ABORTIONS AND INFERTILITY
DOES GENETICS HAVE A SOLUTION?

Infertility is the failure to conceive after a year of unprotected intercourse. It affects one in every six couples worldwide. For some couples, having a baby is a fairly straight forward process. However, some couples face difficulty in conception. Fertility struggle is one of the major problems in our society these days. The path to infertility is complex, painful and stressful. There are a variety of factors that affects fertility such as ovulation defects, spermatogenic failure, parental age, obesity and infections. Apart from these reasons the major factor that is affecting your fertility are genes and chromosomes. We will explain how genes hit your fertility and how you can treat infertility issues at genetic level.

An individual genetic information is packed into strings of DNA known as chromosomes. The arrangement of genes and chromosomes in DNA depicts the genetic makeup of an individual. Any alteration in this genetic makeup of an individual results in the disturbed functioning of the genes or disturbed chromosomal pattern. Normal human cells contain 46 chromosomes or 23 chromosomes pairs. These chromosomes are labelled 1 to 22 (the autosomes) while the X and Y are sex chromosomes. Any errors in the early development of egg, sperm or embryo can lead to an abnormal number of chromosomes in the developing embryo (i.e. missing or an extra chromosome). There are chromosomal deletions, where part of a chromosome is missing, and mutations, which involve changes in DNA. There are also translocations, where chromosomal pieces attach to the wrong chromosome. There can be inversions, where the chromosome is upside-down, and then something called aneuploidy in which there are too few or too many chromosomes. An abnormal chromosome can cause infertility implantation failure in IVF, miscarriage or the birth of a child with chromosomal aneuploidy. Any alteration in the gene sequence can lead to single gene mutations and can cause diseases such as Cystic fibrosis or Huntington's chorea etc.

INFERTILITY AT THE LEVELS OF GENES CAN BE DUE TO FACTORS

1. FAMILY HISTORY WITH GENETIC PROBLEMS

Sometimes, a person has all the genetic information, there's nothing missing or duplicated. Still they face infertility or miscarriage. In this case its significant to understand a family history to check if any of the family member has a history of delayed pregnancy, miscarriage or early miscarriage, which may place you at the risk level. If anyone in your family has experienced early miscarriage (before age of 40 years) you are at double the risk of having an early miscarriage. If someone is a carrier of an irregular chromosome, his or her embryo could receive either missing or extra genetic information, which could result in a miscarriage or other reproductive concern. It's worth noting that these abnormalities can also occur randomly in a fetus from chromosomally normal parents, but several are passed down from generation as well.

For example, if your mother has one X chromosome that's abnormal, which means there is 50% chance of inheriting that irregular X chromosome such as fragile X syndrome, cystic fibrosis (CF) and Tay-Sachs disease etc that can cause fertility issues.

Reproduction is a process which is controlled by multiple genes involved in the development of gonads, production of gametes, embryonic development and delivery of the newborn. Any genetic mutation will hamper the process and results in reduced fertility, infertility or foetal defects.

2. MALE INFERTILITY

Among the infertile couples 40% of infertility issues are due to male factors. The main cause of male infertility that is now gaining importance is genetic infertility. Any change in gene or chromosome can cause infertility as they affect the sperm production. The most common causes are:

- Fragmented DNA
- Y chromosome deletions, a condition where you have genetic material missing from your Y chromosome that is important for sperm production.
- Klinefelter syndrome. It's a condition in which males are born with an extra X chromosome.

Y chromosome DNA test (Y-DNA test) is used to test Mutations or deletions in the AZF genes. They are associated with inability or lessened ability to create sperm. It may cause azoospermia (not having any sperm in semen). In such males during ICSI procedure, TESA (Testicular Sperm Aspiration) sperms are used. TESA is a surgical procedure done under anaesthesia in which sperms are directly aspirated from testes. Thus, along with ICSI there is the possibility of passing on these genetic issues to the progeny.

DFI (DNA Fragmentation Index): DFI test is done to check abnormal genetic material within the sperm, which in turn may lead to male infertility, IVF failure and miscarriages.

MACS and Microfluidics are the two methods which they can use for sorting out sperms with decreased DNA damage and can use them further in IUI and ICSI.

3. FEMALE INFERTILITY

The main causes of female infertility at the genetic level includes ovulatory disorders such as fragile X syndrome, turner syndrome, deletion of one X chromosome and chromosomal abnormalities. Premature decrease in ovarian reserve is also one of the major factors affecting infertility in females before the age of 40 years. Decreased ovarian reserves can also run in family history. If anyone in your family has this condition, you are at double the risk of having decreased ovarian reserve.

Moreover, any anomalies in the follicle-stimulating hormone (FSH), luteinizing-hormone (LH), gonadotropin-releasing hormone (GnRH) receptors or in the genes supporting pregnancy can also lead to infertility or miscarriages.

One of the major benefits of opting IVF (In Vitro Fertilization) is that couples may be tested for potential genetic problems before the start of cycle. IVF is a medical procedure for conception in couples who fails to conceive naturally. In this procedure we fertilize woman's egg with the partner's sperm outside body in the lab and the embryo formed are then transferred to the woman's uterus. Genetic testing of an embryo prior to transfer helps in minimizing the miscarriage rate or implantation failure and it enhances the rate of take-home babies.

KARYOTYPE

It is a simple blood test by which we can get a snapshot of an individual's chromosomes. Parental karyotype is advised before IVF to have a look at the parent's chromosomal health. Any missing or extra pair of chromosomes either in male or female partner can lead to miscarriages. If any of the parent karyotype shows abnormal karyotype, PGT A (Preimplantation genetic testing for aneuploidies) is advised to have a look at embryos chromosomal health.

IVF is helping infertile couples to get pregnant but still the success rate of IVF is stuck at 40-50%. Sometimes, even though everything seems well, still miscarriage happens. Prognostic testing of embryo(s) has increased the success rate by evaluating the health of embryo chromosomes. PGS, or preimplantation genetic screening, is performed on IVF embryos with the goal of improving the IVF success rate. This is done by checking the embryo's chromosomal health.

EMBRYO BIOPSY & GENETIC TESTING

After IVF, embryos are grown in lab up to 5 to 6 days. PGS is usually performed on day 3 or day 5 embryos. Biopsy of 5-6 cells is taken from the embryo's trophectoderm layer on day 5. Blastocysts and is sent to genetic lab for testing. Next Generation Sequencing (NGS) is a novel technique used for chromosomal testing of embryos created during IVF. After biopsy all embryos are frozen in liquid nitrogen at -196 degrees while PGS report is awaited. After the result of PGS those embryos with the correct number of chromosomes are transferred, whereas embryos with an extra or missing chromosomes are rejected. This transfer is known as frozen embryo transfer (FET). By transferring an embryo with the correct number of chromosomes, you have a higher likelihood of achieving an ongoing, healthy pregnancy.

PGT A (PREIMPLANTATION GENETIC TESTING FOR ANEUPLOIDIES):

This test is done to couples who have normal karyotype yet still they fail 2 cycles of IVF. It also reduces the chances of having a child with extra or missing chromosomes, such as Down syndrome.

PGT-M:

If any of the parent's karyotype is abnormal or they are a carrier for any specific gene mutation, the chances of having miscarriage are high during IVF. This genetic test help in reducing the risk of having a child with an inherited condition.

You may consider PGT-M if:

- You and your partner are carriers of the same autosomal recessive condition (eg. Cystic fibrosis/ sickle cell anaemia etc)
- You are a carrier of an X-linked condition (eg. Duchenne Muscular Dystrophy)
- You or your partner have an autosomal dominant condition (eg. Huntington disease)
- You or your partner have a mutation associated with a hereditary cancer syndrome (eg. BRCA1 &2)
- You had a child or pregnancy with a single gene disorder
- You want to perform HLA matching (E.g. HLA typing is done for the treatment of affected sibling with Sickle Cell)

PGT-SR/PGD:

Couples with chromosomal rearrangements are at an increased risk of producing embryos with the incorrect amount of genetic material and these embryos do not lead to a successful IVF. This test minimizes the risks of having child with structural abnormality and this technique involves testing of embryos created through in vitro fertilization (IVF) and then transferring only normal embryos.

Therefore, with advanced technology and judicial use of genetics in this modern era, they can ensure better evaluation of the infertility couples and use a personalised plan for each patient. This will play a major role in not only eliminating the chances of a newborn with genetic diseases but also ensure a successful parenthood you can cherish with the help of modern science.

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Malakpet Branch

Hitech City Branch

Miyapur Branch

HEGDE FERTILITY CENTRE

The hospital established its third centre recently at Miyapur primarily focussing on Fertility related services and Women Wellness. The centre is dedicated for Infertility Treatment & procedures like IUI, IVF, PGS etc. with the goal of being a centre par excellence with advanced facilities such as state of the art labs, highly trained experts, a dedicated staff with affordable options for fulfilling a couple's desire for a baby.

Hegde Fertility Centre which boasts of one of the highest success rates for infertility treatment, is led by Dr. Vandana Hegde, she is a pioneer in the field of infertility care and has carved a niche for herself in Assisted Reproductive Treatments by helping many infertility couples realise their dream of having a baby.

Hegde Fertility Centre now addresses all the needs of couples through a team of highly qualified reproductive medicine specialists for treatments ranging from family planning assistance to advanced genetic procedure for recurrent miscarriages, implantation failure, etc.

For more details, contact

HEGDE FERTILITY
Touching Hearts of Millions since 1977

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