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**PAULA KUIVASAARI-PIRINEN**

*The Pathway from Infertility to  
Motherhood through Assisted  
Reproductive Technology (ART)*

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*Dissertations in Health Sciences*



UNIVERSITY OF  
EASTERN FINLAND

PAULA KUIVASAARI-PIRINEN

*The pathway from infertility to motherhood  
through assisted reproductive technology  
(ART)*

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# List of the original publications

This dissertation is based on the following original publications, which are referred in the text by their Roman numerals I-V:

- I Kuivasaari P, Hippeläinen M, Anttila M, Heinonen S. Effect of endometriosis on IVF/ICSI outcome: stage III/IV endometriosis worsens cumulative pregnancy and live-born rates. *Human Reproduction* 20: 3130-3135, 2005.
- II Kuivasaari-Pirinen P, Hippeläinen M, Hakkarainen H, Randell K, Heinonen S. Cumulative baby take-home rate among women with PCOS treated by IVF. *Gynecological Endocrinology* 26: 582–589, 2010.
- III Raatikainen K, Kuivasaari-Pirinen P, Hippeläinen M, Heinonen S. Comparison of the pregnancy outcomes of subfertile women after infertility treatment and in naturally conceived pregnancies. *Human Reproduction* 27: 1162-1169, 2012.
- IV Kuivasaari-Pirinen P, Raatikainen K, Hippeläinen M, Heinonen S. Adverse Outcomes of IVF/ICSI Pregnancies Vary Depending on Aetiology of Infertility. *ISRN Obstetrics and Gynecology* 2012: Article ID 451915. Epub 2012 Apr 9.
- V Kuivasaari-Pirinen P, Hippeläinen M, Raatikainen K, Koivumaa-Honkanen H, Heinonen S. Outcome of assisted reproductive technology (ART) and subsequent self-reported life satisfaction. Submitted.

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The purpose of this study was to obtain more data for patient counselling. It was decided to investigate the effect of ART in those indications where the published data were controversial, i.e. among women with endometriosis (Somigliana et al. 2006) and among women with Polycystic ovary syndrome (PCOS) diagnosed via Rotterdam criteria, to whom ART is not the first line infertility therapy (Thessaloniki ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group 2008). The specific aim was to assess the cumulative live birth rates with women with tubal factor infertility as a control group. In addition, the risks of adverse pregnancy and neonatal outcomes among ART pregnancies were evaluated in women with different infertility etiologies. By comparing ART pregnancies with spontaneous pregnancies in women who had to wait more than two years before conceiving, it was hoped to determine whether ART treatment or infertility itself would be more crucial in contributing to the increased risks of adverse outcomes. There was also a questionnaire study that assessed the adjustment to infertility after unsuccessful ART and adjustment to motherhood after successful ART.







































































Table 8a. The route to parenthood after infertility treatment

Study	Study group	Time since ART	Conceived through ART or other infertility treatments, %	Spontaneous pregnancy, %	Adoption, %	Foster child, %	Step mother, %	Total proportion of women who lived with children after ART, %
Pinborg et al. 2009 Denmark	N=817 women who had started public infertility treatment	5 years	68	7	6	-	-	75
Sundby et al. 2007 Norway	n=66 women, who had undergone ART	10 years	47	15	15	10	3	82

ART = assisted reproductive technology

Some of the women had more than one solutions; e.g. had adopted and conceived spontaneously





### *3 Aims of the study*

The overall aim of this study was to gather information for counseling purposes be given to couples attending ART.

The specific aims were

1. to evaluate the success of ART among women with different stages of endometriosis and among PCOS women after unsuccessful ovulation induction by analyzing the cumulative live birth rate.
2. to estimate the risk of adverse obstetric and neonatal outcomes in ART pregnancies as compared with spontaneous pregnancies of subfertile women with at least two years' time to conceive and with spontaneous pregnancies in the general population with normal fertility. In addition, the effect of infertility's etiology on the risk of adverse obstetric and neonatal outcomes was evaluated.
3. to assess life satisfaction differences between women who had a live birth after ART and those who failed to conceive and how the time since the last unsuccessful ART associated with the scale of life satisfaction.















## *5 Results*

### **5.1 CHARACTERISTICS OF THE SUBJECTS**

In studies concerning ART outcomes (I and II), women with PCOS were younger and their BMI was higher than women with endometriosis or in comparison with the women with tubal factor infertility. On average, women who conceived through ART were older than women in the general population (study IV). However, no difference in the mean age was found between ART women and women with TTP > 2 years (study III). The detailed information is presented in Table 10.



## 5.2 ART OUTCOMES

The number of retrieved oocytes was significantly higher in women with PCOS than in the reference group, but between women with endometriosis and the reference group there were no differences. When all treatment cycles were pooled, ICSI was used in 68, 44, 27–37 and 34% of oocytes of the women with endometriosis stage I/II, stage III/IV, two reference groups of tubal factor patients, and women with PCOS, respectively. ICSI was used in cases when there were only minimal findings to explain infertility and women had previously failed to achieve pregnancy with the help of insemination, or just in case in severe endometriosis, or if the fertilization rate was low in previous IVF-cycles.

The mean number of transferred fresh embryos was 1.7 in the women with endometriosis and tubal factor infertility, with the corresponding figure being 1.5 in women with PCOS. Women with endometriosis had a significantly lower pregnancy rate than women in the reference group (tubal factor infertility). Nevertheless, when the women with endometriosis were subdivided into two subgroups according to the severity of the disease, the women with minimal to mild endometriosis had a comparable pregnancy rate with women in the reference group. However, if one took the more important endpoint, i.e. live birth rate, into account, there were no statistically significant differences detected between the groups. The women with endometriosis, especially those with stage III/IV, had a significantly lower miscarriage rate than women with tubal factor infertility. To summarize, 58.1% of all achieved pregnancies proceeded to live birth in the tubal factor group, while in women with minimal to mild endometriosis a total of 80% of pregnancies ended in delivery. The corresponding figure in women with moderate to severe endometriosis was 73.3% and in women with PCOS 68.4%. Table 11 presents detailed information of the four pooled cycles (oocyte retrieval).





among the women with a) endometriosis, b) male factor infertility or c) unexplained infertility, the incidence was higher than in the general population.

















































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## **LIFE SATISFACTION SCALE**

Response scores are presented in parentheses. The item responses “cannot say” were scored as 3. According to the total sum of scores, the subjects were categorized into the satisfied (LS score 4–6), the intermediate group (LS score 7–11) and the dissatisfied (12–20).

Do you feel that your life at present is

1. very interesting (1), fairly interesting (2), fairly boring (4) or very boring (5)?
2. very happy (1), fairly happy (2), fairly unhappy (4) or very unhappy (5)?
3. very easy (1), fairly easy (2), fairly hard (4) or very hard (5)?

Do you feel that at the present moment you are

4. very lonely (5), fairly lonely (4), or not at all lonely (1)?



**PAULA KUIVASAARI-PIRINEN**

*The Pathway from Infertility  
to Motherhood through  
Assisted Reproductive  
Technology (ART)*



Involuntary childlessness is a major crisis in life. Assisted reproductive technology (ART) is the most effective treatment for infertility. This thesis provides material for patient counselling. The cumulative live birth rate after ART in women with endometriosis and polycystic ovary syndrome was investigated. In addition, subfertile women's risk for adverse neonatal outcomes was evaluated in spontaneous pregnancies and pregnancies after ART. With the help of the Life Satisfaction scale, the adjustment to childlessness and motherhood was assessed.



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