

# MONITORING ASSISTED REPRODUCTIVE TECHNOLOGIES – ROMANIAN EXPERIENCE

ANCA CORICOVAC<sup>1</sup>, LAURA DRACEA<sup>2</sup>

<sup>1,2</sup>“Carol Davila” University of Medicine and Pharmacy Bucharest, <sup>1,2</sup>Gynera Fertility Clinic Bucharest

**Keywords:** assisted reproductive technologies, fertility treatment, natality

**Abstract:** Monitoring assisted reproductive technologies in Europe is not simply a topic of academic interest, but is also a process that is necessary for safety management, demographic analysis, and health policy development. In addition, fertility treatments are increasingly contributing to natality, given the natural fertility decline and broader access to advanced technology. Therefore, we retrospectively reviewed data that were derived from the most recent European Registry for Organs, Tissues and Cells public report (EUROCET, 2012–2013) with a focus on Romanian findings. In this retrospective study, we evaluated data from Romania and various other European countries to compare the use of, and access to, assisted reproductive technologies (ART). Our findings revealed that only 224 ART cycles were accessed per million Romanian inhabitants, and that this rate was much lower than most of the other countries that we evaluated. Furthermore, ART in Romania only contributed 0.42% of the total births, compared to 1.87–5.16% in other European countries. Based on these findings, we conclude that it is important to develop a prospective and standardized database for ART procedures in Romania, and to consider increasing access to ART (e.g., via reimbursement) to help mitigate the population decline in Romania.

## INTRODUCTION

Romania faces significant demographic challenges, including a drastic population decline (a decrease of 12% in 2013, compared to 1992), a significant decline in fertility, and significant population aging.<sup>(1,2)</sup> Unfortunately, these issues are associated with long-term economic and social consequences, and public policies are needed to address individuals of various ages and motivate them to increase Romania's national natality.

Romania has a natality rate of 8.8 live births per 1,000 inhabitants and a fertility rate of 1.35 children per woman, although the Romanian natality rate is lower than the rates in other European Union countries that have adopted public policies to support families.<sup>(1,2)</sup> Therefore, the management of infertility via education and increased access to fertility treatments and assisted reproductive technologies (ART) should be considered integral parts of Romanian policies that are designed to improve demographic and reproductive characteristics. Furthermore, the systematic and standardized collection of data regarding ART procedures and outcomes would allow a broader analysis and relevant comparisons to other countries. Moreover, a standardized prospective electronic database is needed to generate coherent statistics that can be used to guide Romanian policies regarding reproductive issues.

Louise Brown was the first child to be conceived via in vitro fertilization (IVF), and was born in Great Britain during 1978. However, the first Romanian use of ART was during 1995, and the first IVF baby was born in February 1996. At that time, IVF in Romania was performed at only 3 public universities. However, based on the National Agency of Transplant (NAT) reports, there are currently 23 accredited Romanian centers (2 public and 21 private), which serve a population of approximately 20 million people.

## PURPOSE

Therefore, the primary objective of the present study

was to analyze ART data and outcomes from various European countries, as detailed in the most recent European Registry for Organs, Tissues and Cells (EUROCET) public report, and to interpret similar Romanian data, in order to provide a basis for improving national reimbursement and monitoring policies. We believe that the current monitoring and collection status of Romanian ART data indicates an immediate need for a prospective national registry of ART data, which should be harmonized with European ART and national demographic registries. Furthermore, having reliable and coherent data regarding ART in Romania would enable us to answer several important questions that are related to public policies:

- Can ART slow the declines in Romanian natality and fertility rates?
- Can Romania afford to continue not funding ART as a method for improving fertility rates?
- Is it time to change Romanian ART data collection policies to provide data that is harmonized with, and meets the standards of, European and international data?

## MATERIALS AND METHODS

This retrospective study evaluated ART data from 12 European countries that were included in the EUROCET Report (2012–2013). The Romanian data were collected between January 1 and December 31, 2013, while the data from the remaining 11 European countries were collected between January 1 and December 31, 2012. This discrepancy in the data collection periods is included in the official reports of EUROCET, and is driven by the reporting methodology of the Romanian NAT.

EUROCET is involved in the Vigilance and Surveillance of Substances of Human Origin project, and has developed connections with European Union competent authorities to establish a website where lists of the competent authorities, authorized tissue establishments, and activity data

<sup>1</sup>Corresponding author: Anca Coricovac, Str. Constantin Aricescu, Nr. 8, București, România, E-mail: acoricovac@gmail.com, Phone. +40722 879848

Article received on 13.08.2015 and accepted for publication on 22.01.2016

ACTA MEDICA TRANSILVANICA March 2016;21(1):104-108

are published and updated.(3)

In our analysis, we evaluated the national findings for countries that reported complete data regarding the types and number of ART procedures, the number of pregnancies after ART, the number of live births after ART, and the number of ART infants (all children born after ART cycles). The present study only evaluated ART procedures that were performed without the use of sperm or oocyte donors, in order to avoid the effects of national differences in donor regulation. Next, using our findings regarding the use of ART at a national level, we sought to empirically analyze the use and accessibility of ART in Romania, compared to that in other European countries, in the context of national reimbursement policies. Several rounds of qualitative analyses were performed to ensure that the data entry and statistical findings were accurate.

Data sources: 1. All data were obtained from the 2012 EURO CET Report regarding ART procedures (European Data on ART activities, Final Report 2012; <http://www.eurocet.org/>), the annual Romanian National Agency of Transplant report, or via the authors' calculations, which were based on these publically available sources; 2. Romanian National Institute of Statistics (number of children born in Romania during 2013); 3. EUROSTAT (statistical office of the European Union - <http://ec.europa.eu/eurostat/about/overview>) (population, number of women aged 15–49 years, number of children born in the countries, fertility rates, and natality rates). ART: assisted reproductive technologies, IVF: in vitro fertilization, ICSI: intracytoplasmic sperm injection, ET: embryo transfer.

## RESULTS

During 2013, the 23 Romanian clinics that were accredited for ART procedures performed 4,476 treatment cycles (table no. 1). The highest reported national ART use during 2012 in the other 11 countries was 138,305 cycles in 198 French clinics, which was followed by 83,540 cycles in 196 Italian clinics, and 59,345 cycles in 112 British clinics. Among the countries with lower national usage, 3 Slovenian clinics performed 4,298 cycles, 5 Lithuanian clinics performed 384 cycles, 1 Latvian clinic performed 780 cycles, and 1 clinic in Luxemburg performed 1,011 cycles. In Romania, 738 live births were attributed to ART procedures, while the number of ART-related live births in the other European countries ranged from 115 to 22,553. Regarding access to ART procedures in Romania, the data revealed that only 8 cycles of ART were accessed for every 10,000 women who were of reproductive age (table no. 2). In contrast, >90 cycles were accessed per 10,000 women of reproductive age in France (90.58 cycles per 10,000 women) and Slovenia (90.2 cycles per 10,000 women); these were approximately 10-fold higher than the access rate in Romania.

### 1. Accessibility of ART in Romania

The 4,476 treatment cycles that were performed by Romanian clinics included IVF, intracytoplasmic sperm injection (ICSI), frozen embryo transfer (FET), and intrauterine insemination (IUI). Among these procedures, >50% were ICSI and 23% were IUI. In the EURO CET data, the most procedures during 2012 were registered in France, with 198 clinics reporting 138,305 treatment cycles (39% IUI). Italian clinics performed 83,540 cycles (32% IUI), and British clinics performed 59,345 cycles (13% IUI). The number of ART procedures and the outcomes (expressed as the number of cycles and number of live births) are reported in table no. 1. When we analyzed the Romanian data, we observed that only 224 ART cycles were accessed per million inhabitants. In contrast, high access rates (>2 000 cycles per million inhabitants) were observed in France, Slovenia, and Luxemburg. However, Lithuania had the lowest access rate, with only 128 cycles per million inhabitants –

To eliminate any effect of national age differences, we also analyzed these data while only considering the number of women who were of reproductive age (15–49 years old) in each country (table no. 2). The trend towards a much lower access rate in Romania was still observed in this analysis, with only 0.82 women per 1 000 (0.82‰) accessing ART procedures. Furthermore, France, Slovenia, and Luxemburg had 10-fold higher access rates among women of reproductive age.

**Figure no. 1. Access to assisted reproductive technology treatments in Romania (2013) and various European countries (2012)**



When we analyzed the Romanian data, we observed that one live birth required an average of 7 ART cycles (including all IVF, ICSI, FET, and IUI procedures); the average number of IVF treatments per live birth was 2.7. The highest number of ART cycles per live birth was observed in Italy (8.5 cycles for all procedures), and the lowest number of ART cycles per live birth was observed in Slovenia (4.3 cycles for all procedures) (table no. 2). Unfortunately, this data did not contain the patients' ages, which precludes any age-related analysis. Furthermore, couples prefer multiple IUI procedures, which are less expensive (although also less successful), and this preference may have affected the age at which couples opted to undergo IVF (tables no. 2 and 3).

**Table no. 1. A summary of assisted reproductive technology use in Romania (2013) and various European countries (2012)**

Country	No. fertility clinics	No. of ART cycles	Procedure-specific rates				Total no. of ART infants	Procedure-specific rates				No. ART infants per 100 ART cycles
			IVF	ICSI	FET	IUI		IVF	ICSI	FET	IUI	
Bulgaria	N/A	9,696	697	5,479	956	2,564	2,088	210	1,427	209	242	22
Czech Republic	39	16,785	1,723	10,138	4,924	N/A	4,186	278	2,779	1,129	N/A	25
France	198	138,305	20,995	39,079	23,841	54,390	22,553	4,595	8,667	3,352	5,939	16
Croatia	8	4,874	1,310	2,050	11	1,503	831	269	447	28	87	17
Italy	196	83,540	7,397	42,690	6,513	26,940	11,720	1,374	7,302	888	2,156	14
Lithuania	5	384	59	14	10	301	115	38	21	3	53	N/A
Luxemburg	1	1,011	138	317	239	317	141	16	77	24	24	14
Latvia	1	780	113	329	242	96	158	24	92	34	8	20
Norway	10	8,350	2,922	2,867	2,046	515	1,979	743	744	442	50	24
Romania	23	4,476	626	2,305	514	1,031	738	285	278	58	117	16
Slovenia	3	4,298	1,093	1,695	823	687	1,133	362	531	184	56	26
Great Britain	112	59,345	17,692	23,570	10,605	7,478	15,234	5,314	7,376	2,544	N/A	26

All data were obtained from the 2012 EURO CET Report regarding ART procedures (European Data on ART activities, Final Report 2012; <http://www.eurocet.org/>), the annual Romanian National Agency of Transplant report, or via the authors' calculations, which were based on these publically available sources: Romanian National Institute of Statistics (number of children born in Romania during 2013) and EUROSTAT (statistical office of the European Union - <http://ec.europa.eu/eurostat/about/overview>) (population, number of women aged 15–49 years, number of children born in the countries, fertility rates, and natality rates). ART: assisted reproductive technologies, IVF: in vitro fertilization, ICSI: intracytoplasmic sperm injection, ET: embryo transfer

## CLINICAL ASPECTS

**Table no. 2. Accessibility and outcomes of assisted reproductive technology in Romania (2013) and various European countries (2012)**

Country	Population (million inhabitants)	Frequency of treatments (cycles per million inhabitants)	No. of women who were 15-49 years old (thousands)	Frequency of treatments (cycles per 1,000 women who were 15-49 years old)	Live births (deliveries) after ART	Average no. of cycles per live birth	Live births per 100 cycles of treatment	No. of ART infants	Total no. of children born alive	Proportion of ART infants to total children born in the country (%)	Nativity rate (no. of borne babies per 1,000 inhabitants)	Fertility rate (average no. of babies born during one woman's fertile period)
Bulgaria	7.3	1,328	1,624.9	5.97	1,844	5.3	19.0	2,088	69,121	3.02	9.5	1.50
Czech Republic	10.5	1,599	2,517.9	6.67	3,614	4.6	21.5	4,186	108,576	3.86	10.3	1.45
France	65.3	2,118	14,439.1	9.58	20,257	6.8	14.6	22,553	821,844	2.74	12.6	2.01
Croatia	4.3	1,133	1,040.3	4.69	835	5.8	17.1	831	41,771	1.99	9.8	1.51
Italy	59.4	1,406	14,236.8	5.87	9,876	8.5	11.8	11,720	534,186	2.19	9.0	1.43
Lithuania	3.0	128	882.0	0.44	88	4.4	22.9	115	30,459	0.38	10.2	1.60
Luxemburg	0.5	2,022	121.4	8.33	121	8.4	12.0	141	6,026	2.34	11.3	1.57
Latvia	2.0	390	538.6	1.45	135	5.8	17.3	158	19,897	0.79	9.8	1.44
Norway	5.0	1,670	1,162.9	7.18	1,772	4.7	21.2	1,979	60,255	3.28	12.0	1.85
Romania	20.0	224	5,494.4	0.82	625	7.2	14.0	738	176,013	0.42	8.8	1.35
Slovenia	2.1	2,047	467.1	9.20	1,007	4.3	23.4	1,133	21,938	5.16	10.7	1.58
Great Britain	63.5	935	14,627.7	4.06	13,053	4.5	22.0	15,243	812,970	1.87	12.8	1.92

EUROCET Report regarding ART procedures (European Data on ART activities, Final Report 2012; <http://www.eurocet.org/>), the annual Romanian National Agency of Transplant report, or via the authors' calculations, which were based on these publicly available sources: Romanian National Institute of Statistics (number of children born in Romania during 2013) and EUROSTAT (statistical office of the European Union - <http://ec.europa.eu/eurostat/about/overview>) (population, number of women aged 15-49 years, number of children born in the countries, fertility rates, and natality rates).

**Table no. 3. Live births and infants born via assisted reproductive technologies in Romania (2013) and various European countries (2012)**

Country	Total no. of ART cycles	No. of treated couples	Proportion of ART live births to no. of couples (%)	ART live births	Procedure-specific rates:				Total no. of ART infants	Procedure-specific rates:			
					IVF	ICSI	FET	IUI		IVF	ICSI	FET	IUI
Bulgaria	9,696	10,206	18.1	1,844	192	1,244	176	232	2,088	210	1,427	209	242
Czech Republic	16,785	N/A	N/A	3,614	240	2,403	962	N/A	4,186	278	2,779	1,129	N/A
France	138,305	N/A	N/A	20,257	4,030	7,607	3,140	5,480	22,553	4,595	8,667	3,352	5,939
Croatia	4,874	3,763	22.2	835	243	489	23	80	831	269	447	28	87
Italy	83,540	116,984	8.4	9,876	1,129	5,983	790	1,974	11,720	1,374	7,302	888	2,156
Lithuania	384	443	19.9	88	28	17	3	40	115	38	21	3	53
Luxemburg	1,011	715	16.9	121	14	62	22	23	141	16	77	24	24
Latvia	780	1,349	10.0	135	22	73	32	8	158	24	92	34	8
Norway	8,350	N/A	N/A	1,772	666	657	404	45	1,979	743	744	442	50
Romania	4,476	4,464	14.0	625	231	237	54	103	738	285	278	58	117
Slovenia	4,298	1,519	66.3	1,007	324	465	168	50	1,133	362	531	184	56
Great Britain	59,345	46,807	27.9	13,053	4,554	7,376	2,217	N/A	15,234	5,314	7,376	2,544	N/A

All data were obtained from the 2012 EUROCE Report regarding ART procedures (European Data on ART activities, Final Report 2012; <http://www.eurocet.org/>), the annual Romanian National Agency of Transplant report, or via the authors' calculations, which were based on these publicly available sources: Romanian National Institute of Statistics (number of children born in Romania during 2013) and EUROSTAT (statistical office of the European Union - <http://ec.europa.eu/eurostat/about/overview>) (population, number of women aged 15-49 years, number of children born in the countries, fertility rates, and natality rates). ART: assisted reproductive technologies, IVF: in vitro fertilization, ICSI: intracytoplasmic sperm injection, ET: embryo transfer.

**Table no. 4. Assisted reproductive technology use and outcomes in Romania during 2013 - summarizes the main findings regarding ART use in Romania during 2013**

Treatment	No. of treatment cycles	No. of couples treated	No. of clinical pregnancies	No. of ART live births	Clinical pregnancies per 100 cycles	Live births per 100 cycles (%)	Live births per 100 clinical pregnancies	ART infants per 100 cycles	ART live births per 100 couples	No. of ART infants	Proportion of ART infants to total children born (%)
IVF	626	979	395	231	63.1	36.9	58.5	45.5	23.6	285	0.16
ICSI	2,305	976	340	237	14.8	10.3	69.7	12.1	24.3	278	0.16
FET	514	605	150	54	34.3	10.5	36.0	11.3	8.9	58	0.03
IUI	1,031	1,904	139	103	13.5	10.0	74.1	11.3	5.4	117	0.07
ART with partner	4,476	4,464	1,024	625	23.3	14.0	61.0	16.5	14.0	738	0.42

All data were obtained from the 2012 EUROCE Report regarding ART procedures (European Data on ART activities, Final Report 2012; <http://www.eurocet.org/>), the annual Romanian National Agency of Transplant report, or via the authors' calculations, which were based on these publicly available sources: Romanian National Institute of Statistics (number of children born in Romania during 2013) and EUROSTAT (statistical office of the European Union - <http://ec.europa.eu/eurostat/about/overview>) (population, number of women aged 15-49 years, number of children born in the countries, fertility rates, and natality rates). ART: assisted reproductive technologies, IVF: in vitro fertilization, ICSI: intracytoplasmic sperm injection, ET: embryo transfer.

### 2. Outcomes of ART treatments in Romania

Based on the data in table no. 3, only 14% of infertile Romanian couples are expected to achieve a live birth via ART treatment. A lower rate was observed in Italy (8.4%), and noticeably higher rates were observed in Great Britain and

Slovenia (27.9% and 66.3%, respectively). Based on the data regarding natality and fertility rates among the countries that were studied, Romania registered the second lowest ART contribution, based on the proportion of ART infants to the total number of children born in each country (0.42%; 42 infants born

due to ART among every 10,000 children who were born in Romania) (table no. 2). In contrast, Slovenia (5.16%), Czech (3.86%), and Norway (3.28%) registered the greatest ART contribution to the total number of children born in each country. Those countries also reported increased access to ART procedures per 1,000 women of fertile age (table no. 2). Therefore, the difference between the contribution of ART in Romania (vs. those in other countries) may be related to the fact that the countries with high ART contributions also had relatively high ART access rates among women who were of reproductive age.

In a population of approximately 20 million inhabitants, which includes approximately 5.5 million women of reproductive age (15–49 years old), only 4,464 couples underwent 4,476 ART cycles (excluding cases with sperm donation). This is a relatively low access rate, with 0.82 cycles per 1,000 women who were of reproductive age, and only 224 cycles per million inhabitants. The most common ART procedure in Romania was ICSI, followed by IUI, IVF, and FET. However, in terms of efficiency, IVF and FET provided the highest rates for clinical pregnancies and live births per 100 cycles. Six of 10 clinical pregnancies resulted in live births after ART, and most children were born after IVF treatments (46 infants per 100 IVF cycles). In contrast, the other procedures only provided 11–12 infants per 100 cycles (table no. 1).

Throughout Europe, thousands of couples depend on ART treatments to achieve a pregnancy, although the pregnancy and live birth rates remain low, despite advances in technology, research, medical treatments for ovulation stimulation, and personalized treatments.(4,5) To address this issue, many countries invest significant resources in developing new technologies, as both the European Parliament and World Health Organization have recognized that infertility affects both public health and societal well-being.(4) Unfortunately, there are various methods for data collection in each country, which may partially explain the differences in the national fertility rates that we observed. Therefore, these discrepancies complicate the comparison and interpretation of national fertility statistics.(6) For example, several countries (e.g., Denmark and Germany) have developed their own reporting systems for ART data, using specific IVF registries. As these data are not included in the EUROCE report, it is difficult to compare the fertility rates for non-EUROCE countries to the countries that are included in the EUROCE report. Furthermore, the national differences may also be related to differences in the ability to access ART procedures, which is affected by reimbursement policies, and may also explain the different access rates for couples and various age groups. Therefore, it is likely that the low accessibility and utilization of ART treatments in Romania is closely related to their relatively high cost and the lack of financial reimbursement.

Despite these issues, a 2008 study has reported that ART procedures are rarely utilized throughout Europe, with the highest utilization rate (2 128 cycles per million inhabitants) being observed in Denmark.(7) Similarly, Belgium has a utilization rate of 1 847 cycles per million inhabitants, while Great Britain has a noticeably lower rate of 663 cycles per million inhabitants. However, another study has calculated that a global average of 1 500 additional cycles per million individuals is likely needed to counteract the increasing prevalence of health conditions and infertile couples that are actively seeking consultation and treatment.(8) Furthermore, approximately 4.2% of all live births in Scandinavian countries were conceived via IVF, although this proportion is only 1.6% in Great Britain.(4) Moreover, Germany has experienced a decreased from 2.6% to 1.6% after the introduction of more restrictive policies regarding

the financing of IVF treatments.

Romania is faced with the challenge of maintaining the demographic, social, and medical standards of the European Union members, and must also seek to align and harmonize their policies, practices, and medical services. Unfortunately, due to the decreasing and aging population (and the related long-term economic and social consequences), an increasing number of experts have suggested that various national strategies must be adopted to support families, including strategies that promote access to fertility treatments.

Along with postponing conception, increases in the prevalence of obesity and sexually transmitted diseases are important factors that affect infertility rates.(9) Thus, there is a constant demand for ART procedures, which is related to the current medical and social trends.(10,11,12,13,14) Based on this demand, the European Parliament passed a resolution (on February 21, 2008) that proclaimed the universal right of couples to access fertility treatments. In addition, the reimbursement of ART procedures as a part of national policy has been recognized as a cost-effective decision, and should be considered alongside other social and demographic support measures.(15,16) However, Romania has yet to adopt public policies or reimbursement to increase the accessibility of ART treatments, although ART procedures are becoming increasingly relevant in Romania, as they can facilitate procreation outside of sexual intercourse, via physician-administered treatments. Thus, the low accessibility and utilization of ART treatment in Romania is closely related to affordability and lack of financing, as clearly demonstrated by many studies.

## CONCLUSIONS

In the context of an aging population, and based on the discrepancy between Romania and the other European countries, ART may provide Romania with an opportunity to mitigate the population decline, as these techniques are a significant contributor to the total number of births in countries with modern healthcare systems and significant investments in fertility treatments. However, to achieve more accurate data collection in Romania, it is essential to develop a national registry for ART data, which should provide accurate and consistent data that is harmonized with the data from other European Union member states.

## Acknowledgement:

*This work was funded via the “FERTISET” project (Grant number: 1310/2015).*

## REFERENCES

1. Ghetau V. 2050: Will Romania's population fall below 16 million inhabitants? A prospective study on Romania's population in the 21st century. Romania: Romanian Academy, National Institute of Economic Research; 2004.
2. EUROSTAT (statistical office of the European Union) Retrieved from <http://ec.europa.eu/eurostat/about/overview>.
3. Mareri M, Filippetti M, Ghirardini A, Vespasiano F, Ciaccio PD, Nanni Costa A. The EUROCE Network: Support for Coding, Vigilance and Surveillance. *Transfus Med Hemother*. 2011;38(6):352-6.
4. Zegers-Hochschild F, Adamson GD, de Mouzon J, Ishihara O, Mansour R, Nygren K, et. al. International Committee for Monitoring Assisted Reproductive Technology; World Health Organization. The International Committee for Monitoring Assisted Reproductive Technology (ICMART) and the World Health Organization (WHO) Revised Glossary on ART Terminology, 2009. *Hum Reprod*. 2009;24(11):2683-7.
5. Blohm F, Friden B, Milsom I. A prospective longitudinal

- population-based study of clinical miscarriage in an urban Swedish population. *BJOG*. 2008;115(2):176-83.
6. Boivin J, Bunting L, Collins JA, Nygren KG. International estimates of infertility prevalence and treatment-seeking: potential need and demand for infertility medical care. *Hum Reprod*. 2007;22(6):1506-12.
  7. Andersen AN, Goossens V, Ferraretti S, Bhattacharya R, Felberbaum R, de Mouzon J, et.al . Assisted reproductive technology in Europe, 2004. Results generated from European registers by ESHRE. *Hum Reprod*. 2008;23(4):756-71.
  8. Collins J. An international survey of the health economics of IVF and ICSI. *Hum Reprod Update*. 2002;8(3):265-77.
  9. Low N, McCarthy A, Macleod J, Salisbury C, Campbell R, Roberts TE, et.al. Chlamydia Screening Studies Project Group. Epidemiological, social, diagnostic and economic evaluation of population screening for genital chlamydial infection. *Health Technol Assess*. 2007;11(8):iii-iv, ix-xii, 1-165
  10. Nygren KG, Andersen AN. Assisted reproductive technology in Europe, 1997. Results generated from European registers by ESHRE. European IVF-Monitoring Programme (EIM), for the European Society of Human Reproduction and Embryology (ESHRE). *Hum Reprod*. 2001;16(2):384-91.
  11. Nygren KG, Andersen AN. Assisted reproductive technology in Europe, 1999. Results generated from European registers by ESHRE. *Hum Reprod*. 2002;17(12):3260-74.
  12. Nyboe Andersen A, Gianaroli L, Nygren KG; European IVF-monitoring programme; European Society of Human Reproduction and Embryology. Assisted reproductive technology in Europe, 2000. Results generated from European registers by ESHRE. *Hum Reprod*. 2004;19(3):490-503.
  13. Nyboe Andersen A, Erb K. Register data on assisted reproductive technology (ART) in Europe including a detailed description of ART in Denmark. *Int J Androl*. 2006;29(1):12-6.
  14. Center for Disease Control and Prevention. Assisted reproductive technology success rates 2004. National summary and fertility clinic report. Atlanta (GA): US Department of Health and Human Services; 2006.
  15. Grant J, Hoorens S, Gallo F, Cave JA. Should ART Be Part of a Population Policy Mix? A Preliminary Assessment of the Demographic and Economic Impact of Assisted Reproductive Technologies. Cambridge (UK): RAND Europe, DB-507-FER, 2006. Available at: [http://rand.org/pubs/documented\\_briefings/2006/RAND\\_D B507.pdf](http://rand.org/pubs/documented_briefings/2006/RAND_D B507.pdf).
  16. Hoorens S, Gallo F, Cave JA, Grant JC. Can assisted reproductive technologies help to offset population ageing? An assessment of the demographic and economic impact of ART in Denmark and UK. *Hum Reprod*. 2007;22(9):2471-5.