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# The Consequences of In vitro Fertilization Treatment

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# Abstract

Infertility as a disease of the reproductive system is the inability to become pregnant after 12 months of intercourse without contraception using no birth control methods. In vitro Fertilization (IVF) as a form of Assisted Reproductive Technology (ART) and the most effective intervention is used to treat infertility issues with the joining of a woman's egg and a man's sperm outside the body, in a laboratory. There are several steps including hormonal stimulation, egg retrieval, insemination, fertilization, embryo culture, and embryo transfer to the woman's body. If the chance of fertilization is low, in Intra Cytoplasmic Sperm Injection (ICSI) procedure the sperm is directly injected into the cytoplasm of an egg. IVF as a breakthrough in the treatment of infertility provides the best opportunity of having a child using their own eggs. IVF can be more successful than other forms of ART such as Intrauterine Insemination (IUI) method. Although the procedure of IVF has many advantages for a couple who would be unable to have a baby, it has some disadvantages. The review aims to update the potential impact and risks at different times in the IVF process.

**Keywords**: Infertility; *In vitro* fertilization; Pregnancy; Embryo culture; Advantages; Disadvantages

## Introduction

Infertility as a disease of the reproductive system is biological inability to achieve pregnancy after 12 months or more of unprotected intercourse [1]. The development of *In vitro* Fertilization (IVF) improved the management of female infertility and used to overcome reproductive problems [2,3]. IVF is a complex series of procedures used to treat infertility issues or prevent genetic disorders [4,5]. IVF as a form of Assisted Reproductive Technology (ART) and a major breakthrough in embryo transfer is the joining of a woman's egg and a man's sperm outside the body, *in vitro* "in glass" [6]. In 1978, the first 'IVF baby' was born using natural IVF by Louise Brown [7]. Since then, IVF outcomes improved and provided large numbers of women the possibility of becoming pregnant and increased their chances [8,9]. In traditional IVF, 50,000 or more swimming

sperm are placed next to the egg in an environmentally controlled chamber in a laboratory [10]. Fertilization is the process in which one of the sperm is placed next to the egg to form a diploid cell, known as zygote [11,12].

In the IVF, there are several steps including hormonal stimulation or superovulation with exogenous gonadotropins or similar substances to release more than one healthy egg in a month, egg retrieval or follicular aspiration after a minor surgery, In vitro Maturation (IVM) of gametes, insemination or inserting the highest quality sperm with the best quality eggs, fertilization, embryo culture or cleavage-stage embryos, preimplantation genetic diagnosis, and embryo transfer to the woman's uterus [13,14]. If the chance of fertilization is low, in Intra Cytoplasmic Sperm Injection (ICSI) procedure the sperm being directly injected into the cytoplasm of an egg with a micropipette to promote fertilization [15,16]. After traditional IVF or ICSI, once sperm-egg fusion happens, the fertilized egg or an embryo is cultured for 2-6 days and transferred to the same or another woman's womb [17,18] (Figure 1). After fertility treatment, at the same time, more than one embryo may be put into the uterus of a female [19]. Embryo Transfer (ET) number is dependent on the various variables such as maternal age and egg quality and fertility [20]. Although the procedure of IVF has many advantages for a couple who would be unable to have a baby, it has some disadvantages. This review aims to update the potential impact and risks at different times in the IVF process.

## **Literature Review**

With the advent of ART, IVF as a breakthrough in the treatment of infertility provides the best opportunity of having a child using their own eggs [21]. The advantage of IVF is achieving a successful pregnancy in women with blocked or damaged fallopian tubes, in unexplained or undiagnosed infertility, management for women with cancer, women with menopause or premature ovarian failure, women with endometriosis, patients with Polycystic Ovary Syndrome (PCOS), and patients with a low ovarian reserve or people who would be unable to bear a child [22,23]. Male factor infertility will exhibit a much higher chance of the live birth IVF success rate than in other cases of IVF [24,25]. IVF can be more successful than other forms of ART such as Intrauterine Insemination (IUI) method

that involves putting sperm directly into a woman's cervix, fallopian tubes, or uterus to facilitate fertilization [26,27]. IUI can be a useful option for single women and same couples to become parents. If IUI has not been successful, IVF with donor sperm can provide a great opportunity for helping couples who wish to have a child [28-30]. IVF with fewer drugs can decrease the risk of side effects in some patients who are at high risk for Ovarian Hyper Stimulation Syndrome (OHSS) [31-33]. IVF with Pre-implantation Genetic Diagnosis (PGD) and Pre-implantation Genetic Screening (PGS) can also help to find out fertilization problems and inherited diseases such as cystic fibrosis, Huntington's Disease (HD), Down's syndrome, and muscular dystrophy to improve the chances of a successful outcome [34,35]. With the permission of the biological parents, unused embryos can be donated for human Embryonic Stem Cell (hESC) research, or to help other people who would be unable to have a baby [36-40]. Therefore, IVF is the most powerful fertility treatment available that can help couples overcome various types of infertility and give patients a good chance of success (Figure 1).



Figure 1: Step by step IVF treatment procedure.

In the IVF, there are several steps including hormonal stimulation to release more than one healthy egg in a month, putting a needle through vaginal wall and into the ovary for egg retrieval, insemination or inserting the highest quality sperm with the best quality eggs, fertilization, embryo culture and embryo transfer to the woman's womb [41]. If the chance of

fertilization is low, in Intra Cytoplasmic Sperm Injection (ICSI) procedure the sperm is directly injected into the cytoplasm of an egg with a micropipette to promote fertilization (**Figure 2**).



#### Discussion

Multiple variables such as the economic and political environment of the country, the education and reproductive health care level, and medical-care equipment at the hospital can be important to accessing IVF treatment [42]. Despite the development of IVF more than 30 years ago, the cost as an important element and a barrier to accessing IVF treatment remains high. IVF is an expensive treatment in most parts of the world. The average cost of one fresh IVF cycle in the United States costs around \$12,000. If patients require further ART, the cost will be higher as much as \$15,000 via private funding. IVF treatment in the United Kingdom and Australia costs per IVF/ICSI cycles is around \$5,000-6,000 that is available in a range of prices [43]. IVF in developing countries is limited to people who can afford the cost involved. In resource-poor countries, a large majority of the population cannot afford infertility treatment; because the insurance company only covered fertility diagnosis, not treatment. In recent years, there has been growing interest in finding strategies to enhance the level of mother care in lowresource countries [44,45].

Therefore, the development of low-cost and cost-effective IVF treatment is urgent in areas with limited resources. Public funding (full, partial) and the provision of health insurance for IVF treatment can remove the remaining barrier to IVF by covering fertility care or egg-freezing [46]. There are several strategies to reduce cost in IVF including simplifying diagnostics methods, decreasing the cost of ovarian stimulation, reducing fertility drug levels, simplifying the IVF procedures, and decreasing the need for sophisticated IVF related equipment in the laboratory. Research has shown that IVF is not an effective treatment due to reproductive aging and has low success rates less than 20% per cycle in women 40 and beyond [47]. So, these patients by using their own oocytes do not benefit from ART procedures. Although IVF side effects will vary depending upon the patient, multi-fetal pregnancy or the risk of multiple births should be considered as an adverse effect of IVF for infertility treatment. Therefore, critical attention would be necessary to improve treatment fertilization problems.

### Conclusion

To date, IVF has increased the treatment of infertility and used to overcome reproductive problems or prevent genetic disorders. Several basic issues and interventions need to be elucidated to facilitate effective IVF treatment, especially for individuals of lower socioeconomic backgrounds who cannot afford many of the health care. IVF, unlike other medical procedures, is still too expensive for most and the management of each condition presents many challenges.

# **Declaration of Interest**

The authors declare no conflict of interest.

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