ANOVULATION

Failure of the ovaries to release an oocyte over a period of time generally exceeding 3 months.

Diagnosis  Female

Related Diagnoses:
- Anorexia Nervosa
- Obesity
- Polycystic ovary syndrome
- Menstrual cycle disorders
- Thyroid disorders
- Turner syndrome
- Premature ovarian failure
- Hypogonadism
- Endometrial cancer
- Amenorrhea
- Oligomenorrhea
- Poor ovarian reserve
- Hyperthyroidism
- Hyperprolactinemia
- Luteinised unruptured follicle syndrome
- Pituitary gland malfunction
- Hypothalamus malfunction

About Anovulation

Anovulation affects between 6% and 15% of all women of childbearing age. During the first two years after menarche 50% of the menstrual cycles could be anovulatory. In addition to the alteration of menstrual periods and infertility, chronic anovulation can cause or exacerbate other long term problems, such as polycystic ovary syndrome.

It is in fact possible to restore ovulation using appropriate medication, and ovulation is successfully restored in approximately 90% of cases.

The first step is the diagnosis of anovulation. Temperature charting is a useful way of providing early clues about anovulation, and can help gynaecologists in their diagnosis. The identification of anovulation is not easy; contrary to what is commonly believed, women undergoing anovulation still have (more or less) regular periods. In general, patients only notice that there is a problem once they have started trying to conceive.

Hormonal or chemical imbalance is the most common cause of anovulation and is thought to account for about 70% of all cases. About half the women with hormonal imbalances do not produce enough follicles to ensure the development of an ovule, possibly due to poor hormonal secretions from the pituitary gland or the
hypothalamus. The pituitary gland controls most other hormonal glands in the human body. Therefore, any pituitary malfunctioning affects other glands under its influence, including the ovaries. This occurs in around 10% of cases. The mammary glands are also controlled by the pituitary gland, so lactation can also be affected. The pituitary gland is controlled by the hypothalamus. In 10% of cases, alterations in the chemical signals from the hypothalamus can easily seriously affect the ovaries. There are other hormonal anomalies with no direct link to the ones mentioned above that can affect ovulation. For instance, women with hyper or hypo-thyroidism sometimes have ovulation problems. Thyroid dysfunction can halt ovulation by upsetting the balance of the body’s natural reproductive hormones. Polycystic ovary syndrome (also known as Stein-Leventhal syndrome) and hyperprolactinemia can also cause anovulatory cycles through hormonal imbalances.

**Classification**

According the World Health Organization (WHO) criteria for classification of anovulation, (which include the determination of oligomenorrhea or amenorrhea in combination with concentration of prolactin, follicle stimulating hormone and estradiol) the patients are classified as:

- WHO1 (15%) - hypo-gonadotropin, hypo-estrogenic
- **WHO2 (80%)** - normo-gonadotropin, normo-estrogenic
- WHO3 (5%) - hyper-gonadotropin, hypo-estrogenic

The vast majority of anovulation patients belong to the WHO2 group and demonstrate very heterogeneous symptoms ranging from anovulation, obesity, biochemical or clinical hyperandrogenism and insulin resistance.

**Associated diseases**

- Polycystic ovary syndrome (a set of symptoms due to a hormone imbalance in women)
- pituitary gland malfunction
- hypothalamus malfunction
- hyperthyroidism (the condition that occurs due to excessive production of thyroid hormone by the thyroid gland)
- hypothyroidism (a common disorder of the endocrine system in which the thyroid gland does not produce enough thyroid hormone)
- hyperprolactinemia (the presence of abnormally high levels of prolactin in the blood)
- luteinised unruptured follicle syndrome (luteinised unruptured follicle syndrome)
- anorexia
- obesity
- premature ovarian failure

**Complications**

Anovulation can result in a number of health complications, especially if it is left untreated.
**Functional problem**

This accounts for around 10-15% of all cases of anovulation. The ovaries can stop working in about 5% of cases. This may be because the ovaries do not contain eggs. However, a complete blockage of the ovaries is rarely a cause of infertility.

**Risk factors**

- having PCOS (polycystic ovarian syndrome)
- suffering from hirsutism, or other hormonal disorders
- extreme weight loss or obesity

**Impact on fertility**

An anovulatory cycle is a menstrual cycle during which the ovaries do not release an oocyte. When a woman is anovulatory, she can't get pregnant because there is no egg to be fertilized. Women who are anovulatory have irregular, few or no periods. This is common in women from their mid-thirties, but research has found that increasingly younger women are also suffering from these cycles. In fact, about 40% of infertility in women is related to cycles that don't ovulate.

**Prevention**

Several studies indicate that in some cases, a simple change in lifestyle could help patients suffering from anovulation. Consulting a nutritionist, for example, could help a young woman suffering from anorexia to put on some weight, which might restart her menstrual cycle. Conversely, a young overweight woman who manages to lose weight could also relieve the problem of anovulation (losing just 5% of body mass could be enough to restart ovulation).

**Symptoms**

Anovulation is usually associated with specific symptoms.

- amenorrhea (absence of menstruation)
- infrequent and light menstruation occurs
- irregular menstruation
- absence of mastodynia (breast pain or tenderness)
- increased body mass index
- facial hair
- abnormal or erratic basal body temperature (BBT)
- fewer PMS symptoms
Therapies

Self therapy

Some cases of anovulation can be treated by lifestyle change or diet.

Chinese/East Asian medicine

Acupuncture and other modalities of Chinese/East Asian medicine have been used to treat women's health for many centuries. Gynecology specialties focus particularly on menstrual and reproductive disorders. Acupuncture may positively influence ovulation and fertility.

Conventional medicine

Pharmacotherapy

Ovulation stimulators

Clomid (Clomiphene citrate)

Clomifene is useful in those who are infertile due to anovulation or oligoovulation. Evidence is lacking for the use of clomifene in those who are infertile without a known reason. In such cases, studies have observed a clinical pregnancy rate 5.6% per cycle with clomifene treatment vs. 1.3%–4.2% per cycle without treatment. Clomifene has also been used with other assisted reproductive technology to increase success rates of these other modalities.

Oral antidiabetic agents

Metformin

Metformin was recommended as treatment for anovulation in polycystic ovary syndrome.

Selective estrogen receptor modulator (SERM)

Tamoxifen

Tamoxifen may be used an alternative to clomiphene citrate for ovulation induction in women with anovulatory infertility. A dose of 10–40 mg per day
is administered in days 3–7 of a woman's cycle.

Gonadotropins

1. Human chorionic gonadotropin (hCG)

A molecule which is structurally similar to luteinizing hormone (LH). LH is secreted by the pituitary just before ovulation occurs, whereas hCG is released during pregnancy. On its own, hCG is not very effective in inducing ovulation, but when combined with clomifene citrate, it is much more effective.

2. Human menopausal gonadotropin (hMG)

A very powerful treatment for infertility. It consists of a combination of LH (luteinizing hormone) and FSH (follicle-stimulating hormone). From menopause onwards, the body starts secreting LH and FSH in large quantities due to the slowing down of the ovarian function. This excess of hormones is not used by the body and is expelled in the urine. HMG is therefore collected from the urine of menopausal women. The urine then undergoes purification and a chemical treatment. The resulting hMG induces the stimulation of several ovarian follicles. This increases the risk of producing several oocytes during the same cycle, and thus the risk of multiple pregnancies.

3. Follicle-stimulating hormone (FSH or recombinant FSH)

Now used as a replacement for hMG (human menopausal gonadotropin). Although hMG is a combination of FSH and LH (luteinizing hormone), FSH is the only active component that has an effect on ovulation. However, until recently, it was not possible to produce pure FSH. FSH is now administered in a similar way as hMG, at a specific point during the cycle, and it requires medical monitoring. It is therefore important to fully understand a woman’s cycle, and to be able to accurately anticipate menstruation and ovulation dates. FSH is also sometimes useful for women who are suffering from PCOS (Polycystic ovary syndrome).

Surgical therapy

Surgical therapy is usually indicated to resolve the underlying cause for the anovulation (e.g. fallopian tube obstruction), typically when medical therapy has failed. Surgical treatment is also needed in uncommon cases, such as a macroadenoma of the pituitary with unrelenting growth eliciting acute symptoms (e.g. headaches, bitemporal hemianopsia, diplopia).

Surgery can be attempted in case of inefficient result with medications for ovulation induction. Though surgery is not commonly performed, the polycystic ovaries can be treated with a laparoscopic procedure called "ovarian drilling" (puncture of 4-10 small follicles with electrocautery),
which often results in either resumption of spontaneous ovulations or ovulations after adjuvant treatment with clomiphene or FSH.

**Assisted reproduction**

For patients who do not respond to diet, lifestyle modification and clomiphene, in vitro fertilisation (IVF-ICSI) can be performed. This usually includes controlled ovarian hyperstimulation with FSH (follicle-stimulating hormone) injections, and oocyte release triggering with human chorionic gonadotropin (hCG) or a GnRH (gonadotropin-releasing hormone) agonist.

---

**Find more about related issues**

**Diagnoses**

**Anorexia Nervosa**
An eating disorder characterized by the maintenance of a body weight below average, fear of gaining weight, and a distorted body image.
Learn more at: [www.fertilitypedia.org/therapy/diag/anorexia-nervosa](http://www.fertilitypedia.org/therapy/diag/anorexia-nervosa)

**Obesity**
A disease of excess body fat that can have a negative effect on health, leading to reduced life expectancy and other health problems.
Learn more at: [www.fertilitypedia.org/therapy/diag/obesity](http://www.fertilitypedia.org/therapy/diag/obesity)

**Polycystic ovary syndrome**
Polycystic ovary syndrome is a condition in which a woman has an imbalance of female sex hormones and cysts in the ovaries.
Learn more at: [www.fertilitypedia.org/therapy/diag/polycystic-ovary-syndrome](http://www.fertilitypedia.org/therapy/diag/polycystic-ovary-syndrome)

**Menstrual cycle disorders**
An abnormal condition in a woman's menstrual cycle.
Learn more at: [www.fertilitypedia.org/therapy/diag/menstrual-cycle-disorders](http://www.fertilitypedia.org/therapy/diag/menstrual-cycle-disorders)

**Thyroid disorders**
A medical condition impairing the function of the thyroid.
Learn more at: [www.fertilitypedia.org/therapy/diag/thyroid-disorders](http://www.fertilitypedia.org/therapy/diag/thyroid-disorders)
**Turner syndrome**
Turner syndrome is a genetic disorder in which a female is partly or completely missing one X chromosome that results in ovarian dysgenesis.
Learn more at: [www.fertilitypedia.org/therapy/diag/turner-syndrome](http://www.fertilitypedia.org/therapy/diag/turner-syndrome)

**Premature ovarian failure**
The loss of function of the ovaries before age 40.
Learn more at: [www.fertilitypedia.org/therapy/diag/premature-ovarian-failure](http://www.fertilitypedia.org/therapy/diag/premature-ovarian-failure)

**Hypogonadism**
A medical term which describes a diminished functional activity of the gonads – the testes and ovaries.
Learn more at: [www.fertilitypedia.org/therapy/diag/hypogonadism](http://www.fertilitypedia.org/therapy/diag/hypogonadism)

**Endometrial cancer**
Cancer that arises from the endometrium, the lining of the uterus.
Learn more at: [www.fertilitypedia.org/therapy/diag/endometrial-cancer](http://www.fertilitypedia.org/therapy/diag/endometrial-cancer)

**Amenorrhoea**
The absence of a menstrual period in women of reproductive age.
Learn more at: [www.fertilitypedia.org/therapy/diag/amenorrhoea](http://www.fertilitypedia.org/therapy/diag/amenorrhoea)

**Oligomenorrhea**
Light or infrequent menstrual flow at intervals of 39 days to 6 months or 5–7 cycles in a year.
Learn more at: [www.fertilitypedia.org/therapy/diag/oligomenorrhea](http://www.fertilitypedia.org/therapy/diag/oligomenorrhea)

**Poor ovarian reserve**
A condition of low fertility characterized by low numbers of remaining oocytes in the ovaries or possibly impaired oocyte development or recruitment.
Learn more at: [www.fertilitypedia.org/therapy/diag/poor-ovarian-reserve](http://www.fertilitypedia.org/therapy/diag/poor-ovarian-reserve)

**Hyperthyroidism**
Condition that occurs due to excessive production of thyroid hormone by the thyroid gland.
Learn more at: [www.fertilitypedia.org/therapy/diag/hyperthyroidism](http://www.fertilitypedia.org/therapy/diag/hyperthyroidism)

**Hyperprolactinemia**
The presence of abnormally high levels of prolactin in the blood.
Learn more at: [www.fertilitypedia.org/therapy/diag/hyperprolactinemia](http://www.fertilitypedia.org/therapy/diag/hyperprolactinemia)
**Luteinised unruptured follicle syndrome**
The luteinisation of ovulatory follicle without a release of an oocyte.
Learn more at: [www.fertilitypedia.org/therapy/diag/luteinised-unruptured-follicle-syndrome](http://www.fertilitypedia.org/therapy/diag/luteinised-unruptured-follicle-syndrome)

**Pituitary gland malfunction**
A pituitary malfunction is a disorder affecting the pituitary gland, either by overproduction or underproduction any of pituitary gland hormones.
Learn more at: [www.fertilitypedia.org/therapy/diag/pituitary-gland-malfunction](http://www.fertilitypedia.org/therapy/diag/pituitary-gland-malfunction)

**Hypothalamus malfunction**
Group of diseases, which have impact on function of hypothalamus.
Learn more at: [www.fertilitypedia.org/therapy/diag/hypothalamus-malfunction](http://www.fertilitypedia.org/therapy/diag/hypothalamus-malfunction)

**Organs**

**Hypothalamus**
A region of the forebrain that regulates body temperature, some metabolic processes and governs the autonomic nervous system.
Learn more at: [www.fertilitypedia.org/edu/organs/hypothalamus](http://www.fertilitypedia.org/edu/organs/hypothalamus)

**Ovary**
The ovum-producing organs of the internal female reproductive system
Learn more at: [www.fertilitypedia.org/edu/organs/ovary](http://www.fertilitypedia.org/edu/organs/ovary)

**Pituitary gland**
An endocrine gland, about the size of a pea, whose secretions control the other endocrine glands and influence growth, metabolism, and maturation.
Learn more at: [www.fertilitypedia.org/edu/organs/pituitary-gland](http://www.fertilitypedia.org/edu/organs/pituitary-gland)

**Reproductive cells**

**Cumulus oophorus**
The cell aggregation surrounding an oocyte before and after ovulation serving as a nursing and protective layer.
Learn more at: [www.fertilitypedia.org/edu/reproductive-cells/cumulus-oophorus](http://www.fertilitypedia.org/edu/reproductive-cells/cumulus-oophorus)

**Oocyte**
A female germ cell involved in reproduction.
Learn more at: [www.fertilitypedia.org/edu/reproductive-cells/oocyte](http://www.fertilitypedia.org/edu/reproductive-cells/oocyte)

**Biological control**
**Follicle-stimulating hormone**
FSH is a hormone secreted by the anterior pituitary gland. It regulates the development, growth, pubertal matur and reproductive functions of the body.
Learn more at: [www.fertilitypedia.org/edu/biological-control/follicle-stimulating-hormone](http://www.fertilitypedia.org/edu/biological-control/follicle-stimulating-hormone)

**Gonadotropin-releasing hormone**
A releasing hormone responsible for the release of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) from the anterior pituitary.
Learn more at: [www.fertilitypedia.org/edu/biological-control/gonadotropin-releasing-hormone](http://www.fertilitypedia.org/edu/biological-control/gonadotropin-releasing-hormone)

---

### Reproductive functions

**Fertilization**
The fusion of an ovum with a sperm to initiate the development of a new individual organism.
Learn more at: [www.fertilitypedia.org/edu/reproductive-functions/fertilization](http://www.fertilitypedia.org/edu/reproductive-functions/fertilization)

**Folliculogenesis**
Development of ovarian follicles from primordial to tertiary under the stimulation of gonadotropins.
Learn more at: [www.fertilitypedia.org/edu/reproductive-functions/folliculogenesis](http://www.fertilitypedia.org/edu/reproductive-functions/folliculogenesis)

**Implantation**
The very early stage of pregnancy at which the embryo adheres to the wall of the uterus.
Learn more at: [www.fertilitypedia.org/edu/reproductive-functions/implantation](http://www.fertilitypedia.org/edu/reproductive-functions/implantation)

**Oogenesis**
The process of the maturation of the female gametes through the meiotic division.
Learn more at: [www.fertilitypedia.org/edu/reproductive-functions/oogenesis](http://www.fertilitypedia.org/edu/reproductive-functions/oogenesis)

**Ovulation**
The release of egg(s) from the ovaries.
Learn more at: [www.fertilitypedia.org/edu/reproductive-functions/ovulation](http://www.fertilitypedia.org/edu/reproductive-functions/ovulation)

---

### Risk factors

**Depression and anxiety disorders**
Disorder characterized by symptoms of both anxiety and depression that may cause sexual disorders and anovulation.
Learn more at: [www.fertilitypedia.org/therapy/rf/depression-and-anxiety-disorders](http://www.fertilitypedia.org/therapy/rf/depression-and-anxiety-disorders)
Drug addiction
Learn more at: www.fertilitypedia.org/therapy/rf/drug-addiction

Eating disorder
A mental disorder defined by abnormal eating habits that negatively affect a person's physical or mental health.
Learn more at: www.fertilitypedia.org/therapy/rf/eating-disorder

Heavy metal exposure
The toxic effect of certain metals in certain forms and doses on life.
Learn more at: www.fertilitypedia.org/therapy/rf/heavy-metal-exposure

High level of prolactin
The presence of abnormally high levels of prolactin in the blood.
Learn more at: www.fertilitypedia.org/therapy/rf/high-level-of-prolactin

High level of testosterone
A condition characterized by excessive levels of testosterone in the body.
Learn more at: www.fertilitypedia.org/therapy/rf/high-level-of-testosterone

Low level of estrogen
A diminished level of blood estrogen level.
Learn more at: www.fertilitypedia.org/therapy/rf/low-level-of-estrogen

Poor dietary habits
Eating habits are one of the few factors within our control that impact not only our chances of falling pregnant.
Learn more at: www.fertilitypedia.org/therapy/rf/poor-dietary-habits

Sedentary lifestyle
Type of lifestyle with no or irregular physical activity.
Learn more at: www.fertilitypedia.org/therapy/rf/sedentary-lifestyle

Smoking
Long-lasting inhalation of the smoke of burning tobacco.
Learn more at: www.fertilitypedia.org/therapy/rf/smoking-1

Toxin exposure
Toxins are small molecules, that are capable of causing disease on contact with or absorption by body tissues interacting with biologic macromolecules
Learn more at: www.fertilitypedia.org/therapy/rf/toxin-exposure
**Underweight**
Underweight is a term describing a person whose body weight is considered too low to be healthy.
Learn more at: [www.fertilitypedia.org/therapy/rf/underweight](http://www.fertilitypedia.org/therapy/rf/underweight)

---

**Symptoms**

**Absence of menstrual periods**
The absence of a menstrual period in a woman of reproductive age.
Learn more at: [www.fertilitypedia.org/edu/symptoms/absence-of-menstrual-periods-1](http://www.fertilitypedia.org/edu/symptoms/absence-of-menstrual-periods-1)

**Anxiety**
The emotional state characterized by unpleasant feelings such as uneasiness, worry, apprehension and dread.
Learn more at: [www.fertilitypedia.org/edu/symptoms/anxiety](http://www.fertilitypedia.org/edu/symptoms/anxiety)

**Breast pain**
A medical condition most frequently related to females.
Learn more at: [www.fertilitypedia.org/edu/symptoms/breast-pain](http://www.fertilitypedia.org/edu/symptoms/breast-pain)

**Decreased level of estrogens**
Decreased level of blood estrogen concentration.
Learn more at: [www.fertilitypedia.org/edu/symptoms/decreased-level-of-estrogens](http://www.fertilitypedia.org/edu/symptoms/decreased-level-of-estrogens)

**Depression**
The emotional state characterized by persistent feel of low self-esteem, loss of interest, sadness and negative attitude.
Learn more at: [www.fertilitypedia.org/edu/symptoms/depression](http://www.fertilitypedia.org/edu/symptoms/depression)

**Elevated insulin level**
The condition when there are elevated levels of insulin within the blood in relation to levels of glucose.
Learn more at: [www.fertilitypedia.org/edu/symptoms/elevated-insulin-level](http://www.fertilitypedia.org/edu/symptoms/elevated-insulin-level)

**Elevated level of prolactin**
Learn more at: [www.fertilitypedia.org/edu/symptoms/elevated-level-of-prolactin](http://www.fertilitypedia.org/edu/symptoms/elevated-level-of-prolactin)

**Elevated testosterone level**
The presence of elevated testosterone concentration within the circulating blood.
Learn more at: [www.fertilitypedia.org/edu/symptoms/elevated-testosterone-level](http://www.fertilitypedia.org/edu/symptoms/elevated-testosterone-level)
Excessive facial and body hair growth in women
The excessive hairiness on women in those parts of the body where terminal hair normally is absent or minimal, such as a beard or chest hair.
Learn more at: www.fertilitypedia.org/edu/symptoms/excessive-facial-and-body-hair-growth-in-women-1

Infrequent menstruation
The medical term for infrequent, often light menstrual periods (intervals exceeding 35 days).
Learn more at: www.fertilitypedia.org/edu/symptoms/infrequent-menstruation-1

Irregular menstruation
Irregular menstruation is a menstrual disorder whose manifestations include irregular cycle lengths as well as metrorrhagia
Learn more at: www.fertilitypedia.org/edu/symptoms/irregular-menstruation

Overweight
Body weight that’s greater than what is considered healthy for a certain height.
Learn more at: www.fertilitypedia.org/edu/symptoms/overweight

Premenstrual syndrome
A combination of physical and emotional disturbances that occur after a woman ovulates and ends with menstruation.
Learn more at: www.fertilitypedia.org/edu/symptoms/premenstrual-syndrome

Thyroid gland disfunction
A medical condition that affects the function of the thyroid gland.
Learn more at: www.fertilitypedia.org/edu/symptoms/thyroid-gland-disfunction

Underweight
A term describing a person whose body weight is considered too low to be healthy.
Learn more at: www.fertilitypedia.org/edu/symptoms/underweight

Therapies

Acupuncture
A form of alternative medicine and a key component of traditional Chinese medicine involving thin needles inserted into the body at acupuncture points
Learn more at: www.fertilitypedia.org/edu/therapies/acupuncture
Egg donation
Process by which a woman donates eggs for purposes of assisted reproduction or biomedical research.
Learn more at: www.fertilitypedia.org/edu/therapies/egg-donation

Hormone replacement therapy
Learn more at: www.fertilitypedia.org/edu/therapies/hormone-replacement-therapy

ICSI
A micromanipulative fertilization technique in which a single sperm is injected directly into an egg.
Learn more at: www.fertilitypedia.org/edu/therapies/icsi

Lifestyle change
The way a person lives.
Learn more at: www.fertilitypedia.org/edu/therapies/lifestyle-change

Medical nutrition therapy
It is a therapeutic approach to treating medical conditions and their associated symptoms via the use of a specifically tailored diet.
Learn more at: www.fertilitypedia.org/edu/therapies/medical-nutrition-therapy

Ovarian drilling
A surgical treatment that can trigger ovulation in women with polycystic ovary syndrome (PCOS).
Learn more at: www.fertilitypedia.org/edu/therapies/ovarian-drilling

Pharmacotherapy of anovulation
Learn more at: www.fertilitypedia.org/edu/therapies/pharmacotherapy-of-anovulation

Physical exercise
Physical exercise is any bodily activity that enhances or maintains physical fitness and overall health and wellness.
Learn more at: www.fertilitypedia.org/edu/therapies/physical-exercise-1

Sperm donation
The procedure in which a man (sperm donor) provides his sperm for fertility treatment.
Learn more at: www.fertilitypedia.org/edu/therapies/sperm-donation

Standard IVF
A process in which an egg is fertilised by sperm outside the body: in vitro. Own or donated gametes may be used.
Learn more at: www.fertilitypedia.org/edu/therapies/standard-ivf
**Traditional Chinese medicine**
A broad range of medicine practices sharing common concepts which have been developed in China and are based on a tradition of more than 2000 years.
Learn more at: www.fertilitypedia.org/edu/therapies/traditional-chinese-medicine

**Yoga**
A physical, mental, and spiritual practice or discipline which originated in India.
Learn more at: www.fertilitypedia.org/edu/therapies/yoga

**Sources**

“Polycystic ovary syndrome (https://en.wikipedia.org/wiki/Polycystic_ovalary_syndrome)” — *sourced from Wikipedia* licensed under CC BY-SA 3.0

“Anovulation (https://en.wikipedia.org/wiki/Anovulation#Hormonal_or_chemical_imbalance)” — *sourced from Wikipedia* licensed under CC BY-SA 3.0

“Anovulatory cycle (http://www.wikidoc.org/index.php/Anovulatory_cycle)” — *sourced from Wikidoc* licensed under CC BY-SA 3.0

“Anovulatory (http://www.worldlibrary.org/articles/anovulatory)” — *sourced from World Heritage Encyclopedia* licensed under CC BY-SA 3.0

“Hypothyroidism (https://en.wikipedia.org/wiki/Hypothyroidism)” — *sourced from Wikipedia* licensed under CC BY-SA 3.0

“Hyperthyroidism (https://en.wikipedia.org/wiki/Hyperthyroidism)” — *sourced from Wikipedia* licensed under CC BY-SA 3.0

“Hyperprolactinaemia (https://en.wikipedia.org/wiki/Hyperprolactinaemia)” — *sourced from Wikipedia* licensed under CC BY-SA 3.0

“Anovulation (http://worldheritage.org/article/WHEBN0000692141/Anovulation#Functional_problem)” — *sourced from World Heritage Encyclopedia* licensed under CC BY-SA 3.0

“Ovulation (https://en.wikipedia.org/wiki/Ovulation)” — *sourced from Wikipedia* licensed under CC BY-SA 3.0

“Signs of infertility (http://www.progesteronetherapy.com/signs-of-infertility.html#axzz3yOHTRHoF)” — *sourced from Progesterone Therapy* licensed under CC BY 3.0


“Clomifene (https://en.wikipedia.org/wiki/Clomifene)” — *sourced from Wikipedia* licensed under CC BY-SA 3.0

“Tamoxifen (https://en.wikipedia.org/wiki/Tamoxifen)” — *sourced from Wikipedia* licensed under CC BY-SA 3.0

“Comparison between tamoxifen and clomiphene citrate for induction of ovulation and successful conception in polycystic ovarian syndrome (http://www.scopemed.org/?jft=89&ft=89-1437027946)” — by *Hassan* licensed under CC BY-NC 3.0