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## THE IMPACT OF ENDOCRINE INFERTILITY ON WOMEN'S REPRODUCTIVE HEALTH AND THEIR OUTCOMES OF IN VITRO FERTILIZATION

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**Relevance.** Infertility, remaining one of the most acute reproductive health problems, has been attracting the attention of specialists for several decades.

**The purpose of the study.** To identify the key factors influencing the probability of pregnancy in the in vitro fertilization program and successful full-term delivery in women with endocrine factor infertility.

**Materials and methods.** A prospective study examined 80 women aged 26 to 35 years. The main group included 42 women with endocrine disorders related to the lack of ovulation, and the comparison group included 38 women who had no problems with conception and applied for pre-pregnancy training. The examination of the patients was carried out according to a single scheme, including the analysis of complaints, medical history and underwent clinical, laboratory and instrumental examination in accordance with the Order of the Ministry of Health of the Russian Federation dated July 31, 2020 No. 803n "On the procedure for the use of assisted reproductive technologies, contraindications and restrictions to their use." Microsoft Excel XP and Statistica 6.0 software packages were used to analyze the information received. The statistical significance of the differences between the averages was assessed using the Student's parametric t-test.

**Results.** The age of the patients in both groups ranged from 26 to 35 years. The average age of the patients was 32,1 (1,4) years. All the studied patients, regardless of the group, worked, and every second had a higher education. Infertility duration of more than 10 years occurred in every fifth (8 (19,04%)). A decrease in the ovarian reserve of the main group in (10 (2,3%)) women who had a history of sexually transmitted infections. High frequency of early reproductive losses at 6–8 weeks of pregnancy in 10 (23,8%) women of the main group. Among extragenital diseases, the leading problem is overweight and obesity. Patients (n=42) of the main group underwent an in vitro fertilization (IVF) program. 32 women had a positive result of IVF infertility treatment, which is 76%. Pregnancy ended with an emergency delivery in 24 (75%) patients with endocrine factor infertility.

**Conclusions.** The key predictors of the success of ART programs are: the age of the patient is from 25 to 30 years. Body mass index (BMI) is 18,5 – 24,9 kg/m<sup>2</sup>. Decreased levels of estradiol and anti-Muller hormone indicate a decrease in ovarian reserve, and help predict the ovarian response to gonadotropin stimulation, but is not a predictor of pregnancy. The data obtained emphasize the need for earlier detection of endocrine pathology.

**Keywords.** *Infertility, in vitro fertilization, endocrine infertility.*

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**Relevance.** The problem of infertility remains relevant and has remained a key issue in the field of reproductive medicine for many years. 15-18% of couples face problems conceiving, which is why the WHO considers it both a medical and a social problem [1]. The International Committee for Monitoring Assisted Reproductive Technologies classifies infertility as a condition requiring a comprehensive approach to diagnosis and treatment [2]. According to Litvinova E.V. et al. (2024), the prevalence of infertility allows it to be considered a global public health problem [3].

Despite new scientific advances in reproduction and its widespread introduction into assisted reproductive technologies (ART), the overall effectiveness of ART does not exceed 35,5% on average [4].

**Purpose of the study.** To identify key factors influencing the likelihood of pregnancy in an in vitro fertilization program and successful full-term delivery in women with endocrine infertility.

**Materials and methods.** A prospective study examined 80 women aged 26 to 35 years. The main group included 42 women with endocrine disorders associated with ovulation failure, and the comparison group included 38 women who had no problems conceiving and who sought preconception care.

The patients were examined according to a uniform protocol, including an analysis of their complaints and medical history, and underwent clinical, laboratory, and instrumental examinations in accordance with Order No. 803n of the Russian Ministry of Health dated July 31, 2020, «On the Procedure for the Use of Assisted Reproductive Technologies, Contraindications, and Restrictions on Their Use.»

The main parameters chosen for analysis were: a decrease in progesterone levels in the second phase of the menstrual cycle, the IVF treatment method in the comparison group, and obstetric outcomes.

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Primary data was collected, analyzed, and systematized, and statistical processing was performed using parametric and nonparametric statistical tests. Microsoft Excel XP and Statistica 6.0 software packages were used to analyze the obtained information. The statistical significance of differences between mean values was assessed using the parametric Student's t-test. Primary data was collected, analyzed, and systematized, and statistical processing was performed using parametric and nonparametric statistical tests. Microsoft Excel XP and Statistica 6.0 software packages were used to analyze the obtained information. The statistical significance of differences between mean values was assessed using the parametric Student's t-test.

**Results.** The age of patients in both groups ranged from 26 to 35 years. The average age of patients was 32,1 (1,4) years.

All the patients studied, regardless of group, were employed, and every second one had a higher education.

High sexual activity is noteworthy. Early sexual experience (since adolescence) was reported by one in five patients (8 (19%)) in the study group, and one in four (10 (26%)) in the comparison group.

It should be noted that patients with an early onset of sexual activity more often had a history of sexually transmitted infections (STIs). Upon in-depth assessment of the anamnesis, sexually transmitted infections were detected in 8 (19,5%) women of the main group at the age of up to 21 years, in 4 (9,5%) from 22 to 30 years; in the comparison group, 2 (5,2%) and 4 (10,5%), respectively. In the main group, chlamydia – 6 (14,2%), trichomoniasis - 4 (9,5%), mycoplasma genitalium – 2 (4,7%), in the group in comparison, chlamydia – 2 (5,2%), trichomoniasis – 2 (5,2%), and mycoplasma genitalium – 2 (5,2%) were detected, respectively. It was established that the absolute decrease in the ovarian reserve of the main group was observed in women (10 (2,3%) who had a history of sexually transmitted infections. The results of our study are consistent with the data of Adamyan L.V. (2023), that such infections provoke changes leading to a decrease sensitivity of receptors to gonadotropins and as a result leads to a decrease in fertility [6]. According to V.E. Radzinsky (2017), with this pathology, there is impaired receptivity of the endometrium to hormones, which disrupts the processes of embryo implantation and its further development [7].

The number of unwanted pregnancies in women in the main group was reduced (3 (7,1%), compared to 5 (13,1%) in the comparison group), which ended in medical abortion.

Particular attention should be paid to the high frequency of early reproductive losses at 6–8 weeks of pregnancy, which occurred in 10 (23,8%) women. The leading cause was non-viable pregnancy (6 (60%)) and spontaneous miscarriage (4 (40%)). According to the histological conclusion of the abortion, the cause of non-viable pregnancy was a distorted follicular stage with a reduced estrogen stimulus, and therefore progesterone, accompanied by incomplete gravid restructuring of the endometrium, insufficient decidualization, endometrial hypoplasia, and endocrine disorders.

A period of unsuccessful conception attempts of up to 5 years with regular sexual activity without contraception was observed in 27 (64,2%) patients in the main group. A failure to conceive for 6–9 years was observed in 7 (16,6%) patients. Infertility lasting more than 10 years was observed in one in five (8 (19,04%)).

Among the gynecological diseases in women in the study group, endocrine menstrual disorders were the most common. One in four (23,8%) patients reported early menarche, and five (11,9%) reported menarche at age 17.

Menstrual cycle disorders such as hyperpolymenorrhea were detected in 8 (19,4%) of the observation group and 2 (5,2%) of the comparison group; oligomenorrhea in 18 (42,8%) and 2 (5,2%) of the comparison group, and dysmenorrhea in 12 (28,5%) and 20 (52,6%), respectively.

All women in the main group (100%) showed a decrease in progesterone levels.

Progesterone less than 10 ng/ml and anovulatory cycles (folliculometry was performed in several cycles) are characteristic of 20 (47,6%) patients, Progesterone less than 30 ng/ml in three consecutive cycles – 22 (52,3%), which is a luteal phase insufficiency.

According to the analysis of the criteria for diagnosing polycystic ovary syndrome (anovulation, ultrasound signs of polycystic ovarian structure according to ultrasound data, hyperandrogenism (clinical or biochemical)) it was detected in 15 (35,7%) of the main group.

In a more in-depth study, genital endometriosis was in second place, occurring in every fifth woman (9% (21,4%)), in the comparison group – 11% (28,9%).

An increase in the FSH level in the observation group of 10–24 mIU/ml – 6 (14,2%), in the comparison group was not detected. In every sixth patient in the observation group, FSH was elevated by 25 mIU/ml or more – 7 (16,6%), in the comparison group was not detected. In every second patient, the estradiol level was reduced to less than 30 pg/ml (21 (50,0%)), in the patients of the comparison group, the concentration of these hormones in the blood serum corresponded to physiological parameters.

In 7 (16,6%) patients of the main group, premature ovarian failure (POF) was diagnosed at the age of less than 40 years, with an increase in FSH levels of more than 25 IU/ml, confirmed by two tests, with an interval of 4–6 weeks.

Among extragenital diseases, overweight and obesity are the most common. A high prevalence of overweight and obesity was observed: 20 (47,7%) women in the study group and 12 (32,0%) in the comparison group. Normal body weight was observed in 22 (52,3%) women in the study group and 26 (68,0%) in the comparison group.

Patients (n=42) of the main group underwent an in vitro fertilization (IVF) program with an average gonadotropin dose of 1917 IU, the number of stimulation days was 10 (2,1) days. A positive result of infertility treatment by IVF was achieved in 32 women, which is 76%. Pregnancy ended in term delivery in 24 (75%) patients with endocrine factor infertility.

It is noteworthy that there was a high frequency of complications during pregnancy and somatic diseases: gestational diabetes mellitus in 8 (33%), latent iron deficiency anemia in 20 (83,3%), gestational arterial hypertension – 4 (16,6%), gestational pyelonephritis – 3 (12,5%), vaginitis, cervicitis – 18 (75%), threatened miscarriage – 24 (100%), threatened premature birth – 10 (29,4%), isthmic-cervical insufficiency, an obstetric pessary was inserted in all – 4 (16,6%), oligohydramnios – 6 (25%), fetoplacental insufficiency – 8 (33,3%), edema of pregnancy – 7 (29%). Pregnancy ended in premature birth at 34 weeks in one (4,1%) patient. Vaginal delivery occurred in 18 (75%) cases, and Caesarean section occurred in 6 (25%) cases.

Late miscarriage 1 (4,7%) at 16 weeks ended out of 32 positive results after the IVF program, according to the histological conclusion, the cause of termination of pregnancy according to histology was hematogenous infection.

A missed abortion occurred in 2 patients (6,2%) at 6–8 weeks, with curettage performed in the hospital.

Pregnancy did not occur in 10 women (23,8%) in the study group; 6 (25%) women were offered embryo transfer.

The full-term delivery rate in the observation group was 57%, while in the comparison group it was 94,7%. The overall pregnancy success rate was 76% versus 100%, respectively.

Histological reports indicate that the causes of pregnancy loss include decidualization insufficiency, endometrial hypoplasia, and endocrine disorders.

Women with a previous obstetric history had a higher live birth rate. Concomitant gynecological and endocrine conditions, such as endometriosis, uterine fibroids, and chronic inflammatory diseases, reduce a woman's fertility. Previous surgical procedures, such as tubectomies and ovarian surgeries, significantly reduce ovarian reserve and oocyte quality.

Duration of infertility – the highest live birth rate can be expected after one year, followed by a gradual decline up to 5 years, and then further decline thereafter.

**Conclusions.** Key predictors of ART program success include: patient age – the highest live birth rate is observed in women aged 25–30 years; body mass index – the highest chances of success were observed in the BMI range of 18,5–24,9 kg/m<sup>2</sup>; menstrual function – irregular menstrual cycles reduce the likelihood of pregnancy; and hormonal profile (FSH, AMH, estradiol) – decreased AMH and estradiol and increased FSH indicate decreased ovarian reserve and help predict ovarian response to gonadotropin stimulation, but are not a predictor of pregnancy. The data obtained highlight the need for earlier detection of endocrine pathology and optimized approaches to preparing such patients for IVF programs, including correction of metabolic disorders and hormonal imbalances.

## Literature

1. Lanzburg M.E., Krysanova T.V., Solovieva E.V. / Research of psychosomatic aspects of gynecological and andrological diseases and infertility: a review of modern foreign research // "Modern Foreign Psychology" 2016. Vol. 5. No. 2. – P. 67–77.

2. Litvinova E.V., Noskova O.V. / Infertility is a global medical and social problem of the world community // Mother and Child in Kuzbass. 2024. No. 3 (98). – P. 26–32.

3. Savostina G.V., Perminova S.G., Timofeeva A.V., Veyukova M.A. Modern methods for assessing the implantation potential of embryos in assisted reproductive technology programs // Doctor.Ru. 2021, No. 20(8). – pp. 12–18.

4. "Predictors of success after in vitro fertilization" (translation of a review article from the journal Fertility and Sterility). Original: Shingshetty L. et al. Predictors of success after in vitro fertilization // Fertility and Sterility. – 2024. – Vol. 121. – No. 5. – P. 742–751. DOI: 10.1016/j.fertnstert.2024.03.003. Authors of the article: Laxmi Shingshetty, Natalie J. Cameron, David J. McLernon, Siladitya Bhattacharya.

5. Adamyan L.V., Sibirskaya E.V., Sharkov S.M.5,6, Pivazyan L.G., Shapovalenko R.A., Zakaryan A.A. The impact of sexually transmitted infections on the reproductive health of adolescent girls. Russian Pediatric Journal. 2023; 26(5)<https://doi.org/10.46563/1560-9561-2023-26-5-376-382>

6. Radzinsky V.E., Petrov Yu.A. B., Polina M.L. Chronic endometritis: modern aspects. Kuban Scientific Medical Bulletin. 2017;24(5): 69-74. DOI: 10.25207/1608-6228-2017-24-5-69-74