07-fold increase in the total number of treatments and a 2.25-fold increase in the number of cycles with a live birth. As the average age of patients who receive assisted reproductive technology has become markedly higher year by year, the most common age of those patients who received assisted reproductive technology in 2014 was 40 years.

**Conclusion:** The total numbers of both assisted reproductive technology treatments and assisted reproductive technology live births are likely to be higher in the future. In addition, the trend toward aging patients seems to be continuing into the future.

## KEYWORDS

assisted reproductive technology, *in vitro* fertilization, intracytoplasmic sperm injection, Japan Society of Obstetrics and Gynecology

## 1 | INTRODUCTION

The Japan Society of Obstetrics and Gynecology (JSG) implemented a registry report system for the clinical practice of assisted reproductive technology (ART) in 1986. Starting with the report for fiscal year 1989 (The First Report),<sup>1</sup> the JSG continuously has reported the clinical outcomes of ART.<sup>2–25</sup> Since 2008, the JSG has implemented an online cycle-based registry system (individual surveys). The most recent version of the annual report is 2014 (the period from January 1 to December 31,

2014) that was published previously in Japanese.<sup>25</sup> As Japan has been the largest contributor of ART in terms of the annual amount of practice, herewith is presented the aggregate results for Japan.

## 2 | MATERIALS AND METHODS

For all patients who began treatment between January 1 and December 31, 2014, data for all treatment cycles that were

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**TABLE 1** Cycle-based registry form: clinical outcome of assisted reproductive technology

Patient ID number (req)	Unique ID for patient
Use of governmental support system for ART (req)	1. Yes 2. No 3. Unknown
Woman's age at starting of therapy (req)	( ) years old
Man's age at starting of therapy (req)	( ) years old
Height and body weight at starting of therapy	Height ( ) cm Body weight ( ) kg
Pregnancy history	Gravida ( ) Para ( )
Cause of infertility (req)	1. Tubal dysfunction 2. Endometriosis 3. Antisperm antibody 4. Male factor 5. Unknown 6. Others ( ) 7. Oocyte cryopreservation (medical indication)
Type of controlled ovarian stimulation	1. Natural 2. CC 3. CC + hMG or FSH 4. hMG or FSH 5. GnRH agonist + hMG or FSH 6. GnRH antagonist + hMG or FSH 7. Others ( ) 8. Hormone replacement cycle
Method of oocyte pick up (req)	1. Failed 2. Endovaginal ultrasonography 3. Laparoscopy 4. Use of thawed egg or embryo 5. Others ( )
Type of used egg or embryo (req)	1. Fresh egg or embryo 2. Frozen thawed embryo 3. Frozen thawed egg ※ If check (2. Frozen thawed embryo), input the registration number at oocyte pick up ( )
Therapeutic method (req)	1. IVF-ET 2. GIFT 3. ICSI 4. IVF-ET + ICSI 5. Thawed embryo 6. Others ( ) 7. Oocyte cryopreservation (medical indication)
Type of sperm collection	1. Ejaculated sperm 2. TESE 3. Others ( )
Sperm analysis	※ If check (1. Ejaculated sperm) in (Type of sperm collection), input the results of sperm analysis Concentration ( ) ×10 <sup>6</sup> /mL (the second decimal place) Motility ( ) %
If check (1. Fresh eggs or embryo) in (Types of used egg or embryo), input of following two items is necessary	
Number of eggs retrieved	( )
Number of fertilized eggs	( )
If check (2. Frozen thawed embryo) in (Types of used egg or embryo), input of following item is necessary	
Number of thawed embryos	( )
If check (3. Frozen thawed egg) in (Types of used egg or embryo), input of following two items is necessary	
Number of thawed eggs	( )
Number of fertilized eggs after thawed	( )

(Continues)

**TABLE 1** (Continued)

Patient ID number (req)	Unique ID for patient
If check any of three alternatives in (Types of used egg or embryo), input of following seven items is necessary	
Stage of embryo at embryo transfer	1. Egg (unfertilized) 2. Cleavage embryos 3. Blastocysts 4. ET cancellation 5. Others ( )
Number of egg or embryo transfers	( )
Number of frozen egg or embryos	( )
Assisted hatching	1. Yes 2. No
Luteal support	1. None 2. Progesterone (P) 3. hCG 4. hCG + P 5. Estrogen + P 6. Others ( )
Complications	1. None 2. Bleeding 3. Infection 4. OHSS (more than Stage II) 5. Others ( )
Having pregnancy or not	1. None 2. Clinical pregnancy (Evidence by ultrasound of an intrauterine sac with or without a fetal heart) (Date of embryo transfer [day/month/year]) ※ If check (2. Clinical pregnancy), input the (Data items from pregnancy to delivery) form. 3. Undetermined ※ Reselect (1. None) or (2. Clinical pregnancy) after determined.

req, required; ART, assisted reproductive technology; CC, clomiphene citrate; hMG, human menopausal gonadotropin; FSH, follicle-stimulating hormone; GnRH, gonadotropin-releasing hormone; IVF-ET, *in vitro* fertilization-embryo transfer; GIFT, gamete intrafallopian transfer; ICSI, intracytoplasmic sperm injection; TESE, testicular sperm extraction; OHSS, ovarian hyperstimulation syndrome.

**TABLE 2** Cycle-based registry form: obstetric outcome of pregnancy

Number of gestational sacs (req)	( )
Number of fetal heartbeat	( )
Outcome of pregnancy (req)	1. Miscarriage 2. Ectopic pregnancy 3. Heterotopic pregnancy 4. Elective termination of pregnancy (reason: ) 5. Live birth 6. Stillbirth 7. Selective reduction performed (number of fetus before reduction [ ], number of fetuses after reduction [ ]) 8. Unknown
Number of live births	※ If check (5. Live birth) or (6. Stillbirth) in (Outcome of pregnancy), input is necessary Number ( ) (Date of delivery [day/month/year])
Style of delivery	1. Vaginal delivery 2. Cesarean delivery 3. Vaginal and cesarean delivery 4. Unknown
Obstetric complications of pregnancy	1. None 2. Yes 3. Unknown

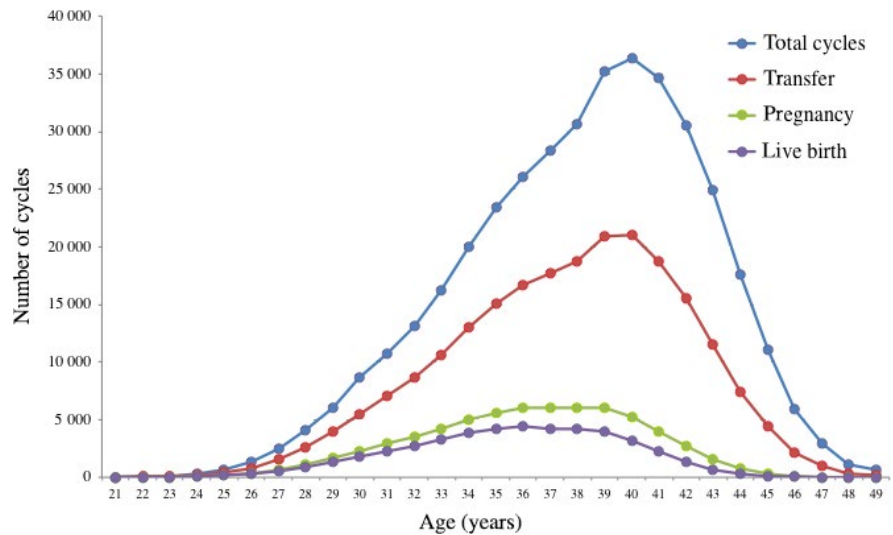
(Continues)

**TABLE 2** (Continued)

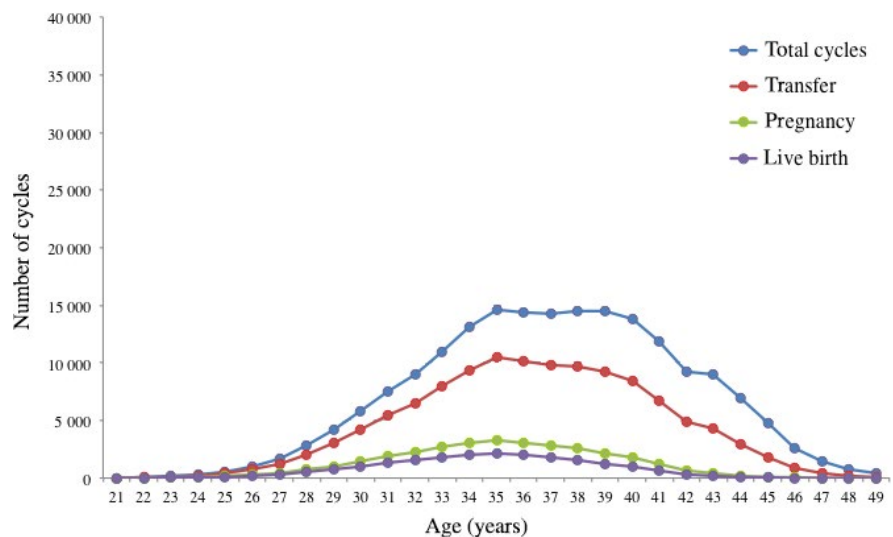
Finding of the baby									
	Sex	Gestational age	Birthweight	State of baby			Prognosis after delivery		
				Live birth or stillbirth	Monozygotic	Malformation	Under 7 days	Under 28 days	Date of death
1	1. Male	1. ( ) weeks	1. ( ) g	1. Live birth	1. Yes	( )	1. Survival	1. Survival	(Day/month/year)
	2. Female	2. Unknown	2. Unknown	2. Stillbirth	2. No		2. Death	2. Death	
	3. Unknown				3. Unknown		3. Unknown	3. Unknown	
2	1. Male	1. ( ) weeks	1. ( ) g	1. Live birth	1. Yes	( )	1. Survival	1. Survival	(Day/month/year)
	2. Female	2. Unknown	2. Unknown	2. Stillbirth	2. No		2. Death	2. Death	
	3. Unknown				3. Unknown		3. Unknown	3. Unknown	
3	1. Male	1. ( ) weeks	1. ( ) g	1. Live birth	1. Yes	( )	1. Survival	1. Survival	(Day/month/year)
	2. Female	2. Unknown	2. Unknown	2. Stillbirth	2. No		2. Death	2. Death	
	3. Unknown				3. Unknown		3. Unknown	3. Unknown	
4	1. Male	1. ( ) weeks	1. ( ) g	1. Live birth	1. Yes	( )	1. Survival	1. Survival	(Day/month/year)
	2. Female	2. Unknown	2. Unknown	2. Stillbirth	2. No		2. Death	2. Death	
	3. Unknown				3. Unknown		3. Unknown	3. Unknown	

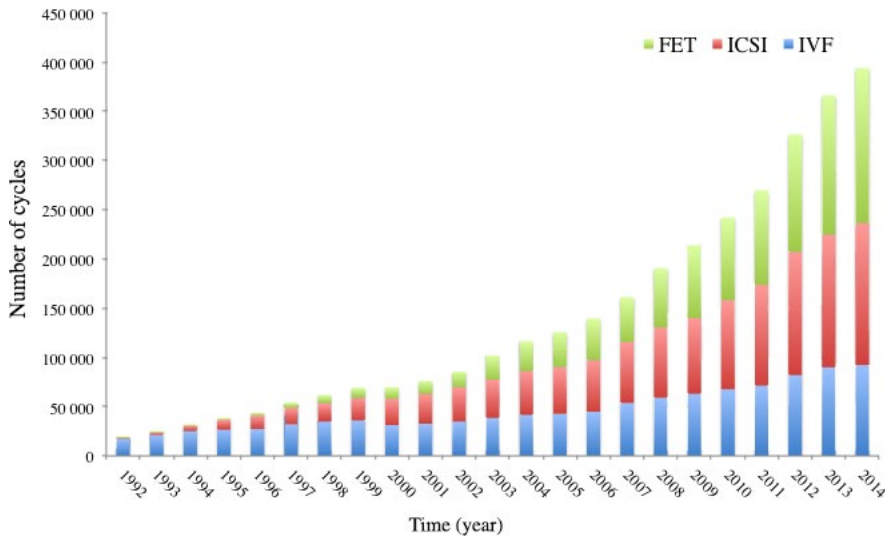
req, required.

**FIGURE 1** Age distribution of the women who were treated with assisted reproductive technology procedures in Japan in 2014. Adapted from Japan Society of Obstetrics and Gynecology ART Databook 2014 ([https://plaza.umin.ac.jp/~jsog-art/2014data\\_201609.pdf](https://plaza.umin.ac.jp/~jsog-art/2014data_201609.pdf))

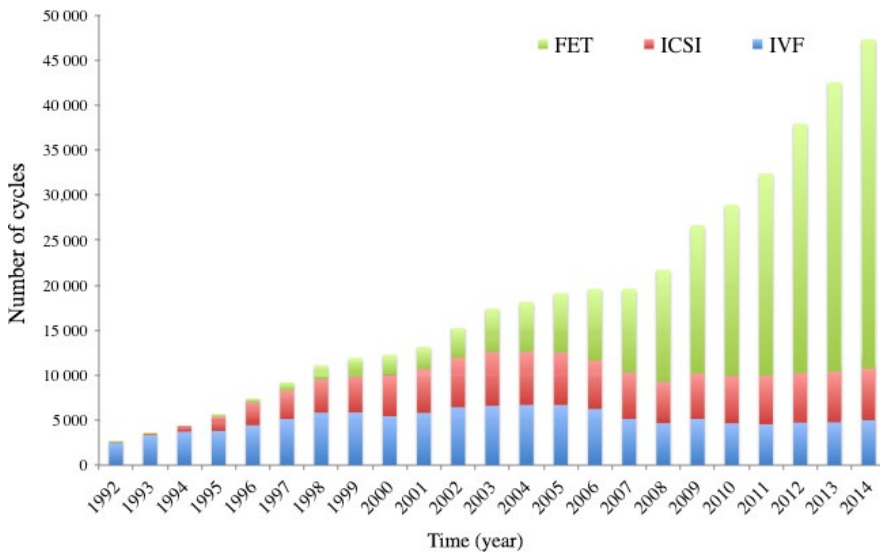


**FIGURE 2** Age distribution of the women who were treated with assisted reproductive technology procedures in Japan in 2008. Adapted from Japan Society of Obstetrics and Gynecology ART Databook 2008 ([https://plaza.umin.ac.jp/~jsog-art/2008data\\_pdf.pdf](https://plaza.umin.ac.jp/~jsog-art/2008data_pdf.pdf))

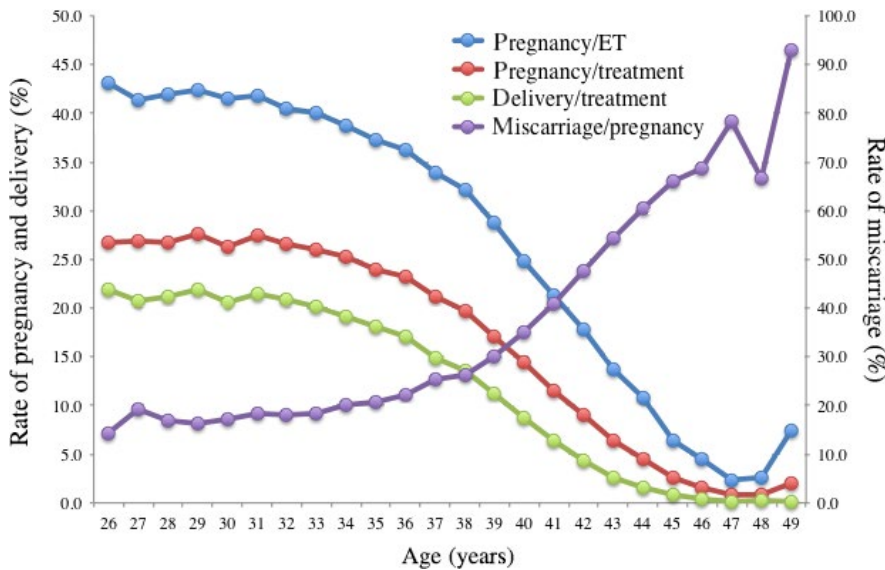




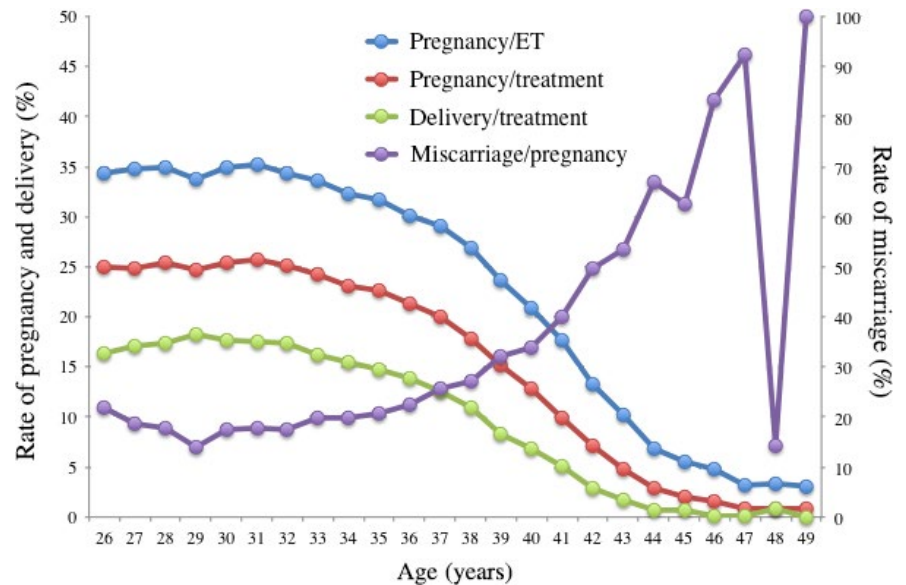
**FIGURE 3** Number of cycles in each assisted reproductive technology procedure in Japan between 1992 and 2014. Adapted from Japan Society of Obstetrics and Gynecology ART Databook 2014 ([https://plaza.umin.ac.jp/~jsog-art/2014data\\_201609.pdf](https://plaza.umin.ac.jp/~jsog-art/2014data_201609.pdf)). FET, frozen-thawed embryo transfer; ICSI, intracytoplasmic sperm injection; IVF, *in vitro* fertilization



**FIGURE 4** Number of live births after assisted reproductive technology procedures in Japan between 1992 and 2014. Adapted from Japan Society of Obstetrics and Gynecology ART Databook 2014 ([https://plaza.umin.ac.jp/~jsog-art/2014data\\_201609.pdf](https://plaza.umin.ac.jp/~jsog-art/2014data_201609.pdf)). FET, frozen-thawed embryo transfer; ICSI, intracytoplasmic sperm injection; IVF, *in vitro* fertilization



**FIGURE 5** Rates of pregnancy, live birth, and miscarriage at each age in Japan in 2014. Adapted from Japan Society of Obstetrics and Gynecology ART Databook 2014 ([https://plaza.umin.ac.jp/~jsog-art/2014data\\_201609.pdf](https://plaza.umin.ac.jp/~jsog-art/2014data_201609.pdf)). ET, embryo transfer



**FIGURE 6** Rates of pregnancy, live birth, and miscarriage at each age in Japan in 2008. Adapted from Japan Society of Obstetrics and Gynecology ART Databook 2008 ([https://plaza.umin.ac.jp/~jsog-art/2008data\\_pdf.pdf](https://plaza.umin.ac.jp/~jsog-art/2008data_pdf.pdf)). ET, embryo transfer

performed at all ART treatment facilities nationwide were entered for each treatment cycle by using the online registry system by the end of November, 2015. The contents that were investigated are shown in Tables 1 and 2.

### 3 | RESULTS AND DISCUSSION

There were 598 registered ART facilities in 2014 and the ART treatments at all of these facilities were registered. The number of facilities that actually provided ART treatment in 2014 was 574; the number of implemented cycles was zero at 24 facilities. Figure 1 shows the age distribution of the patients for all registered treatment cycles. The total number of registered treatments was 393 745 cycles, of which 66 550 were pregnancy cycles and 46 008 were cycles with a live birth. Compared to the number of registered treatments in 2008 (Figure 2), there was a 2.07-fold increase in the total number of treatments and a 2.25-fold increase in the number of cycles with a live birth. The age of the patients who receive ART has become markedly higher each year and the most common age of those patients who received ART in 2014 was 40 years. The trend toward an increasing patient age is thought to continue into the future. Figures 3 and 4 show the annual changes in the number of registered cycles and live births since registration began in 1992. The increases in the total number of ART treatments and ART live births are thought to continue for some time into the future. The total number of ART live births that was registered between 1992, the year in which registration began, and 2014 was 431 626.

Figure 5 shows the outcomes of ART by patient age for all treatment cycles. As the age increases, the success rate decreases and the rate of miscarriage increases. Compared to the 2008 results (Figure 6), these outcomes represent a slight increase, but no major change.

### ACKNOWLEDGEMENTS

This report had the cooperation of all the registered facilities that provided responses. We would like to express our sincere gratitude to these facilities and we ask that they promote the use of the online registry system and continue to cooperate in our efforts.

### CONFLICT OF INTEREST

There is no conflict of interest regarding the publication of this study.

### HUMAN RIGHTS STATEMENT AND INFORMED CONSENT

All the procedures that were followed were in accordance with the ethical standards of the responsible committees on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and its later amendments. Informed consent was obtained from all the patients in the study.

### ANIMAL RIGHTS

This article does not contain any study that was performed by any of the authors that included animal participants.

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