



Variables in male infertility

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Infertility is defined by the World Health Organization (WHO) as “the inability of a sexually active, non-contracepting couple to achieve pregnancy in one year.”¹ Though infertility is often considered a woman’s health issue, male factor infertility is a variable in almost half of couples undergoing fertility treatment.² In about 35% of couples with infertility, a male factor is identified along with a female factor. And in about 8% of couples with infertility, a male factor is the only cause.³ This article outlines diagnostic procedures for male infertility and discusses some causes of male infertility, including the effects of genetics, environment, lifestyle choices and other medical conditions.

Semen analysis

A semen analysis is one of the initial tests for evaluating male fertility. This diagnostic tool can determine whether a man is producing enough healthy sperm to initiate pregnancy. It can also indicate the possibility of related health issues, such as abnormal hormone levels.⁴

After a two- to five-day abstinence period, a semen sample is collected in a sterile specimen container via masturbation or during intercourse with a special collection condom provided by a physician. A semen sample must be evaluated within one hour of collection for accurate results.⁴ The sample is analyzed for pH, volume, total count, motility and morphology.⁵

According to current WHO standards, a normal semen analysis meets the following criteria⁵:

Criteria	Normal Values	Interpreting a semen analysis
pH	≥ 7.2	A pH below 7.2 means the semen is acidic, which can adversely affect the viability and motility of sperm. ⁶
Sperm volume (ml)	≥ 1.5ml	A low volume means the seminal vesicles are not producing enough fluid and might be blocked. It could also indicate a problem with the prostate gland. ⁷
Total sperm count (no./ejaculate)	≥ 39 million / ≥ 15 million	A total sperm count below 39 million for an entire specimen or below 15 million per milliliter is considered low. ⁵ Genetic abnormalities, environment and lifestyle can all contribute to a low sperm count. ^{8,9}
Total motility (PR +NP)	≥ 40%	Motility indicates the sperm’s ability to swim and move. Progressive motility refers to sperm moving in a straight line or in a large circular pattern. Non-progressive motility refers to other movement with no clear progression, such as smaller circles. Total motility is the percentage of all sperm that are moving, regardless of direction or pattern. A sample is considered normal when showing more than 40% total motility or 32% progressive motility. ⁵
Normal morphology (%)	≥ 4% (strict)	Morphology evaluates the size and shape of sperm. Sperm with normal morphology have an oval head and a long tail. Abnormal morphology can refer to a head that is misshapen, a missing tail or a double tail. ⁹

A semen analysis can detect a number of sperm abnormalities¹⁰:

- Oligospermia: sperm count below normal limits
- Azoospermia: absence of sperm cells from the ejaculate
- Teratozoospermia: poor morphology
- Asthenozoospermia: poor motility
- Polyzoospermia: disproportionately large number of sperm, or > 250 x 10⁶/mL¹¹

If any part of a semen analysis is abnormal, additional evaluation may be indicated for further evaluation and a clearer diagnosis. This might include a full medical history and physical examination, additional semen and sperm analysis, endocrine evaluation, post-ejaculatory urinalysis, ultrasonography or genetic screening.¹²



Genetic abnormalities

Genetic abnormalities can affect the body's ability to produce and transport sperm. Men with low or no sperm counts are more likely to have genetic abnormalities than men with normal counts. About 10% to 15% of men with azoospermia and about 5% of men with severe oligospermia have chromosomal abnormalities such as cystic fibrosis and Klinefelter syndrome. About 16% of men with azoospermia or severe oligospermia have Y-chromosome microdeletions.¹² Testing for such genetic conditions is key to understanding possible causes of infertility, and is often a necessary step before proceeding with assisted reproduction.

- Cystic fibrosis is the most common autosomal recessive disease, with an incidence of 1 in 2,500 among Caucasians.¹³ Nearly all men with cystic fibrosis also have congenital bilateral absence of the vas deferens. This prevents sperm from passing from the testes through the urethra, resulting in azoospermia.^{13,14}
- Klinefelter syndrome occurs when a male has at least one extra X chromosome. This syndrome is found in about 1 out of every 500 to 1,000 newborn males.¹⁵ Its most common symptom is infertility.¹⁵
- Y-chromosome microdeletion usually has no symptoms and is only diagnosed when a semen analysis is performed. Variations in the severity of the deletion can result in oligospermia or azoospermia.¹⁶

If a genetic abnormality is identified during a fertility assessment, testicular cytology can further assess testicular function and sperm quality or retrieve sperm for assisted reproduction.¹⁶

Environmental factors and lifestyle

A number of environmental factors and lifestyle choices can also contribute to male infertility. In many cases, these factors are related to exposure to high temperatures or chemicals, or the use of drugs and alcohol.

Some men have occupations that place them at higher risk. For example, occupational drivers are almost two times more likely than nonoccupational drivers to develop abnormal sperm morphology.¹⁷ Long periods of sitting—as required in occupational driving—exposes the testes to long-term heat that can cause abnormal sperm quality and quantity. In other cases, men who work with pesticides and other chemicals are also at risk for low sperm parameters.¹⁷

Lifestyle choices such as smoking, drinking alcohol, and drug use can all contribute to male infertility.¹⁷ For the purposes of this article, anabolic steroid use and marijuana will be discussed due to their increasing prevalence.^{17,18}

Anabolic steroid use has been around for many years, and is increasing among teenage boys wishing to increase muscle mass.¹⁷ Steroid use has health consequences, especially for fertility. The artificial increase in testosterone from steroid use actually prevents the natural production of testosterone in the testes, which can shrink and stop sperm production altogether. With short-term anabolic steroid use, sperm production may return. But in some cases, this could take a year or more. Long-term use of anabolic steroids increases the risk of losing sperm production permanently.¹⁷

Marijuana is the most commonly used illicit drug in the United States, and its use has risen over the past decade.¹⁸ Limited research has suggested that the use of cannabis has a “detrimental impact” on male fertility.¹⁹ In particular, marijuana may negatively affect sperm quality.²⁰ In particular, men who have smoked marijuana have sperm that exhibit a “hyperactivity” pattern, wherein the sperm are initially highly active, then lose that energy before reaching the egg.¹⁷

Gastric bypass surgery

Lastly, one emerging cause of male infertility is gastric bypass surgery. Limited research suggests vitamin D and zinc deficiency and hyperestrogenism following gastric bypass surgery are contributing factors.²¹⁻²² Vitamin D plays a role in hormone regulation and reproductive function, while zinc is an essential element for normal spermatogenesis.²² A three-case study of males after bariatric surgery noted severe alterations in semen parameters following the procedure, specifically low sperm count with poor motility and morphology. For one patient in the study, however, the decreased sperm parameters reversed two years after the surgery.²³ Further study in this area is needed, but researchers suggest counseling potential gastric bypass patients on the potential consequences to fertility and available options for cryopreservation of sperm prior to surgery.

Summary

Genetic abnormalities, environmental and lifestyle choices and gastric bypass surgery are just a few of the many variables that can be tied to male infertility. A thorough diagnostic workup by a reproductive endocrinologist and/or urologist is essential to determining the reasons for a couple's inability to achieve pregnancy.

About the author

Susan Sciandra has worked as an infertility nurse for nearly three decades, and is the director of clinical operations at IVF FLORIDA Reproductive Associates in South Florida. Sciandra has been a member of the American Society for Reproductive Medicine (ASRM) for more than 25 years, and is a member of the Nurses' Professional Group. She served on the Nurses Advisory Board for Walgreens for two years and on the Florida Society of Reproductive Endocrinology and Infertility's Board of Directors for two years as its nurse liaison. Sciandra has co-authored several abstracts presented at ASRM conferences.

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