IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

Managing Adverse Outcomes: IVF and Pregnancy Complications

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Abstract : This study revealed that in-vitro fertilization is a very advanced technology for infertility treatment. In this procedure, the sperm cell or egg is fertilized outside, or after being fertilized, it is inserted into the uterus of the woman. Sometimes IVF also causes complications like multiple births, irritability, jaundice, early delivery, high blood pressure, low birth weight, diabetes, etc. Before IVF, the IUI (intrauterine insemination) method was used, which had a 10% to 20% chance of pregnancy. IVF is more successful than IUI. Many infertile couples require therapy, including assisted reproductive techniques. The most cutting-edge approach to treating infertility is in vitro fertilization and embryo transfer. The management of these pregnancies is challenging since the couples and medical professionals caring for them worry excessively about the fate of such pregnancies. This research was done to learn more about delivery methods and problems.

Keywords : In vitro fertilization, Infertility, Fertility, Embryo transfer, Pregnancy complications

INTRODUCTION

IVF is a fertilization technique performed outside of the body in laboratories; that's why it's known as in vitro fertilization. After fertilization in the laboratory, the embryo transfers to the woman's uterus [1]. In vitro fertilization is the most advanced method of infertility treatment. In vitro fertilization (IVF) is one method of treatment for those who are unable to conceive. More than a million children have been born since the invention of IVF [2]. After not conceiving naturally, patients go for IVF treatment. In this program, using donated sperm and eggs can aid couples who are unable to conceive naturally. In IVF, multiple births increase the risk of birth abnormalities, early labor and delivery, high blood pressure, and diabetes associated with pregnancy,as well as low birth weight and early delivery [3]. This happens because,in the process of IVF, one or more embryos are transferred into the mother's uterus, increasing the chances of having twins or triplets. If a child is born through in vitro fertilization, he may have heart issues and digestive problems. Possibilities arise during IVF treatment [4].

Dr. Subhash Mukhopadhyay first discovered IVF in India. Before the IVF method, fertility treatment was done with the IUI (intrauterine insemination) method [5]. Which is much less invasive than IVF. During the fertile window, sperm is washed and placed directly into the woman's uterus. With each IUI cycle, women have a 10% to 20% chance of becoming pregnant. According to several studies, IVF treatment seems to be associated with an increased risk of miscarriage, ecotopic pregnancy, and bleeding [6]. In the IUI procedure, the liquefied semen sample is taken, then centrifuged, and its upper layer is discarded (seminal plasma and other cells). Now add culture media and incubate at 37°C for 20 minutes. After incubation, motile sperm will be present in the upper layer, which is known as wash sperm [41],[42]. The cleaned sperm are inserted straight into the uterus (womb) by medical professionals via a catheter, or tiny tube. Bypassing the vagina and cervix, this technique gives the sperm a "head start" on reaching the egg to fertilize it [43].

During in vitro fertilization (IVF), a single sperm is injected directly into the egg for the purpose of fertilization. This procedure is also known as intracytoplasmic sperm injection (ICSI). ICSI has gained popularity since it was created in the early 1990s to treat male infertility. In 2012, ICSI accounted for 93.3% of IVF cycles, including male factor infertility, and 66.9% of IVF cycles without male factor infertility [7]. Embryos created by IVF or ICSI can either be placed directly into the uterus (fresh embryo transfer) or cryopreserved and then thawed (frozen/thawed transfer) in a subsequent cycle with higher physiological hormonal levels. IVF has also been connected to neurodevelopmental abnormalities, imprinting disorders, and congenital malformations [8],[9].

Male infertility

The failure of a couple to become pregnant even after a year of frequent, unprotected sexual activity is the standard definition of infertility [44]. About 20% of cases include the male only, and another 30% to 40% involve the male and other factors. At least 180 million people worldwide are impacted, with 15% of American couples experiencing it. Male infertility is described as a man's incapacity to conceive a fertile woman after at least a year of unprotected sexual activity. About 20% of cases of infertility are exclusively the fault of the man, while another 30% to 40% are caused by him. Given that female and male factors frequently coexist, it's critical to look into infertility in both partners and treat it together [45]. The epidemiology and pathogenesis of male infertility are highlighted in this activity. In addition, it discusses the assessment and treatment of male infertility and the role that the interprofessional team plays in diagnosing and managing these patients [46].

An infertile couple's male spouse should be assessed for the following reasons: to ascertain whether the male component is causing the infertility problem. To determine the small proportion of cases (20%) that can be treated to normalcy. To ascertain whether the pair might ultimately benefit from assisted reproductive procedures (ART). The evaluation begins with a thorough and exhaustive review of the patient's medical and sexual history. This includes information on reproductive history, family history, major trauma to the head, testicles, or pelvis, sexual performance, libido, occupation, systemic diseases, alcohol and drug use, recreational drug use, prescription drug abuse, steroid abuse, prior radiation or chemotherapy, pubertal development, testicular descent, history of surgery on the scrotum and inguinal regions, exposure to toxic chemicals like pesticides, hair loss, frequency of shaving, STIs, tuberculosis and mumps [47],[48]. Examining the body form is crucial during the physical examination, as is looking for any indications of endocrinopathy, gynecomastia, skin, hair distribution, and secondary sexual features in particular. Perform an endocrine screening panel on the patient if he looks muscular and has a low sperm count. A very low level of LH may indicate testosterone misuse. The peripheral conversion of testosterone to estrogen is generally higher in obese people. This lowers LH levels and has been linked to a decrease in the number of sperm [49].

Embryo fertilization

The oocytes are fertilized using either ICSI or insemination. The sperm is separated from the semen sample using density centrifugation, and it is then washed in a high-protein solution to encourage capacitation, which is a procedure required for sperm to become fertile. An oocyte and fifty to one hundred thousand sperm are incubated together for 12 to 18 hours. ICSI, which involves injecting one immobilized sperm straight into the oocyte, may be necessary for male factor infertility. By bypassing the zona pellucida, the glycoprotein matrix surrounding the egg, the sperm can bypass this step [10].

Embryo transfer

A catheter is inserted through the cervix to transfer embryos into the uterus under transabdominal ultrasound guidance. The embryo(s) are positioned 1 to 2 cm from the uterine fundus. After the transfer, the catheter is examined under a microscope to make sure that no embryos are left inside and that every embryo was successfully implanted in the uterus. The stage of the embryos, their quality, the age of the mother, and the patient's preferences will all influence how many embryos are transplanted [10].

Fig.1 Embryo transfer

Advantages

The main benefit of IVF is having a successful pregnancy and a healthy child. For those who would not otherwise be able to have children, IVF can make this a reality: Blocked fallopian tubes: IVF offers the best chance for women who have blocked or damaged fallopian tubes to conceive using their own eggs. This covers same-sex couples, single women, and women who are physically unable to carry a child to term.In some circumstances, a fertility specialist might think about using donated sperm and eggs. The egg may occasionally be manually fertilized in the laboratory. You have a better probability of getting pregnant on the first or second try when you use the resulting viable embryo for IVF [11]. IVF therapy will not only be a viable option in a few decades, but practically everyone will have heard of it. Even more impressive is the fact that IVF has a higher success rate than natural conception. 20% of 100 couples who are trying to conceive naturally will become pregnant each month. Some fertility centers have monthly pregnancy rates of up to 70% for patients undergoing in vitro fertilization [11].

Disadvantages

Before in vitro fertilization (IVF) treatment, a critical disadvantage is the emotional toll it can take on individuals or couples struggling with infertility. The process can be physically and emotionally demanding, involving multiple medical procedures, hormone injections, and uncertainty about success rates. One critical disadvantage after in vitro fertilization treatment is the risk of ectopic pregnancy, where the fertilized egg implants outside the uterus, usually in the fallopian tube. Ectopic pregnancies can be life-threatening and require immediate medical intervention. [50],[51]

Complications

High blood pressure: Hypertension, another name for high blood pressure, occurs when the arteries that carry blood from the heart to the body's organs tighten. As a result, the arteries experience an increase in pressure. When pregnant, this may make it difficult for blood to reach the placenta, which supplies the fetus with nutrition and oxygen. A reduced blood supply can stunt fetal growth and increase the mother's risk of premature labor and preeclampsia. Gestational hypertension is a term used to describe high blood pressure that occurs during pregnancy [12].

Gestational diabetes: Impaired glucose tolerance that is discovered for the first time when pregnant is referred to as gestational diabetes. It is believed to happen as a result of placenta-generating hormones that interfere with insulin's ability to work in the mother's body. Due to this resistance, the mother's pancreas must work harder to create enough insulin to overcome it. Gestational diabetes arises when the pancreas is unable to produce enough insulin [13].

Low birth weight: Premature babies are newborns who arrive before 9 months of gestation. Although a baby's weight increases quickly in the final weeks of pregnancy, all of its organs are not fully developed in premature births. Because of this, a premature infant is born with a lower birth weight [14].

Neurodevelopmental disorders: The alteration of the embryo's hormonal and physical environment may have an impact on the development of the brain [15]. Disorders of the growth and development of the brain and central nervous system are referred to as neurodevelopmental disorders. A more specific meaning of the phrase relates to a brain issue that develops as a person matures and develops and affects memory, learning ability, self-control, emotion, and learning ability [16],[17].

Preterm delivery: Babies who are delivered alive before 37 weeks of pregnancy are complete are considered preterm[18]. Depending on gestational age, there are many types of preterm birth:

1. Exceedingly premature (less than 28 weeks)
2. Extremely preterm (28 to less than 32 weeks)
3. Moderate to late preterm (32 to 37 weeks) Preterm births can happen naturally or when a cesarean section or early labor induction is advised by a doctor [19].

Congenital Defects and Imprinting Disorders: Numerous studies have drawn attention to the potential increased risk of congenital malformations and imprinting disorders in pregnancies resulting from IVF [20],[21]. However, many of these studies lack sufficient power to identify an elevated risk, assuming one exists, considering the rarity of congenital abnormalities as a whole. During intrauterine life, structural or functional defects are referred to as congenital diseases [22]. These diseases, also known as birth defects, congenital anomalies, or congenital malformations, arise during pregnancy and can be detected before or at birth, as well as later in life [23]. Cleft lip and cleft palate are two common congenital conditions that are frequently discovered during regular prenatal examinations. Congenital heart disease, which might include a hole in the heart, a valve issue, or a blood vessel issue [24].

Multiple birth: The procedure of transferring multiple embryos at once during an IVF cycle is mostly to blame for the seeming greater incidence rate of twins and triplets. In an effort to increase their chances of success, most fertility specialists routinely transplanted numerous embryos until recently [25]. According to a prospective, population-based study, 10.1% of subfertile women treated with in vitro fertilization (IVF) gave birth to twins, compared to 1.3% of untreated women [26],[27].

Fallopian tube blockage and damage: Through the fallopian tubes, eggs go from the ovaries to the uterus. It is difficult for an egg to be fertilized or for an embryo to go to the uterus if both tubes become damaged or clogged [28].

Endometriosis: This syndrome occurs when tissue that resembles the uterine lining spreads outside of the uterus. The ovaries, uterus, and fallopian tubes are frequently impacted by endometriosis [29].

Female reproductive systems

The internal and external sex organs that make up the female reproductive system are crucial for reproduction. Infancy results in an undeveloped female reproductive system. Internal sex organs include the ovary, uterus, fallopian tubes, and vagina [30]. The cervix, which connects the vagina to the uterus, enables sex and birthing. The embryo develops into the fetus in the uterus, often known as the womb. The ovaries release an ovum throughout the menstrual cycle, which travels via the fallopian tube and into the uterus. A single sperm cell can penetrate the uterus and unite with an egg cell if it comes into contact with sperm on the way there, fertilizing the egg to form a zygote. Typically, fallopian tubes are the site of fertilization, which initiates embryogenesis [31].

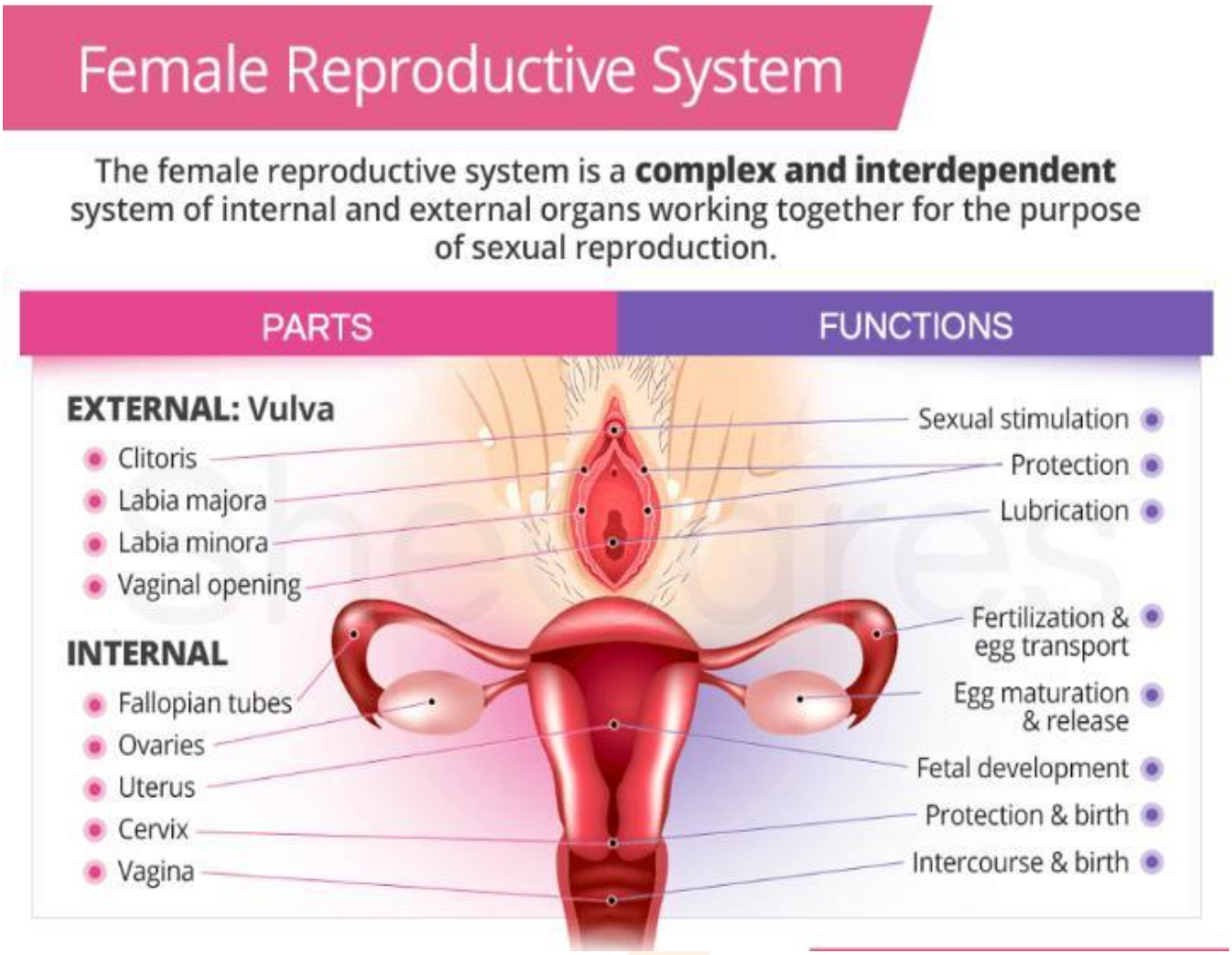

Fig.2 Female reproductive system

External genital organs

The collective word for all the structures that comprise the female external genitalia is vulva. The mons pubis, labia majora, labia minora, clitoris, vestibular bulbs, vulva vestibule, Bartholin's glands, Skene's glands, urethra, and vaginal opening are the parts of the vulva.

Clitoris: An organ near the top of the vulva that is both erectile and very erogenous. The clitoral body and its pear-shaped glands, which are covered by the clitoral hood, make up this structure [32].

Labia: The labia majora, or outer folds of the vulva, cover other portions of the body, and the labia minora, or inner folds, shield the vestibule from dryness, infections, and irritation.

Mons pubis: where the pubic hair grows, a lump of fatty tissue.

Urinary meatus: urine's passageway through the urethra's opening.

Vaginal opening: the opening to the vagina.

Hymen: The vaginal entrance is covered by connective tissue [33].

Internal genital organs

Vagina: The vagina, which connects the cervix of the uterus or womb to the outside of the body, is a fibromuscular (made up of fibrous and muscular tissue) canal. In the context of pregnancy, it is also referred to as the birth canal. When having sex, the male penis fits into the vagina. During an orgasm, the male ejaculates spermatozoa-containing semen into the vagina, possibly facilitating the fertilization of the egg cell (ovum) [34],[35].

Cervix: The cervix Is the lower, thin region of the uterus' neck, where it connects with the upper portion of the vagina. It pokes through the upper anterior vaginal wall and is cylindrical or conical in form. Only a portion of its length is visible; the rest is above the vagina and out of sight. The fetus emerges from the opening of the vagina, which has a thick coating on the outside, during delivery [36].

Uterus: A muscular organ in the shape of a pear is the uterus. Its primary role is to accept a fertilized ovum that is implanted into the endometrium, and it receives nourishment from blood vessels that form specifically for this job. An ovum that has been fertilized grows into an embryo, a fetus, and then a child during the pregnancy. Women start their menstrual cycles if the egg does not attach to the uterine wall [37].

Fallopian tube: Two tubes connecting the ovaries to the uterus are known as fallopian tubes [38]. When an ovum reaches maturity, the ovary's wall and follicle burst, allowing the ovum to leave and enter the fallopian tube. Moving cilia on the inner lining of the tubes help it go toward the uterus from where it is. This journey takes hours or days. In the event that the ovum is fertilized while still in the fallopian tube, it will typically implant in the endometrium when it reaches the uterus, which marks the start of pregnancy [39].

Ovaries: An ovum is created by the ovary, a part of the female reproductive system. This passes into the uterus through the fallopian tube after being discharged. On both the left and right sides of the body, there is an ovary (from Latin ovarium, "egg, nut"). The hormones secreted by the ovaries also affect fertility and the menstrual cycle [40].

Male reproductive system

The male reproductive system includes organs like the testes, epididymis, vas deferens, prostate gland, seminal vesicles, and penis. Its main functions are to produce sperm and deliver them to the female reproductive system during sexual intercourse [52]. A mature sperm has a head, midpiece, and tail. The nucleus is located in the head, which contains very little cytoplasm. An acrosome, or cap, protects the head and contains lysosomes, which aid in fertilization. The midpiece includes an abundance of mitochondria, which supply energy to the sperm's flagellum or tail [53].

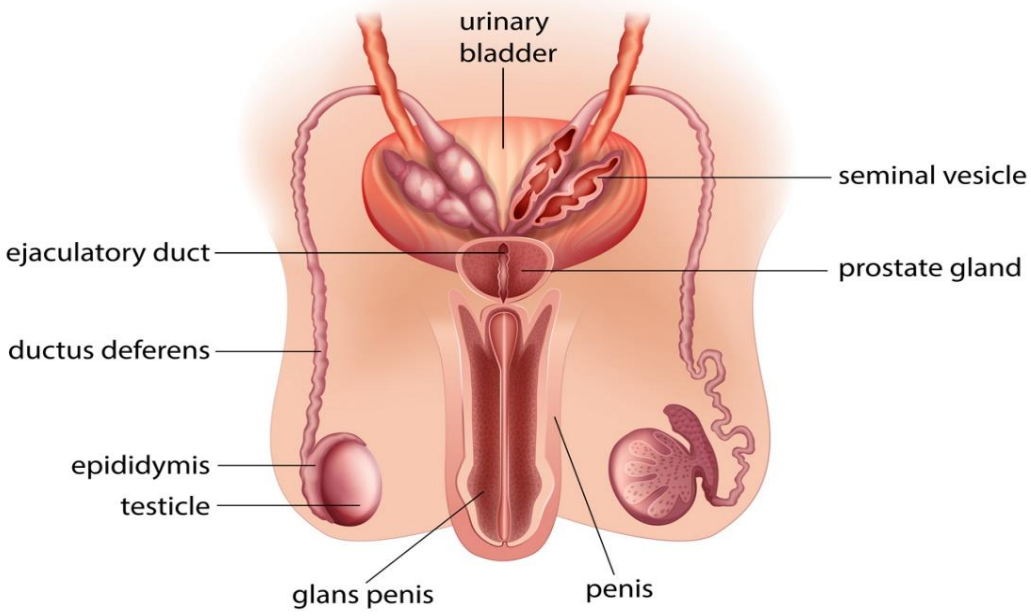

Fig:-3 Male reproductive system

Testes: The testes have two main functions: producing sperm and secreting testosterone, the primary male sex hormone. Sperm production occurs in the seminiferous tubules within the testes, while testosterone is produced by Leydig cells in the interstitial tissue surrounding the tubules.

Epididymis: Stores and matures sperm produced by the testes, allowing them to become motile and capable of fertilization.

Vas deferens: Tubes that transport mature sperm from the epididymis to the urethra during ejaculation.

Prostate gland: Secretes fluid that nourishes and protects sperm, forming a significant portion of semen volume.

Seminal vesicles: Produce a significant portion of the fluid that makes up semen, providing nutrients and aiding sperm motility.

Penis: Organ of copulation, delivering semen into the female reproductive tract during sexual intercourse[53],[54],[55].

CONCLUSION

This study shows that couples who do not consume fertility can get in vitro fertilization treatment done. But doing IVF can lead to a premature baby or many disorders like high blood pressure, diabetes, Irritability, and low birth weight and multiple birth So there is a chance to cause Side effects because of IVF but nowadays IVF is good technique for conceiving babies .

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