NEET Revision Notes
Biology
Reproductive Health

Introduction:

Introduction: The World Health Organisation (WHO) defines reproductive health as overall well-being in all factors of reproduction. This includes the physical, emotional, behavioural, and social aspects of health.

Problems and Solutions in Reproductive Health

- India was one of the first countries in the world to implement a family planning program in 1951.
- Reproductive health plays an essential role in the overall health of a person or population. The following are some critical concerns:
  - ➢ Pregnancy, childbirth, and unsecure abortion complications
  - ➢ Young people have the highest rates of infection with sexually transmitted diseases including AIDS.
  - ➢ Due to premature pregnancy and childbearing, young mothers have low education and income.
- **Reproductive and Child Health Care (RCH) programs** are advanced programs that cover a broader range of reproduction-related topics.
- Health and education of young people, as well as marriage and childbearing during grown-up stages of life, are critical factors to a society's reproductive health.

Programs for reproductive health:

- Using audio-visual and print media, raise awareness in both genders about various reproduction-related issues.
- Focus on providing sex education in schools to protect young students from sex-related myths and misconceptions.
- Give detailed information about reproductive organs and adolescent development.
- Educating people of marriageable age about birth control methods, prenatal and postnatal care for mothers and children, and so on.

Population Explosion and Birth Control

- **Human population explosion** refers to the rapid increase in human population size in a very small period of time.
- Fertility, mortality, natality, migration, age, and sex structure all influence population growth rates.
- The regulation of conception through preventive methods or devices to restrict the number of offspring is defined as **birth control**.
- **Contraception** is a method of birth control that prevents fertilisation.
- Contraceptive methods are effective and come in two varieties: **temporary** and **permanent**.
- **Temporary methods** include natural methods, chemical methods, mechanical modes, physiological devices, and hormonal methods, whereas sterilisation is a **permanent method.**
- **Natural methods** use the principle of reducing the chances of ovum and sperm meeting. It consists of a **safe period** as well as **lactational amenorrhea**. Sexual intercourse is considered safe one week before and one week after periods. The concept is founded on the following facts:
  - ➢ On the 14th day of menstruation, ovulation occurs.
  - ➢ The Ovum lives for approximately two days.
  - ➢ Sperms live for about three days.
- **Periodic abstinence** is such a method during which couples refrain from having sexual relations from day 10 to 17 of the menstrual cycle when ovulation is likely. The **fertile period** is so named because the chances of fertilisation are so high during this time.
- **Withdrawal or coitus interruptus:** It is one of the oldest methods. In this method, the male partner pulls back his penis from the vagina a little before ejaculation to avoid insemination. This method has some drawbacks, such as males producing lubricating fluid, which contains some sperm.
- **Lactational Amenorrhea (absence of menstruation):** Because the method is based on ovulation, the cycle does not take place during the intense lactation period. As a result, as long as the mother breastfeeds her child entirely, the chances of conception are nearly nil.
- **Chemical methods** imply the use of spermicides such as lactic acid, boric acid, citric acid, and potassium permanganate. When foams, jellies, pastes, and creams are introduced into the vagina before sexual intercourse, they adhere to the mucous membrane and decapitate the sperm by blocking oxygen intake.

- **Mechanical methods** use barriers to prevent ovum and sperm from physically meeting. These methods are available for both sexes. Mechanical methods include the use of condoms, diaphragms, vaults, cervical caps, and intrauterine devices (IUDs).
  - ➢ **Condoms** are barriers made from thin rubber sheet-like components that are used to conceal the male penis so that ejaculated sperm does not approach the female reproductive tract, preventing conception.
  - ➢ **Diaphragms, vaults, and cervical caps** are rubber structures that are embedded into the female reproductive tract to cover the cervix during intercourse. This inhibits conception by preventing sperm from entering the cervix. These can be used multiple times.
  - ➢ **Intrauterine devices (IUDs):** Doctors insert intrauterine devices (IUDs). These are implanted into the uterus via the vaginal canal. **Non-medicated IUDs,** like **copper-releasing IUDs and hormone-releasing IUDs,** are presently accessible. IUDs boost sperm phagocytosis within the uterus, leading to the release of Cu ions. These Cu ions reduce sperm motility and fertilising capacity. IUDs are released by the hormone. IUDs are contraceptive devices that delay pregnancy. It is among the most extensively used contraception methods in India.

- **Physiological devices**: **Birth control pills** are examples of physiological devices.
  - ➢ Another method of contraception for females is to take small doses of progestogens or a progestin-oestrogen combination orally. These are commonly referred to as pills because they are consumed in the form of tablets.
  - ➢ **Saheli** is a new female oral contraceptive. Scientists at the **Central Drug Research Institute in Lucknow, India,** created it.
  - ➢ Another pill, **Mala D**, is consumed daily, whereas the pill **Saheli** is taken once a week.
  - ➢ Females can use progestogens as implants under the skin (when combined with oestrogen) or injections.

- **Surgical methods**: Surgical methods, also known as **sterilisation**, are generally recommended for the male/female partner as a last resort to prevent further pregnancies.

- ➢ Surgical intervention prevents gamete transport and thus conception. Male sterilisation procedures are referred to as 'vasectomy,' while female sterilisation procedures are referred to as 'tubectomy.'
- ➢ A tiny portion of the vas deferens is eliminated or tied up through a surgical hole on the scrotum in a vasectomy, whereas a tiny portion of the fallopian tube is eliminated or tied up through a tiny hole in the abdomen or via the vagina in a tubectomy.

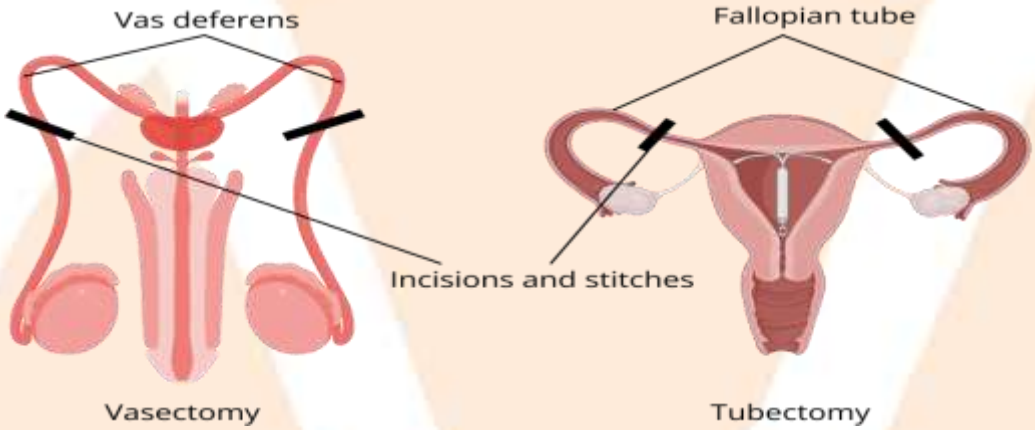

Image: Vasectomy and Tubectomy

Table: Method of Birth Control

S. No.	Method	Action
1	Rhythm method	No intercourse during women's fertile period (day 12-20)
2	Withdrawal	Penis is withdrawn before ejaculation.
3	Tubectomy/Tubal ligation	Women's fallopian tubes are cut and tied, permanently blocking sperm release.
4	Vasectomy	Man's vasa deferentia are cut and tied permanently blocking sperm passage.
5	Intrauterine device (IUD)	A small T-shaped birth control tool that is implanted into the uterus to avoid pregnancy is known as an intrauterine device (IUD).
6	Oral contraceptive	Oral contraceptives, also known as birth control pills, are a type of synthetic steroid hormone that suppresses the release of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) from the pituitary gland's anterior lobe in the female body.

7	Male condom	A male condom is a sheath-shaped barrier device that is used during sexual contact to reduce the possibility of pregnancy or sexually transmitted infection.
8	Female condom	Female condoms are a type of barrier contraception that is worn inside the vagina. They inhibit pregnancy by preventing sperm from contacting an egg.
9	Diaphragm	A diaphragm or cap is a type of contraception barrier. It is designed to fit inside the vagina and prevent sperm from passing through the cervix.
10	Cervical cap	A cervical cap is a tiny silicone or rubber cup that is inserted into the vagina before sexual contact to aid in the prevention of pregnancy.
11	Foams, creams, jellies, etc.	Chemical spermicides inserted in the vagina before intercourse
12	Implant (Norplant)	Capsules surgically implanted beneath the skin gradually release a hormone that prevents ovulation.
13	Injectable contraceptive (Depo-Provera)	Every three months, an injection of a hormone that inhibits ovulation is given.

Amniocentesis

- Amniocentesis is a pre-diagnostic procedure used to determine the
  - ➢ Gender of the developing baby.
  - ➢ Genetic disorders
  - ➢ Foetal metabolic disorders
- The following steps are involved in the **amniocentesis procedure:**

1. **Sonography** is used to determine the location of the foetus in order to avoid accidental damage to the foetus.
2. To complete the procedure, a fine **hollow needle** is transferred through the abdominal as well as uterine walls of a pregnant woman. There is a minimal amount of amniotic fluid released. It contains foetal skin cells as well as a variety of proteins, particularly enzymes.

Significance of Amniocentesis

Sex Determination

- To identify the existence of sex chromatin, the somatic cells of fetal skin drawn with amniotic fluid are stained further.
- The presence of a **Barr body** implies that the developing foetus is female and has two X-chromosomes, one of which is active and the other is heterochromatic into such a darkly stained Barr body.

Congenital Disorder

- Abnormalities caused by changes in chromosome number, such as Down's syndrome, Klinefelter's syndrome, Turner's syndrome, and others, can be determined through studies of somatic cells.

Metabolic Disorder

- Various types of innate metabolic disorders like phenylketonuria, alkaptonuria, etc. can be identified using amniotic fluid enzyme analysis.
- These inherent errors are caused by gene mutations that result in the absence or lack of activity of specific enzymes. So, if amniocentesis confirms that the child is prone to suffer from an abnormality that cannot be corrected, the mother can have an abortion.

Drawbacks of Amniocentesis

- However, amniocentesis is also being abused these days. If the foetus is female, the mother is even forced to abort it. This is the same as killing a normal child. So, on January 1, 1994, the Government of India imposed the Pre-natal Diagnostic Techniques Act, under which all genetic counselling centres and laboratories are needed to apply for registration.
- An infringement of this act can result in an Rs. 50,000 fine and imprisonment for two years.
- If some doctors pursue to check the gender of a child, the doctor's certification is also cancelled.

Chorionic Villus Sampling (CVS)

- Only after the 16th week of pregnancy is amniocentesis possible without the risk of injuring the foetus with the needle. Abortion is not currently safe.
- **Chorionic Villus Sampling (CVS)** is a new technique that can be used during the 8th - 10th week of pregnancy when abortion is secured for the woman.
- Cells are squeezed into a catheter that is transferred through the cervix for CVS. The CVS technique generates a large number of rapidly dividing foetal cells, allowing for the investigation of chromosomal disorders.

Medical Termination of Pregnancy (MTP)

- Medical termination of pregnancy (MTP) refers to the intentional or voluntary termination of a pregnancy before full term. It is also called Induced abortion.
- Every year, approximately 45 to 50 million MTPs are conducted worldwide, accounting for one-fifth of all conceived pregnancies.
- In 1971, the Indian government legalised MTP under strict conditions to prevent its misuse.
- During the first trimester, or up to 12 weeks of pregnancy, MTPs are regarded as relatively safe.
- Misoprostol and mifepristone work well together.
- MTP is used to end unwanted pregnancies in which continuing the pregnancy would be harmful or even fatal to the mother, the foetus, or both.

Sexually Transmitted Diseases (STDs)

- Sexually transmitted diseases (STDs), venereal diseases (VDs), and reproductive tract infections are all terms for diseases that are spread through sexual contact (RTI).
- A variety of bacterial, viral, fungal, and protozoan agents end up causing these diseases.

Disease	Pathogen
Bacterial	
Syphilis	*Treponema pallidum*
Gonorrhoea	*Neisseria gonorrhoeae*
Chancroid	*Haemophilus ducreyi*

Vaginitis	*Gardnerella vaginalis*
Chlamydiasis	*Chlamydia trachomatis*
Viral	
Herpes genitalis	HSV-2 (DNA) virus
Condyloma acuminatum	Papova (DNA) virus
Molluscum contagiosum	Pox (DNA) virus
Protozoan	
Trichomoniasis	*Trichomonas vaginalis*

- Complications from these diseases include pelvic inflammatory disease (PID), stillbirths, abortions, ectopic pregnancies, infertility, and even cancer of the reproductive tract.
- Some of these infections, such as hepatitis B and HIV, can also be transmitted through the sharing of surgical instruments, injection needles, and so on with infected people, blood transfusion, or from an infected mother to the foetus.
- Other diseases, with the exception of genital herpes, hepatitis B, and HIV infections, are completely curable if identified early and treated appropriately.
- Preventing sex with multiple or unknown partners can help prevent the spread of sexually transmitted diseases. Using condoms during sexual encounters.
- Consultation with trained doctors for early detection and comprehensive treatment if detected with the disease.

Infertility

- Infertility is defined as the inability to conceive or bear children after two years of unsafe sexual cohabitation.
- Several methods are already available to assist such couples.

Assisted reproductive technology (ART)

➢ It refers to all fertility treatments that use both sperm and eggs. The art procedure entails surgically eliminating eggs from a mother's ovaries, incorporating them with sperm in a laboratory, and either

returning the eggs to the woman's body or giving them away to another woman.

➢ The most common ART techniques include

1) In vitro fertilisation (IVF)
2) Intracytoplasmic sperm injection (ICST)
3) Zygote intrafallopian transfer (ZIFT)
4) Gamete Intrafallopian Transfer (GIFT).
5) Surrogacy, also known as surrogate motherhood.

In-vitro fertilisation (IVF):

- The most widely used assisted reproductive technology (ART) is in vitro fertilisation.
- In vitro fertilisation is performed outside the body under specific laboratory conditions by fusing ova from a female donor and sperm from a male donor.
- This produces a zygote, also known as a test-tube baby. Following embryo culture, an embryo is passed to the mother's uterus.
- This procedure is commonly used on women who have damaged or blocked Fallopian tubes.

IVF example: Test tube baby

- Test Tube baby program is in vitro fertilisation followed by embryo transfer into the female genital tract.
- Dr. Petrucci, an Italian scientist, made the first attempt to create a test-tube baby. Despite the fact that this human embryo only lived for 29 days, his experiment marked a turning point in biological science. Lesley and Gilbert Brown gave birth to the first test-tube baby on July 25, 1978, in England.
- Louise Joy Brown was the name of the world's first test-tube baby who was a baby girl. Test-tube babies were later born in Australia, the United States, and other countries. Durga, India's first test-tube baby, was born on October 3, 1978, in Kolkata.
- In the test-tube baby program, female ova and male sperm are collected and stimulated to form zygotes in the laboratory under simulated conditions.

- The zygote or early embryos can then be transmitted into the fallopian tube, and embryos having more than 8 blastomeres could be transferred into the uterus to finish their development. Embryos created by the fusion of gametes inside the female could also be used for such transport to help infertile women.

Zygote intrafallopian transfer (ZIFT)

- IVF is analogous to zygote intrafallopian transfer (ZIFT), also referred to as Tubal Embryo Transfer.
- ZIFT is an ART method in which fertilisation is performed in a laboratory. The zygote is transferred to the mother's Fallopian tube via laparoscopy.
- ZIFT is carried out in the following steps: egg retrieval from the ovaries, fertilisation, transporting the zygote into the uterus for implantation, and further development.
- ZIFT is not recommended for women who have abnormal uterine tubes.

Intra cytoplasmic sperm injection (ICSI)

- Another specialised procedure for forming an embryo in the laboratory is intracytoplasmic sperm injection (ICSI), in which a sperm is straight injected into the ovum.
- Infertility cases caused by the male partner's inability to inseminate the female or by very poor sperm counts in the ejaculates could be treated with artificial insemination.
- In this technique, the semen obtained from the husband or a healthy donor is mechanically introduced into the female's vagina or uterus.

Gamete Intra-Fallopian Transfer (GIFT)

- GIFT is the most recent method of childbirth.
- In a cycling female, sperm and ovum obtained via laparoscopy are infused into the middle of the oviduct via a separate catheter.
- Fertilisation and zygote formation are more natural in GIFT because they occur within the female body.
- However, this method is only used if the sperm count is sufficient and at least one fallopian tube is fully operational. GIFT is an IVF alternative.

Surrogacy

- Surrogate motherhood is a byproduct of artificial insemination.
- It implies that a woman consents to the injection of another couple's fertilised ovum into her womb. Then she carries another couple's pregnancy to term.

Points to remember:

- Reproductive health is defined as overall well-being in all aspects of reproduction, including physical, psychological, behavioural, and social well-being.
- Our country was the first in the world to initiate various national action plans aimed at achieving a reproductively healthy society.
- Counseling and raising public awareness about adolescence, reproductive organs, and related changes, safe and sanitary sexual practises, sexually transmitted infections (STIs) including AIDS, and other topics is the first step toward reproductive health.
- Another crucial component of the Reproductive and Child Health Care programmes is the provision of medical facilities and care for problems such as menstrual irregularities, pregnancy-related issues, child delivery, medical pregnancy termination, STIs, contraception, infertility, post-natal child and maternal management.
- Our country's reproductive health has improved overall, as evidenced by lower maternal and child mortality rates, early diagnosis and treatment of STIs, guidance to infertile couples, and so on. Improved health care and living conditions aided in the explosive growth of the population.
- Such expansion necessitated the aggressive dissemination of contraceptive methods. There are numerous contraceptive methods available today, including natural, barrier, traditional, IUDs, pills, injectables, implants, and surgical methods.
- Contraception is not a regular requirement for reproductive health, but it is required to use it to prevent pregnancy or to delay pregnancy.
- In our country, abortion on medical grounds is legal. MTP (Medical Termination of Pregnancy) is commonly used to end an unwanted pregnancy caused by rape, a casual relationship, or other circumstances, as well as when the continuation of the pregnancy would be harmful or indeed fatal to either the mother, the unborn child, or both.
- Sexually Transmitted Diseases are infections or diseases spread through sexual contact (STIs). Some of the complications are Pelvic Inflammatory

Diseases (PIDs), stillbirth, and infertility. Early detection aids in the treatment of these diseases. Avoiding sexual contact with unknown/multiple partners and using condoms during coitus are two simple precautions to take to avoid contracting STIs.

- Infertility is defined as the inability to give birth or produce children after two years of unprotected sexual cohabitation. Several methods are now available to assist such couples.
- One such method is in vitro fertilisation preceded by embryo transfer into the female genital tract, also known as the 'Test Tube Baby' Programme.