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# Comparison of in vitro fertilization outcome in women with and without sonographic evidence of polycystic ovarian morphology

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**Abstract**

*Objective:* This study compared the outcome of in vitro fertilization (IVF) treatment in women who had polycystic ovaries (PCO) seen on an ultrasound scan, but who had no clinical symptomatology associated with polycystic ovary syndrome, with that of women who had normal ovarian morphology on ultrasound examination.
*Methods:* Outcome of IVF 39 women with PCO evidence by ultrasound compared with 102 women, who had normal ovarian morphology by ultrasound. All 141 women had normal early follicular phase serum follicle stimulating hormone (FSH) concentration, were less than 40 years of age and used the long protocol pituitary suppression with gonadotropin-releasing hormone agonist therapy.
*Results:* On average, the women with PCO produced more follicles and oocytes than the women with normal ovaries, but the fertilization cleavage and pregnancy rates were similar.
*Conclusion:* Although the response to follicular stimulation in PCO women is better than that for women with normal ovaries, the outcome of pregnancy in vitro fertilization is similar.


*Keywords:* In vitro fertilization; Outcome; Polycystic ovaries

## 1. Introduction

Polycystic ovarian syndrome (PCOS) is one of the main causes of ovulation disorder that it is defined as persistent anovulation with a spectrum of etiologies and clinical manifestation that now includes insulin resistance and hyperinsulinemia, as well as hyperandrogenism [1]. At one end of the spectrum of this disorder, there is a large group of women who manifest sonographic evidence of polycystic ovaries (PCO) but who do not have any clinical manifestation of the syndrome [2,3].

Several studies have shown the outcome of in vitro fertilization treatment in women with PCOS. The response of the polycystic ovarian syndrome women to ovulation induction differs significantly from that of normal ovaries. Several studies have described an increase in follicle production in patients with PCOS [4]. Some studies have shown that the pregnancy rate for women with PCOS undergoing in vitro fertilization (IVF) treatment is comparable with that of women with other causes of infertility [5–7]. Every one of these studies, however, has included women at the other end of the spectrum of the disorder, i.e., women with clinical or endocrine manifestations of the syndrome. There are few data on the outcome of IVF treatment in women who have PCO diagnosed on ultrasound but who do not have clinical manifestations of the syndrome.

The purpose of this study was to evaluate the outcome of IVF treatment in women with a variety of indications, who had sonographic evidence of PCO, but no clinical symptomatology associated with PCOS, compared with that of women who had normal ovarian morphology on pelvic ultrasonography.

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Table 1
Maturational status of the oocyte

| Maturational status | Cumulus | Corona | Germinal vesicle | Polar body | Classification |
|---|---|---|---|---|---|
| Meiosis I, prophase I | C | C | + | – | Immature (stage I) |
| Meiosis I, metaphase I | E | V | – | – | Intermediate (stage II) |
| Meiosis II, metaphase II | E | E | – | + | Mature (stage III) |

C: condensed, V: variable, E: expanded, +: present and –: absent.

## 2. Materials and methods

A case-control study was conducted using data and biologic specimens obtained as part of an infertility study of Fatemeh-Alzahra of Babol infertility center from October 2000 to November 2003. Only data from women undergoing IVF or intracytoplasmic sperm injection treatment for the first time who were less than 40 years of age and who had normal early follicular phase serum follicle stimulating hormone (FSH) concentration of <10 IU/l were included in the analyses. The couples had various cases of infertility, but all the female partners had regular menstrual cycle, no signs of obesity, or any symptoms of hyperandrogenism. Women whose male partners had severe male factor infertility (i.e., <500,000 spermatozoa, >90% abnormal spermatozoa) were offered ICSI.

All the women underwent transvaginal ultrasonography to assess uterine and ovarian morphology on day 2 or day 3 of the menstrual cycle, and they were then divided into two groups, depending on whether they had ultrasonic evidence of PCO. Polycystic ovarian syndrome was diagnosed if the ultrasound scan showed 10 or more cysts measuring 2–8 mm in diameter arranged peripherally around a dense core of stroma or scattered through an increased amount of stroma [8]. All the women used the standard long protocol of pituitary suppression with gonadotropin releasing hormone (GnRH) agonist followed by administration of urinary gonadotropin for ovarian stimulation [9].

The standard starting dose of urinary gonadotropins was 2–4 ampules (150–300 IU/l FSH activity)/day depending on the patient's age, basal serum FSH concentrations, and appearance of ovaries (the total number of basal antral follicles) [10]. As the patient's ovarian response is usually dependent on these three factors, we designed the following starting dose of gonadotropin for the protocol of the institute. Women who had one of this condition, age <35, or FSH <8 IU/l, or the number of follicle antral >10 were administered 2 ampules, and age>35 or FSH 8–10 IU/l or the follicle antral <10 were given 3 ampules. If women had two or three factors for poor response to ovaries, we started them on 4 ampules/day. This chosen initial daily dosage of gonadotropin was maintained until day 6. Transvaginal ultrasound was done at this time to determine follicular response. If no response had occurred by these measurements, the gonadotropin dosage was increased by 1–2 ampules/day every 3–4 days until a response was evident on ultrasound (or until maximum dosage was reached). The maximum dosage was 8 ampules per day [11]. Once an ovarian response was obtained, treatment typically was continued without a further increase in dose. With this protocol of controlled ovarian hyperstimulation, we did not have OHSS.

Transvaginal ultrasound was performed every 2 days to evaluate follicular size, number, and quality. When the largest measured follicle reached a maximum diameter of 18–19 mm or more, 10,000 IU of hCG was administered intramuscularly. Testing for pregnancy was performed about 15 or 16 days after hCG administration. A positive test of pregnancy was followed with an ultrasound to detect gestational sac at 5 weeks menstrual age. Clinical pregnancy was defined as positive serum human chorionic gonadotropin (hCG) test with ultrasonic evidence of a gestational sac. We followed the pregnant women every 2 weeks for 12 weeks.

As no reliable biochemical test of follicular fluid has been developed that can accurately and rapidly assess oocyte maturation status, most classification systems rely on direct visualization of maturational status, morphology of the oocyte, and appearance of companion cumulus oophorus and cornea radiata cells. We classified oocytes according to the criteria of Table 1.

Characteristics estimated at one point in time such as age, or cause of infertility and ovarian response, were summarized and compared using means, standard deviation and *t*-tests, or percentage distributions and $x^2$-tests, as appropriate. The effects of ovarian morphology on probability of fertilization and pregnancy were estimated using odds ratios (OR) by means of logistic regression analysis. Statistical significance was assessed using the likelihood ratio test.

## 3. Results

Of the original population of 239 women, after matching factors for age, cause of infertility, and duration of infertility [12,13], 141 women fulfilled the study criteria. They comprised 39 women with PCO and 102 women with normal ovaries. There were no significant differences

Table 2
Characteristics of women with polycystic ovaries (PCO) and normal ovaries

| Characteristics | PCO ($n$ = 39) | Normal ovaries ($n$ = 102) |
|---|---|---|
| Mean age in years (S.D.) | 26.5 (4.4) | 25.4 (5.2) |
| Mean duration of infertility in years (S.D.) | 5 (3.4) | 5.2 (3.6) |
| Cause of infertility male factor, $n$ (%) | 25 (64.1) | 85 (77.3) |

No significant difference in any result.