

Definition

Infertility is the failure of a couple to conceive a pregnancy after trying to do so for at least one full year. In primary infertility, pregnancy has never occurred. In secondary infertility, one or both members of the couple have previously conceived, but are unable to conceive again after a full year of trying.

Description

Currently, in the United States, about 20% of couples struggle with infertility at any given time. Infertility has increased as a problem over the last 30 years. Some studies pin the blame for this increase on social phenomena, including the tendency for marriage to occur at a later age, which means that couples are trying to start families at a later age. It is well known that fertility in women decreases with increasing age, as illustrated by the following statistics:

infertility in married women ages 16–20 = 4.5%

infertility in married women ages 35–40 = 31.8%

infertility in married women over the age of 40 = 70%.

Nowadays, individuals often have multiple sexual partners before they marry and try to have children. This increase in numbers of sexual partners has led to an increase in sexually transmitted diseases. Scarring from these infections, especially from pelvic inflammatory disease (a serious infection of the female reproductive organs, most commonly caused by gonorrhea) seems to be in part responsible for the increase in infertility noted. Furthermore, the use of some forms of the contraceptive called the intrauterine device (IUD) contributed to an increased rate of pelvic inflammatory disease, with subsequent scarring. However, newer IUDs do not lead to this increased rate of infection.

To understand issues of infertility, it is first necessary to understand the basics of human reproduction. Fertilization occurs when a sperm from the male merges with an egg (ovum) from the female, creating a zygote that contains genetic material (DNA) from both the father and the mother. If pregnancy is then established, the zygote will develop into an embryo, then a fetus, and ultimately a baby will be born.

The male contribution to fertilization and the establishment of pregnancy is the sperm. Sperm are small cells that carry the father's genetic material. This genetic material is contained within the oval head of the sperm. The sperm are mixed into a fluid called semen, which is discharged from the penis during sexual intercourse. The

whip-like tail of the sperm allows the sperm to swim up the female reproductive tract, in search of the egg it will try to fertilize.

The female makes many contributions to fertilization and the establishment of pregnancy. The ovum is the cell that carries the mother's genetic material. These ova develop within the ovaries. Once a month, a single mature ovum is produced, and leaves the ovary in a process called ovulation. This ovum enters a tube leading to the uterus (the fallopian tube). The ovum needs to meet up with the sperm in the fallopian tube if fertilization is to occur.

When fertilization occurs, the resulting cell (which now contains genetic material from both the mother and the father) is called the zygote. This single cell will divide into many other cells within the fallopian tube, and the resulting cluster of cells (called a blastocyst) will then move into the womb (uterus). The uterine lining (endometrium) has been preparing itself to receive a pregnancy by growing thicker. If the blastocyst successfully reaches the inside of the uterus and attaches itself to the wall of the uterus, then implantation and pregnancy have been achieved.

Causes and symptoms

Unlike most medical problems, infertility is an issue requiring the careful evaluation of two separate individuals, as well as an evaluation of their interactions with each other. In about 3–4% of couples, no cause for their infertility will be discovered. About 40% of the time, the root of the couple's infertility is

due to a problem with the male partner; about 40% of the time, the root of the infertility is due to the female partner; and about 20% of the time, there are fertility problems with both the man and the woman.

The main factors involved in causing infertility, listing from the most to the least common, include:

male problems: 35%

ovulation problems: 20%

tubal problems: 20%

endometriosis: 10%

cervical factors: 5%

Male factors

Male infertility can be caused by a number of different characteristics of the sperm. To check for these characteristics, a sample of semen is obtained and examined under the microscope (semen analysis). Four basic characteristics are usually evaluated:

Sperm count refers to the number of sperm present in a semen sample. The normal number of sperm present in just one milliliter (ml) of semen is over 20 million. An individual with only 5–20 million sperm per ml of semen is considered subfertile; an individual with less than 5 million sperm per ml of semen is considered infertile.

Sperm are also examined to see how well they swim (sperm motility) and to be sure that most have normal structure.

Not all sperm within a specimen of semen will be perfectly normal. Some may be immature, and some may have abnormalities of the head or tail. A normal semen sample will contain no more than 25% abnormal forms of sperm.

Volume of the semen sample is important. An abnormal amount of semen could affect the ability of the sperm to successfully fertilize an ovum.

Another test can be performed to evaluate the ability of the sperm to penetrate the outer coat of the ovum. This is done by observing whether sperm in a semen sample can penetrate the outer coat of a guinea pig ovum; fertilization cannot occur, of course, but this test is useful in predicting the ability of the individual's sperm to penetrate a human ovum.

Any number of conditions result in abnormal findings in the semen analysis. Men can be born with testicles that have not descended properly from the abdominal cavity (where testicles develop originally) into the scrotal sac, or may be born with only one instead of the normal two testicles. Testicle size can be smaller than normal. Past infection (including mumps) can affect testicular function, as can a past injury. The presence of

abnormally large veins (varicocele) in the testicles can increase testicular temperature, which decreases sperm count. History of having been exposed to various toxins, drug use, excess alcohol use, use of anabolic steroids, certain medications, diabetes, thyroid problems, or other endocrine disturbances can have direct effects on the formation of sperm (spermatogenesis). Problems with the male anatomy can cause sperm to be ejaculated not out of the penis, but into the bladder; and scarring from past infections can interfere with ejaculation.

Treatment of male infertility includes addressing known reversible factors first; for example, discontinuing any medication known to have an effect on spermatogenesis or ejaculation, as well as decreasing alcohol intake, and treating thyroid or other endocrine disease. Varicoceles can be treated surgically. Testosterone in low doses can improve sperm motility.

Other treatments of male infertility include collecting semen samples from multiple ejaculations, after which the semen is put through a process that allows the most motile sperm to be sorted out. These motile sperm are pooled together to create a concentrate that can be deposited into the female partner's uterus at a time that coincides with ovulation. In cases in which the male partner's sperm is proven to be absolutely unable to cause pregnancy in the female partner, and with the consent of both partners, donor sperm may be used for this process. Depositing the male partner's sperm or donor sperm by mechanical means into the female partner are both forms of artificial insemination.

Ovulatory problems

The first step in diagnosing ovulatory problems is to make sure that an ovum is being produced each month. A woman's morning body temperature is slightly higher around the time of ovulation. A woman can measure and record her temperatures daily, and a chart can be drawn to show whether or not ovulation has occurred. Luteinizing hormone (LH) is released just before ovulation. A simple urine test can be done to check if LH has been released around the time that ovulation is expected.

Treatment of ovulatory problems depends on the cause. If a thyroid or pituitary problem is responsible, simply treating that problem can restore fertility. (The thyroid and pituitary glands release hormones that also are involved in regulating a woman's menstrual cycle.) Medication can also be used to stimulate fertility. The most commonly used of these are called Clomid and Pergonal. These drugs increase the risk of multiple births (twins, triplets, etc.).
Pelvic adhesions and endometriosis

Pelvic adhesions and endometriosis can cause infertility by preventing the sperm from reaching the egg or interfering with fertilization.

Pelvic adhesions are fibrous scars. These scars can be the result of past infections, such as pelvic inflammatory disease, or infections following abortions or prior births. Previous surgeries can also leave behind scarring.

Endometriosis may lead to pelvic adhesions. Endometriosis is the abnormal location of uterine tissue outside of the uterus. When uterine tissue is planted elsewhere in the pelvis, it still bleeds on a monthly basis with the start of the normal menstrual period. This leads to irritation within the pelvis around the site of this abnormal tissue and bleeding, and may cause scarring.

Pelvic adhesions cause infertility by blocking the fallopian tubes. The ovum may be prevented from traveling down the fallopian tube from the ovary or the sperm may be prevented from traveling up the fallopian tube from the uterus.

A hysterosalpingogram (HSG) can show if the fallopian tubes are blocked. This is an x-ray exam that tests whether dye material can travel through the patient's fallopian tubes. A few women become pregnant following this x-ray exam. It is thought that the dye material in some way helps flush out the tubes, decreasing any existing obstruction. Scarring also can be diagnosed by examining the pelvic area through the use of a scope that can be inserted into the abdomen through a tiny incision made near the naval. This scoping technique is called laparoscopy.

Pelvic adhesions can be treated during laparoscopy. The adhesions are cut using special instruments. Endometriosis can be treated with certain medications, but may also require surgery to repair any obstruction caused by adhesions.
Cervical factors

The cervix is the opening from the vagina into the uterus through which the sperm must pass. Mucus produced by the cervix helps to transport the sperm into the uterus. Injury to the cervix or scarring of the cervix after surgery or infection can result in a smaller than normal cervical opening, making it difficult for the sperm to enter. Injury or infection can also decrease the number of glands in the cervix, leading to a smaller amount of cervical mucus. In other situations, the mucus produced is the wrong consistency (perhaps too thick) to allow sperm to travel through. In addition, some women produce anti-bodies (immune cells) that are specifically directed to identify sperm as foreign invaders and to kill them.

Cervical mucus can be examined under a microscope to diagnose whether cervical factors are contributing to infertility. The interaction of a live sperm sample from the male partner and a sample of cervical mucus from the female partner can also be examined. This procedure is called a postcoital test.

Treatment of cervical factors includes antibiotics in the case of an infection, steroids to decrease production of anti-sperm antibodies, and artificial insemination techniques to completely bypass the cervical mucus.

Prognosis

It is very hard to obtain statistics regarding the prognosis of infertility because many different problems may exist within an individual or couple trying to conceive. In general, it is believed that of all couples who undergo a complete evaluation of infertility followed by treatment, about half will ultimately have a successful pregnancy. Of those couples who do not choose to undergo evaluation or treatment, about 5% will go on to conceive after a year or more of infertility.