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# What Influences Rate of Success of In - Vitro Fertilisation?

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**Abstract:** ***The rate of infertility in humans has peeked. More and more people are seeking IVF treatment due to their inability to conceive. As the numbers of IVF increase, we intend to inform you about the possible ways in which IVF could be made further successful. These include age, previous pregnancies, the kind of infertility you suffer from, lifestyle etc.***

**Keywords:** Invitro fertilisation abbreviated as IVF, Infertility, Egg cell (the ovum)

## 1. Introduction

Every year the rate of Infertility is increasingby 5% to 10%, due to unhealthy lifestyle choices like: excessive alcohol consumption, smoking, malnutrition, lack of exercise, stress etc. With increasing infertility, people turn to invitro fertilisation to help them conceive their own child.

IVF is performed when a woman has trouble conceiving due to multiple reasons like advance age, damaged or blocked fallopian tubes to treat infertility. IVF involves combining eggs and sperm outside the body in a laboratory. Once an embryo or embryos form, they are then placed in the uterus. IVF is a complex and expensive procedure; only about 5% of couples with infertility seek it out. [1] However, since its introduction in the U. S. in 1981, IVF and other similar techniques have resulted in more than 2, 00, 000 babies. Although the success rate, in terms of successful pregnancies, has an of 27.3% chance of conceiving (higher or lower depending on the age of the woman) which is quite low, bearing their own child is a commonly chosen option by couples.


**Figure 1:** Decrease in infertility rate

There are multiple factors that influence the success rate of IVF, if these factors are kept in mind, the success rate of IVF will increase or decrease depending on its influence, which is why it is important to consider all aspects before choosing IVF.

## 2. Literature Survey

IVF is a laboratory procedure in which sperm and egg are fertilized outside the body; the term “in vitro” is Latin for “in glass.” This treatment was introduced by Patrick Steptoe and Robert Edwards in the 1970s to treat female infertility caused by damaged or blocked fallopian tubes. This greatly influenced the way we look at fertility issues, it opened new

doors towards creating families. It let women who cannot conceive, have children. Although the chances of the embryo surviving till birth are quite low, it still gave couples hope.

IVF also gave homosexual couples the chance to have a child that is 50 theirs, genetically. It created a deep emotion boding of the couple with the child. IVF has had much success since its the late nineteen hundred due to its introduction in mainstream media.

[2] By 1986, over 1, 000 children were born via IVF. The 40 - year journey of developing IVF brought the challenge of infertility into public conversation and changed millions of lives around the world. This journey was perceived as a miracle in the 20th century and is still delivering remarkable results. Louise Joy Brown (born 25 July 1978) is an English woman who was the first human to have been born after conception by in vitro fertilisation experiment (IVF). Her birth, following a procedure pioneered in Britain, has been lauded among "the most remarkable medical breakthroughs of the 20th Century".


Evening News

Meet Louise, the world's first test-tube arrival

SUPERBABE

Wide-eyed Louise Brown pictured in hospital 18 hours after she was born. Today she's doing well. See Page Three

**Figure 2:** First test tube baby

**1) How does the female reproductive system work?**

The female reproductive system is mainly present for the use of reproduction. The reproductive cell is called the ovum or simply the egg cell. It is the size as the full stop at the end of this sentence. A female baby is born with all the eggs that she will ever have. These eggs mature in the ovaries during puberty around ages 10 - 14. This is when the egg cells are released roughly once a month from alternating ovary. This travels out the ovary and moves down the fallopian tube or the oviduct. Here is where fertilisation occurs if there is presence of sperm cells which are deposited up the vaginal tract during sexual activities. The uterus is where the female body hosts a foetus in case of pregnancy. The nuclei of the egg cell and the sperm cell fuse to form a zygote, this zygote embeds in the uterus to form a ball of cells called the embryo that turns into a foetus. This process takes roughly 9 months.

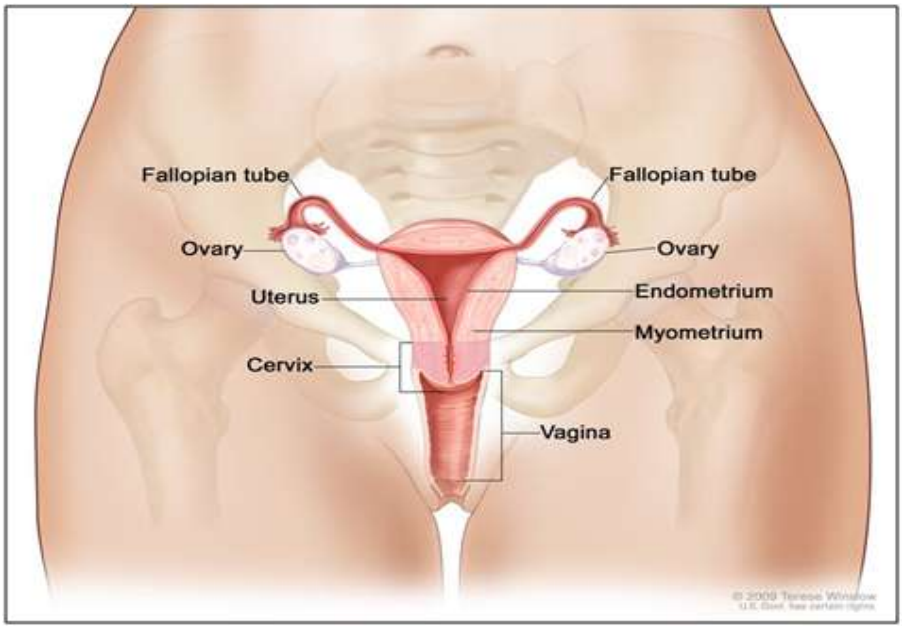



**Figure 3:** Female Reproductive System

During most cases, sex is more of a physical or psychological need rather than to conceive a child. In most societies the "sex talk' is a taboo due to its predominantly private nature according to outdated social norms but it is no more than a normal human need just like oxygen. *"Sex is the driving force on the planet. We should embrace it, not see it as the enemy, " said Hugh Hefner in a 2007 interview with Esquire.* Lucky for us, the recent generation of children have identified the taboo as threat and are making an effort to make a sex friendly environment by promoting female exploration, anti - sex shaming and pro - sex educational rights.

**2) What is infertility?**

The traditional Googled definition of infertility is "The act of not getting pregnant, despite having carefully timed, unprotected sex for one year. The cause of infertility may be difficult to determine but may include inadequate levels of certain hormones in both men and women, and trouble with ovulation in women. The main symptom is an inability to get pregnant. In many cases, there are no additional symptoms. Many treatments significantly improve the chances of getting pregnant. They include hormone treatments, fertility drugs and surgery. In addition, assisted reproduction uses various medical techniques to fertilise an egg.

Why do we define infertility as "having unprotected sex for one year"? [3] Most couples (approximately 85%) will achieve pregnancy within one year of trying, with the greatest likelihood of conception occurring during the earlier months. Only an additional 7% of couples will conceive in the second year. As a result, infertility has come to be defined as the inability to conceive within 12 months.

[4] Most of the pregnancies occur in the first six cycles with intercourse in the fertile phase (80%). After that, serious **subfertility (a delay in conceiving)** must be assumed in every second couple (10%) although—after 12 unsuccessful cycles—untreated live birth rates among them will reach nearly 55% in the next 36 months. Thereafter (48 months), 5% of the couples are definitive infertile with a nearly zero chance of becoming spontaneously pregnant in the future.

### 2.1 Subfertility vs infertility in 2 sentences

[5] Infertility is defined as trying to become pregnant for **a year**, with properly timed sexual intercourse (during the most fertile phase of a woman's menstrual cycle), without success. By contrast, the term subfertility describes a prolonged time span of trying to become pregnant (or an extended period of unwanted non conception) that **hasn't reached a year.**

## 3. Factors that Influence Infertility

Infertility is caused due to multitude of reasons; the clinical ones are explained below but the non - clinical causes include:

- **Age:** The quality and quantity of a woman's eggs begin to decline with increasing age. In the mid - 30s, the rate of follicle loss speeds, resulting in fewer and poorer quality eggs. This makes conception more difficult and increases the risk of miscarriage.
- **Smoking:** Besides damaging your cervix and fallopian tubes, smoking increases your risk of miscarriage and ectopic pregnancy (explained further). It's also thought to age your ovaries and deplete your eggs prematurely. Stop smoking before beginning fertility treatment.
- **Weight:** Being overweight or significantly underweight may affect normal ovulation. Getting to a healthy body mass index (BMI) may increase the frequency of ovulation and likelihood of pregnancy.
- **Sexual history:** Sexually transmitted infections such as chlamydia and gonorrhoea can damage the fallopian tubes. Having unprotected intercourse with multiple partners increases your risk of a sexually transmitted infection that may cause fertility problems later.
- **Alcohol:** Stick to moderate alcohol consumption of no more than one alcoholic drink per day.
- **Previous Pregnancy:** Couples are more likely to get pregnant if they have previously achieved a pregnancy together (irrespective of whether or not that pregnancy resulted in the birth of a baby) compared to couples that have never been pregnant.

### 3.1 Ovulation disorders

Ovulation is the realise of the egg cell from an ovum. Ovulation disorders, means ovulation occurs infrequently or not at all, it accounts for infertility in about 1 in 4 infertile couples. This could be due to problems with the regulation of reproductive hormones by the hypothalamus or the pituitary gland, or problems in the ovary, can cause ovulation disorders.

- **Polycystic ovary syndrome (PCOS)** is a condition that affects a woman's hormone levels. Women with PCOS produce higher - than - normal amounts of male hormones (e. g., Testosterone). This hormone imbalance causes their body to skip menstrual periods and makes it harder for them to get pregnant. PCOS is associated with insulin resistance and obesity, abnormal hair growth on the face or body, and acne. It's the most common cause of female infertility.
- **Hypothalamic dysfunction** is a problem with part of the brain called the hypothalamus. The hypothalamus helps control the pituitary gland and regulates many body functions. Two hormones produced by the pituitary gland are responsible for stimulating ovulation each month — follicle - stimulating hormone (FSH) and luteinizing hormone (LH). Excess physical or emotional stress, a very high or very low body weight, or a recent substantial weight gain or loss can disrupt production of these hormones and affect ovulation. Irregular or absent periods are the most common signs.
- **Premature ovarian failure**. Also called primary ovarian insufficiency, this disorder is usually caused by an autoimmune response or by premature loss of eggs from your ovary (possibly from genetics or chemotherapy). The ovary no longer produces eggs, and it lowers oestrogen production in women under the age of 40.
- **Too much prolactin.** The pituitary gland may cause excess production of prolactin (hyperprolactinemia), which reduces oestrogen production and may cause

infertility. Usually related to a pituitary gland problem, this can also be caused by medications you're taking for another disease.

Damaged or blocked fallopian tubes keep sperm from getting to the egg or block the passage of the fertilized egg into the uterus. Causes of fallopian tube damage or blockage can include:

- **Pelvic inflammatory disease,** an infection of the uterus and fallopian tubes due to chlamydia, gonorrhoea or other sexually transmitted infections.
- **Previous surgery in the abdomen or pelvis**, including surgery for ectopic pregnancy (a fertilized egg grows outside a woman's uterus, somewhere else in their belly. It can cause life - threatening bleeding) which a fertilized egg implants and develops in a fallopian tube instead of the uterus

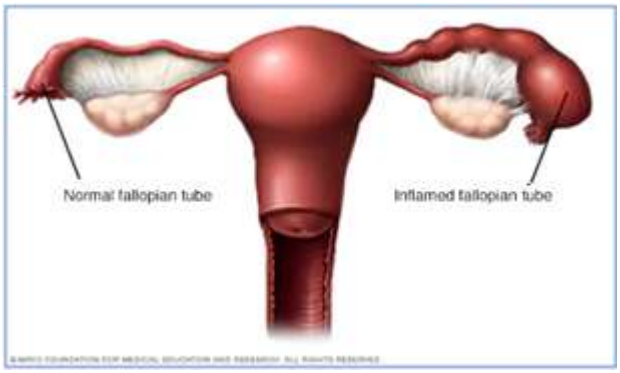



**Figure 4:** Inflamed fallopian tube

- **Pelvic tuberculosis** is a rare and often difficult disease to diagnose which can present with features that are indistinguishable from ovarian malignancy such as abdominal pain, ascites, and pelvic mass.

Endometriosis occurs when tissue that normally grows in the uterus implants and grows in other locations. This extra tissue growth — and the surgical removal of it — can cause scarring, which may block fallopian tubes and keep an egg and sperm from uniting. Endometriosis can also affect the lining of the uterus, disrupting implantation of the fertilized egg. The condition also seems to affect fertility in less - direct ways, such as damage to the sperm or egg.

### 3.2 Uterine or cervical causes

Several uterine or cervical causes can impact fertility by interfering with implantation or increasing the likelihood of a miscarriage:

- Benign polyps or tumours (fibroids or myomas) are common in the uterus. Some can block fallopian tubes or interfere with implantation, affecting fertility. However, many women who have fibroids or polyps do become pregnant.
- Endometriosis scarring or inflammation within the uterus can disrupt implantation.
- Uterine abnormalities present from birth, such as an abnormally shaped uterus, can cause problems becoming or remaining pregnant.
- Cervical stenosis, a narrowing of the cervix, can be caused by an inherited malformation or damage to the cervix.
- Sometimes the cervix can't produce the best type of mucus to allow the sperm to travel through the cervix into the uterus.

## 4. How is IVF conducted? [6], [7]

In vitro fertilization (IVF) is the most effective, commonly performed, and final infertility treatment in the world. It is a complex series of procedures used to help with fertility or prevent genetic problems and assist with the conception of a child. In vitro - means in a glassware in Latin. Hence, IVF involves combining eggs (female gamete or sex cell) and sperm (male gamete or sex cell) outside the body in a laboratory glass ware. The usual standardised procedure occurs as so:


**Figure 5:** IVF

1) Before IVF, an evaluation of the uterus and fallopian tubes occurs to make sure there are no issues that require surgical repair. Pre - cycle testing includes hormonal evaluation to assess thyroid function and ovarian reserve, screening both partners for sexually transmitted infection, and a semen analysis of the male partner.
2) Most women will take fertility drugs for ovarian stimulation for 8 - 14 days; the average is 10 - 11 days. Ovarian stimulation is used to mature multiple eggs for egg retrieval. Even if ovulation is normal, fertility drugs are used to produce more than a single egg because pregnancy rates are higher with more eggs. An average of 10 – 20 eggs are usually retrieved for IVF. However, not all of them are viable to use as on average only about two - thirds have the appropriate maturity. There may be regular ultrasounds or blood tests to measure your hormone levels and keep track of your egg production.
3) Once an ultrasound determines that there area sufficient number of large enough follicles and your oestrogen level is at the right level, you'll receive a trigger shot of hCG or other medication. This replaces the natural luteinizing hormone surge a woman has that spurs the final stage of egg maturation, so eggs are capable of being fertilized.
4) Next is Egg Retrieval - Thirty - four to thirty - six hours after receiving the trigger shot – before the eggs ovulate a surgical procedure to removes the eggs from follicles in your ovaries. For this egg retrieval procedure, an ultrasound is used to visually guide a small needle through the top of the vagina into one ovary and then the other. The needle is connected to a suction device that gently pulls the eggs out of each follicle along with fluid. There shouldn't be any pain or discomfort during the process as the patient will be under sedation through an IV while closely monitored by an anaesthesiologist. The entire process usually takes less than 30 minutes.
5) The fluid from the follicles – that contains the egg – is suctioned by the IVF physician through small tubing and into a test tube. The test tube is then handed to an embryologist who uses a microscope to find the egg in each test tube of follicular fluid. All the details of the eggs are carefully recorded. **The number of eggs produced and removed are influenced by a patient's age, ovarian reserve, response to ovarian stimulation and, occasionally, the ability to access the ovaries with the needle.**
6) Fertilisation - Mature eggs are transferred into a special culture medium, placed in an incubator and within a few hours of egg retrieval are fertilized with sperm. The eggs are mixed with sperm cells from the partner or a donor — this is called insemination. The eggs and sperm are stored together in a special container, and fertilization happens. there are two ways to fertilize an egg: conventional insemination or intra - cytoplasmic injection (ICSI). Which process is used will be determined by the IVF team (physicians and embryologists) and depends on multiple factors related to the couple going through IVF. Both methods have approximately the same success rate.
7) Following fertilization, the IVF team and the couple determine exactly when embryo transfer will take place – anywhere between 1 and 6 days but usually 3 - 5 days after egg retrieval. However, if the decision is made to do genetic testing, first a biopsy is taken from the embryo, almost always on culture day 5 or 6. Usually 3 to 8 cells are sent for testing performed at an outside lab, while the embryos are frozen and remain in the IVF laboratory. After receiving the genetic test results, the selected embryo is chosen, thawed, and transferred into the uterus, usually within 1 to 2 months after the egg retrieval.
8) Embryo Transfer - A soft, flexible, and thin catheter is used to transfer the embryo into the uterus. An abdominal ultrasound is used to make sure that the tip of the catheter places the embryo at the best location for the embryo to implant. Pain and discomfort are rare, and the experience has been compared to how it feels to get a pap smear. Good embryos not used for transfer are usually frozen in case the cycle is not successful or a couple wants more children following a successful first cycle.
9) Hopefully, the development of the embryo continues in the uterus and the embryo hatches and implants in the uterine lining within 1 - 2 days following embryo transfer
   Assisted Hatching - Sometimes an additional process is used to provide further help for older women, for couples who have previously been unsuccessful with IVF or with frozen/thawed embryos. Assisted hatching is a **micromanipulation** procedure where a hole is made in the flexible shell that surrounds the cells of the early embryo. Normally, this membrane dissolves on its own since this is necessary for embryo implantation. This extra process has **not** been demonstrated definitively to improve live birth rates and there may be very minor risks involved. Also, there is no evidence that it improves pregnancy or live birth rates for other types of IVF patients. Assisted hatching, if performed, is done just prior to embryo transfer.
10) About 12 days after an embryo transfer, a blood pregnancy test will be taken. If a pregnancy is confirmed, you'll be followed with blood tests and eventually, ultrasounds, to confirm viability and whether there's a multiple pregnancy. If the pregnancy appears normal at 9 - 10 weeks, the obstetrician does the further process.

Most women typically see success rates of 20 - 35% per cycle, but the likelihood of getting pregnant decreases with each successive round, while the cost increases. The cumulative effect of three full cycles of IVF increases the chances of a successful pregnancy to 45 - 53%.

## 5. What maximises the chances of a successful IVF?

It is a fact that a healthy lifestyle is always a benefactor. The majority of success rate of IVF depends on lifestyle choices such as:

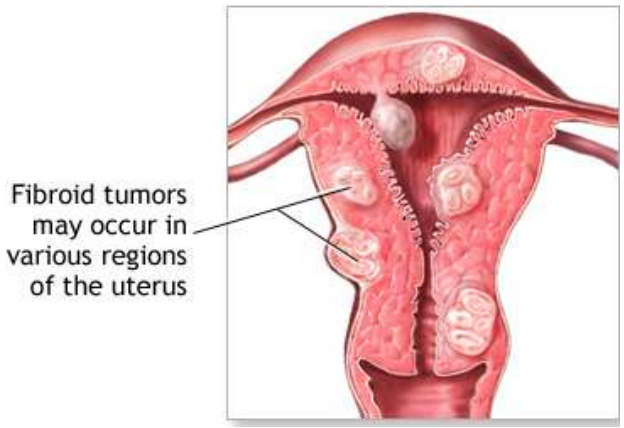
- Smoking causes the female reproductive tract to slowly deteriorate along with early onset of aging of the ovaries

and uteruses become less receptive. [8]Previously it has been shown that smoking can affect the outcome of IVF/ICSI treatments **negatively**. It can lead to reduced fertilization rates, pregnancy rates (PR) and live birth rates as well as to significantly higher chances of miscarriages or ectopic pregnancies. Smokers' chances of implantation are 50% lower than non - smokers. Hence, quitting smoking is always a good idea.

- Overweight and is associated with lower chances of pregnancy using in vitro fertilization (IVF) adversely affects IVF outcomes in women with poor ovarian response. Obesity can change how the body processes fertility medications and hormones and can affect the menstrual cycle and ovulation. It can also make it more difficult to carry a baby to term.

There are further many factors can affect the success rate of IVF:

- Previous Pregnancy: A couple who have had a successful pregnancy in the past indicates a better/higher chance of a positive pregnancy with in vitro fertilization. On the other hand, a medical history of multiple miscarriages and fertility - related issues could mean a more difficult IVF as itindicates that the infertility challenge faced is not one that responds well to IVF.
- Age – From 24 to 34, women have the highest chances of success with IVF treatment (32.2%) because this is the age range when women are most fertile. By the time a woman reaches age 40, success rates drop to around 13.6%. Women in every stage of reproductive life have been able to successfully use IVF. Although, success rates drop with age, you should still explore IVF options, as the success of treatment is highly dependent on your unique body and medical history. Women's increased age reduces fertility; however, this fact does not apply to men, but men's fertility does decreasewith age.
- Type of Fertility Issue – Certain fertility issues make success with IVF less likely, including fibroid tumours, uterine abnormalities, dual infertility, ovarian dysfunction and the amount of time the couple has had difficulty conceiving (in other words, the longer you wait to seek treatment, the less likely it will be successful). IVF, however, can very successfully overcome lots of fertility issues. Infertility caused by factors such as endometriosis or blockages of fallopian tubes, issues with ovulation, or male - factor infertility such as low sperm count, or motility often respond very well to IVF.




- Sperm Quality – About 90% of chromosomal embryo issues occur due to egg quality. However, male fertility factors still affect embryos. If the male partner has fertility issues, new technology is helping to mitigate the adverse effects to make successful pregnancy more likely.
- Embryo Transfer – Some believe the embryo transfer process is the most critical step in the entire process of IVF treatments. The health of embryos and successful implant in the uterus depend on a flawless transfer. Any snag with timing or biological factors can be detrimental to the process
- Uterine Receptivity – This is as important as embryo quality. Similar to planting a seed, if either the quality of the seed or soil is compromised, then the likelihood of cultivating a healthy plant is reduced. Factors affecting receptivity include the thickness of uterine lining, immunological factors, and the uterine cavity's contour.

## 6. Conclusion

Early diagnosis of uterine diseases can aid in infertility issues. A healthy lifestyle affects the rate of IVF just as much as the other factors. Choosing the right option is on the patient, each is tailored to their needs.

## 7. Area of Further Analysis

Can IVF success rate be influenced by positive affirmations?

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## Author Profile

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**Artwork Citations**

**Figure 1:** Decrease in infertility. (n. d.). [Graph]. Statcan. https: //www150. statcan. gc. ca/n1/pub/89 - 503 - x/2015001/article/14235/c - g/c - g05 - eng. gif

**Figure 2:** The first test tube baby turns 40. (n. d.). [Photograph]. Https: //I. Cbc. ca/1.4737030.1530901812!/FileImage/HttpImage/Image. Jpg_gen/Derivatives/Original_780/Louise - Brown - Test - Tube - Baby - Newspaper. Jpg. https: //i. cbc. ca/1.4737030.1530901812!/fileImage/httpImage/image. jpg_gen/derivatives/original_780/louise - brown - test - tube - baby - newspaper. jpg

**Figure 3:** Female reproductive system. (n. d.). [Illustration]. https: //visualsonline. cancer. gov/retrieve. cfm?imageid=8262&dpi=72&fileformat=jpg

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Figure 5: Affordable IVF treatment. (n. d.). [Illustration]. https: //delhi - ivf. com/wp - content/uploads/2019/05/ivf - treatment. png