Assisted reproductive technologies (ART) in Canada: 2001 results from the Canadian ART Register

Joanne Gunby, M.Sc.,[a] *and Salim Daya, M.B.,*[a,b] *on behalf of the IVF Directors Group of the Canadian Fertility and Andrology Society*

Departments of [a] Obstetrics and Gynecology and [b] Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, Ontario, Canada

Objective: To present the success rates of assisted reproductive technologies (ART) cycles performed in 2001 in Canada.
Design: Retrospective cohort study.
Setting: Nineteen of 22 ART centers in Canada.
Participants: Couples undergoing ART treatment in Canada during 2001.
Methods: Data on each ART cycle performed during 2001 were submitted electronically to the Canadian ART Register (CARTR) by participating centers.
Main Outcome Measure(s): Clinical pregnancy and live birth rate per cycle started, multiple birth rate.
Result(s): A total of 7,884 ART cycles was reported to CARTR. There were 5,393 in vitro fertilization/intracytoplasmic sperm injection (IVF/ICSI) cycles using the woman's own oocytes. Per cycle started, the pregnancy rate was 28.3%, and the live birth rate was 23.1%; the multiple birth rate per delivery was 32.8%. Of cycles with oocytes retrieved, IVF was performed in 44% and ICSI in 56%; the outcomes were similar with the two procedures. There were 301 IVF/ICSI cycles using donor oocytes. The pregnancy rate was 29.2%, and the live birth rate was 22.4%; the multiple birth rate was 43.5%. There were 1,936 frozen embryo transfer cycles using the woman's own oocytes. The pregnancy rate was 18.9%, and the live birth rate was 15.4%; the multiple birth rate was 24.9%.
Conclusion(s): For 2001, CARTR achieved 86% voluntary participation from Canadian ART centers. Pregnancy and live birth rates comparable to those of other countries were achieved. (Fertil Steril® 2005;84:590–9. ©2005 by American Society for Reproductive Medicine.)

Key Words: ART, success rates, IVF, ICSI, frozen embryo transfer, oocyte donation, multiple births

The Canadian Assisted Reproductive Technologies Register (CARTR) was first established in 1999 for the collection of treatment cycle data from Canadian fertility centers using assisted reproductive technologies (ART), including in vitro fertilization (IVF), intracytoplasmic sperm injection (ICSI), gamete intrafallopian transfer (GIFT), and frozen embryo transfer (FET). The establishment of the register was initiated by the IVF Directors Group of the Canadian Fertility and Andrology Society (CFAS) and implemented by the Data Subcommittee of the CFAS Accreditation Committee. Participation of ART centers in CARTR is voluntary.

The reasons for the establishment of CARTR were [1] to collect and maintain a database of results of all ART cycles initiated in Canadian centers, [2] to calculate overall success rates in terms of clinical pregnancy and live birth per cycle started for the variety of different types of ART procedures being offered, [3] to provide estimates for the likelihood of undesired events from ART treatment, such as miscarriage, ectopic pregnancy, ovarian hyperstimulation syndrome, and multiple birth, [4] to identify predictors of outcome, so that treatment options can be provided more efficiently, [5] to obtain baseline event rates to assist in developing proposals for intervention studies, [6] to evaluate the provision of services from a quality assurance perspective, [7] to provide realistic expectations and options for infertile couples wishing to avail themselves of treatment with ART, and [8] to provide guidelines for resource allocation.

The purpose of this article is to report the results of ART cycles performed in Canadian centers in the 2001 calendar year and submitted to CARTR.

MATERIALS AND METHODS

The Society for Assisted Reproduction (SART) in the United States generously provided CFAS with permission to use their computerized Clinical Outcome Reporting System (CORS). Since the 1999 reporting year, CARTR has been using SART-CORS version 2. This computer program was provided to all Canadian ART centers at no charge. Staff at each center entered information about patient demographics, diagnosis, and obstetrical history, details of treatment, and pregnancy and birth outcomes for each ART treatment cycle initiated. The completed anonymous case records were sent

Received December 20, 2004; revised and accepted March 4, 2005.
Supported by the Canadian Fertility and Andrology Society, Montreal, Quebec, Canada.
Reprint requests: Joanne Gunby, M.Sc., Department of Obstetrics and Gynecology, McMaster University HSC-3N52, 1200 Main Street West, Hamilton, Ontario L8N 3Z5, Canada (FAX: 905-524-2911; E-mail: gunbyj@mcmaster.ca).

0015-0282/05/$30.00
doi:10.1016/j.fertnstert.2005.03.037

electronically from each center to the CARTR coordinating center, where they were checked for accuracy and completeness, with corrections or clarifications requested from the centers as necessary. The records from each clinic were then aggregated for data analysis with the software program Statistical Package for the Social Sciences, version 10 (SPSS, Chicago, IL). For this report, ART cycles started between January 1, 2001 and December 31, 2001 were submitted.

It was not necessary to obtain institutional review board approval for this study because the data collection is one of the requirements for accreditation of clinics providing ART services, which is organized by the CFAS in conjunction with the Canadian Council on Health Services Accreditation. Although participation in accreditation is voluntary, most of the clinics in Canada have agreed to the process and are obliged to inform patients that such data will be collected in a manner that is anonymous.

When CARTR was established, one of the conditions under which the directors of the various Canadian centers agreed to provide data was complete confidentiality of the information. In keeping with this agreement, the results of the yearly analysis of aggregated data from CARTR have been provided, to this point, only to the medical and laboratory directors of the ART centers that submitted data for that year. This has been done through a slide presentation at the annual IVF Directors' Meeting. Identified clinic-specific results have never been presented, at the directors' request, and are not available to anyone at this time. A brief summary of the national pregnancy and live birth rates has been provided to the media, with the directors' permission, immediately after each meeting. At the 2003 IVF Directors' Meeting, the participants agreed to the publication, in a major medical journal, of a complete report of the CARTR results from 2001. Before submission for publication, this report was read and approved by all IVF directors.

Definitions of Outcomes

A cycle is considered to have "started" when a woman undergoing ovarian stimulation receives the first dose of gonadotropins or, in a nonstimulated cycle (e.g., for FET), when a decision is made to attempt ART treatment in that cycle. A canceled cycle is one that is stopped before the oocyte retrieval procedure or thawing of embryos.

Clinical pregnancy includes intrauterine gestation (presence of a fetal sac on ultrasonography), ectopic pregnancy, and miscarriage occurring before an ultrasound examination has been done with histological evidence of pregnancy. Cycles with only a positive pregnancy test are not considered to be clinical pregnancies.

Pregnancy loss includes miscarriage and therapeutic abortion occurring at ≤20 weeks' gestation. Any pregnancy termination, either spontaneous or therapeutic, occurring after 20 weeks' gestation with no liveborn infant is considered a stillbirth. A delivery is the birth of one or more infants, either living or not, after 20 weeks' gestation. A live birth is a delivery that results in at least one living infant (but, if a multiple birth, might include one or more stillborn infants). A neonatal death is the death of an infant in the first 28 days of life. A multiple birth is the delivery of more than one infant, either liveborn or stillborn, including deliveries with all infants stillborn. High-order multiple births (triplets and quadruplets) are reported separately.

Unless otherwise noted, the clinical pregnancy rate is reported per cycle started. Cycle cancellation, ectopic pregnancy, and other complications are reported per cycle started. The miscarriage rate is reported per intrauterine pregnancy. The live birth rate is reported per cycle started, excluding from the denominator cycles in which the outcome of the pregnancy has not been reported (outcomes were unknown for only 3% of ongoing pregnancies). Because of these missing data, the live birth rates reported might underestimate the true live birth rates. The multiple birth rate is reported per delivery, including stillbirths.

RESULTS

Participating Centers

Although ART centers are located in every Canadian province except Newfoundland and Prince Edward Island, approximately half the centers are located in Ontario, mainly in the Toronto area. Of the 22 ART centers operating in 2001, 19 contributed to CARTR for that year (listed in the Appendix). Three centers, all in the province of Quebec, declined to participate.

Of the 19 centers, 5 performed >500 ART cycles in 2001, 10 performed 200–500 cycles, and 4 performed <200 cycles.

Success Rates by Type of ART Procedure

In total, 7,884 treatment cycles involving ART were reported to CARTR in 2001. Overall, 1,983 ART cycles (25.9% of cycles started) resulted in a clinical pregnancy, 1,668 resulted in a delivery (21.5%), and 1,645 resulted in a live birth (21.2%) (there were 51 cycles with ongoing pregnancies for which the birth outcome was not reported). Overall, there were 527 multiple births (31.6% of known births): 479 twin births (28.7%), 44 triplet births (2.6%), and 4 quadruplet births (0.2%).

The various procedures and their success rates are described below. The results of the most common procedures are summarized in Table 1.

In Vitro Fertilization/Intracytoplasmic Sperm Injection

In vitro fertilization, including ICSI, was the most common procedure performed, with 5,393 cycles reported. This category includes only cycles in which the woman's own oocytes are used and the same woman receives the resulting embryos, to distinguish them from donor oocyte and gestational carrier cycles (see below). However, cycles using