

A REVIEW ON MODERN METHODS OF CONTRACEPTION

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ABSTRACT

Unintended pregnancy is a worldwide problem with major consequences for women, families and society, including abortion, infertility, and maternal mortality. Despite the fact that existing contraceptive methods are frequently used in people's lives. Despite the fact that present contraceptive techniques are widely utilised in people's lives, feedback has been unsatisfactory due to low contraceptive efficacy and concomitant adverse effects. Using data from the Indian National Family and Health Survey-4 (2015-2016), we assessed the proportion of partnered women aged 15-49 years who were happy with modern contraceptive methods in terms of family planning demand. Modern contraceptive treatments are reversible and long-acting, owing mostly to improved delivery channels and controlled medication distribution. Given the high incidence of unwanted pregnancy in the United States, doctors must be well-versed in the whole range of contraception alternatives in order to increase reproductive autonomy. Transdermal sprays and gels, combined injectable contraception, transdermal contraceptive patches, subdermal implants, and vaginal rings are all included in this review.

KEYWORDS: Subdermal implants, Combined injectable contraceptives, Transdermal patches and vaginal rings.**INTRODUCTION**

Contraception is a method or device for preventing pregnancy. Fertility control is a method or equipment for preventing pregnancy. Contraceptive procedures are used to help women avoid unintended births. They cover all temporary and permanent methods of preventing pregnancy as a result of coitus. Contraception is useful for family planning and plays a significant role in the lives of many women. Safe, effective, acceptable, affordable, reversible, simple, and long-lasting contraception options are ideal. Unintended pregnancy is a global issue with serious ramifications for women, their families, and society, including abortion, infertility, and maternal death. There are approximately 85 million unwanted pregnancies and 40-60 million abortions worldwide each year. Abortion inevitably damages the female endometrium, which can cause menstrual disorder, uterine adhesion, intrauterine infection, habitual abortion, and even lifelong infertility. According to the report from the World Health Organization (WHO) to investigate the effectiveness of contraceptive methods in 2020, traditional therapies e.g., sperm-egg fusion disruption alone, emergency drug contraception, and standard date calculation are all not effective in

contraception. In addition, although both male and female sterilization have low rates of re-pregnancy, they do not meet the requirements of post-contraceptive reproduction and protection against the risk of future child demise.^[1]

These finding already suggested the need for greater focus on improving access to reversible methods, especially for women who to delay or space pregnancies but are not ready to commit to ending their fertility. Family planning policies in India have historically been aimed at controlling population growth rather than advancing women's reproductive rights and choices. The modern methods among women aged 15-49 years who are currently married or in union. This indicator is defined as the proportion of women using a modern contraceptive method among those in need of contraception. Women who are fecund and do not want to become pregnant within the next 2 years, or who are unsure about whether or when they want to become pregnant. If they are married for five years or more, did not use contraception and had not gotten pregnant in that period is reported that they cannot get pregnant and menopause, hysterectomy or never menstruated the last

period more than 6 months ago and are not postpartum amenorrhea. To address women's need for family planning, the provision of a wide range of safe, effective and affordable contraceptive methods is essential. The mix of methods offered must cater to women's needs and preferences. It is also important to note that every contraceptive method has advantages and disadvantages. Thus, it is essential that women are fully informed about them so they can make an informed decision on which method is more appropriate for their specific situation. A nationally representative study found that India's demand for family planning satisfied (DFPS) with modern contraceptive methods was 70% in 2005, with heavy reliance on female sterilization rather than reversible contraceptive methods. These findings already suggested the need for greater focus on improving access to reversible methods, especially for women who wish to delay or space pregnancies but are not ready to commit to ending their fertility. Family planning policies in India have historically been aimed at controlling population growth rather than advancing women's reproductive rights and choices.^[2]

REPRODUCTIVE SYSTEM AND FERTILISATION

The reproductive system refers to the tissues, glands, and organs required for the reproduction of human offspring. Regulated by the neuro-endocrine system, the system is responsible for the maturation of sperm and eggs, fertilization, pregnancy, and childbirth. The main contraceptive methods intervene in the early stages of the pregnancy by inhibiting the secretion of hormones or cytokines, blocking pathways, and altering the environment of implantation in the uterus, which prevents the maturation of the sperm and egg, cuts of the sperm-egg fusion pathway and interfere with the implantation of the fertilised egg.^[3]

Male Reproductive System and Spermatogenesis

A male reproductive system is a group of organs that can promote sperm maturation, storage, and ejaculation, as well as secrete androgens for development and maintain androgynous characteristics. It consists mainly of the gonads (testis), the vas deferens (epididymis, vasdeferens, ejaculatory ducts, and urethra), the accessory glands (seminal vesicle glands, prostate gland and urethral bulb glands), the scrotum, and the penis. During sexual arousal, the penis is engorged with blood causing penis erection. With the sexual stimulation continuing, the smooth muscle of the epididymis contracts to push sperm into the vas deferens, which is located in the spermatic cord. The vas deferens is connected to the seminiferous ducts near the prostate and carries the sperm to the ejaculatory ducts to reach the female vagina.^[4]

Female Reproductive System and Fertilization

The female reproductive system plays a critical role in ovulation, fertilization, pregnancy, childbirth, promoting growth, as well as developing and maintaining female

secondary sexual characteristics. It consists mainly of the internal genitalia, including the vagina, uterus, fallopian tubes and ovaries, and the vulva. Unlike the male reproductive system, the female reproductive system has a regular menstrual cycle and ovulation regulated by the hypothalamic-pituitary-gonadal axis.

The menstrual cycle refers to the cyclical changes in the functional layer of the endometrium under the cyclical action of estrogen and androgens secreted by the ovary from puberty, and the process of endometrial exfoliation, bleeding, repair and proliferation occurs every 28 days, including the follicular phase, ovulation phase, and luteal phase. The ovulation period generally occurs approximately 14 days before the next menstrual cramp. Similarly, GnRH secreted by the hypothalamus stimulates the anterior pituitary to release FSH and LH. Under the stimulation of FSH, the granulosa cells in the ovary secrete estradiol and inhibin, and the negative feedback regulates the secretion of the hypothalamus and pituitary gland so that the level of FSH gradually decreases. The sperm and egg fusion in the abdomen of the fallopian tube and complete the fertilization process to form a zygote. The zygote remains in the fallopian tube for 3 days and undergoes a series of cell divisions, differentiation, and eventually the formation of a mulberry embryo. The mulberry embryo moves along the fallopian tube towards the horn of the uterus and enters the uterus in the form of an embryo. Over approximately 6 days, the zygote develops into a blastocyst and completes its implantation in the endometrium, while actively secreting human chorionic gonadotropin (hCG), which allows the corpus luteum to continue to produce progesterone, thus maintaining the thickened endometrium for the continuation of the pregnancy.^[5]

CONVENTIONAL METHODS^[6]

- Pills
- Condoms
- Spermicide
- Fertility Awareness
- Lactational Amenorrhea
- Vasectomy
- Tubal Ligation
- Progestin-Only Pill
- Intrauterine Device

MODERN CONTRACEPTIVE METHODS

- Subdermal Implants
- Combined Injectable Contraceptives
- Transdermal Patches
- Vaginal Rings

Subdermal Implants

Sub-dermal implants are a long-term birth control method. They're also called long-acting reversible contraception, or LARC. A contraceptive implant is a small, flexible plastic rod like device that inserts in the upper arm of the body. The implant is about 1.6 inches in

long 4 cm and approximately one-eighth inch in diameter. It's flexible and about the size of a matchstick. The implant releases a low, steady dose of the hormone progestin into your bloodstream. Progestin prevents pregnancy by pausing ovulation. And it thickens the mucus of the cervix. This makes it hard for sperm to reach an egg.^[8]

Progestin also thins the lining of the uterus. If sperm do reach an egg, this makes it harder for the fertilized egg to attach to the uterus. The original implant, Implanon, was replaced by the Nexplanon, in some countries named Implanon NXT. These devices contain the same dose of etonogestrel but come with an improved pre-loaded inserter, which makes correct sub dermal placement easy. Correct placement is essential for easy removal. The core contains barium sulphate detectable by x-ray, allowing providers an additional option to check for correct positioning if palpation fails. The Norplant capsule is implanted below the skin by minor surgery. It suppresses ovulation, creates thick cervical mucus which prevents sperms from entering the cervix and also creates a thin, atrophic endometrial lining. It is not related to coitus. It is suitable for women seeking continuous contraception.



Fig. 1: Subdermal Implant.

Advantages^[8]

- It is very inexpensive method of long-term contraception, comparable to intrauterine devices.
- Efficacy for three years
- Easily removed in most cases to allow pregnancy to naturally occur.
- It reduces the risk of pelvic inflammatory disease.
- Improve patient compliance.

Disadvantages

- Mini-surgery is needed, arm pain and painful removal.
- Irregular bleeding, cramping.
- Headache, nausea, weight change, rash, hair growth or loss.
- Vision problem.

Combined Injectable Contraceptives

It is a birth control method that contains two hormones, progestin and estrogen. It is short-term reversible contraceptive method is effective for three months. The

injection is given in the upper arm, thigh or buttocks every 12 to 13 weeks (four times a year). Prevents the ovary from releasing an egg, Thickens the cervical mucus making it difficult for sperm to get to the egg. The injectable should be administered by a trained provider every three months to maintain protection from unintended pregnancies. The progestin –only injectable does not contain estrogen. These inhibit ovulation and also increase the viscosity of the cervical secretions to form a barrier to sperms. It is a 99% effective, easily administered method, suitable during lactation too. It has non-contraceptive advantages, like recession of ovarian cysts or breast lumps. Menstrual cycle may become irregular, spotting or cease altogether as long as the injectable are used. There may be gain in weight and return to fertility may take time. Subsequent injections should not be delayed more than 2 weeks from the prescribed date. Counseling and support are needed for women when this method is chosen.^[9]

Advantages

- It is effective and reversible.
- Semi- long acting hormonal method without the need for a daily dose.
- Progestin only injections can be used during breast feeding.
- Reduces risk of endometrial cancer.

Disadvantages

- It causes decrease in bone density.
- No protection in sexual transmitted disease.
- Delayed return of fertility.
- May induced headaches, dizziness, spotty skin, tender breasts, mood swings, weight gain and blotting.

Transdermal Patches

The birth control patch is a type of contraception that contains the hormones estrogen and progestin. You wear the patch to avoid becoming pregnant. The patch is attached to lower abdomen, buttocks, upper body are absorbed through the skin, inhibiting the production of FSH and LH. Once a week for three weeks, you place a small patch on your skin, so that you wear a patch for a total of 21 days. During the fourth week, you don't wear a patch which allows menstrual bleeding to occur. The birth control patch works similarly to combination birth control pills. The birth control patch prevents pregnancy by releasing hormones into your bloodstream that keep your ovaries from releasing an egg (ovulation). The birth control patch also thickens cervical mucus to keep sperm from reaching an egg. The transdermal contraceptive patch was developed to provide a similar reversible contraceptive with a more convenient dosing schedule that would enhance patient compliance and achieve high contraceptive efficacy.^[10,11]

When applied to the skin, the patch delivers the two active ingredients into the systemic circulation. Because

the patch is a transdermal delivery system, the doses of estrogen and progestin delivered cannot be compared with the doses of estrogen and progestin in an oral contraceptive. The primary mechanism of action is inhibition of ovulation. In addition, the contraceptive patch produces an endometrium that is not receptive to ovum implantation, and cervical mucus which becomes thick and hostile to sperm transport. Tubal and endometrial motility are slowed. The Patients using the patch should receive counselling about and, as needed, prescriptions for emergency contraception. These warning states that a patient using the patch will be exposed to about 60% more estrogen than if the patient had been using a typical birth control pill containing 35 mcg of estrogen. The risk of venous thromboembolic disease (blood clots in the legs and/or the lungs) may be increased with Ortho Evra compared with that of oral contraceptives containing a norgestimate and 35 mcg of estrogen.^[13,14]



Fig. 2: Transdermal Patch.

Advantages

- A reversible and highly effective birth control method.
- Only change in once a week.
- Regulates menstrual cycle and reduces cramps.
- It reduces the risk of cancer.
- It improves adherence.

Disadvantages

- It does not protect against sexual transmitted disease.
- Less effective if over 90 kgs.
- It possible skin irritation.
- May cause irregular bleeding or spotting.

Vaginal Rings

The vaginal ring it is a form of contraception. It's a small, flexible ring that's worn inside the vagina. It releases the same hormones as the contraceptive pill to prevent pregnancy. The vaginal ring can also help control the periods. It's sometimes called a 'birth control'. Stopping the ovaries from releasing an egg. Changing the cervical mucus to prevent sperm from reaching an egg. The vagina has the unique anatomical advantage of serving as the only route for sperm to enter the woman's body during intercourse, while the elastic

folds of the vagina itself provide the basis for long-term device placement. Compared to the gastrointestinal tract, vaginal long-acting contraception has lower drug interactions and dose of drugs, greatly increasing the biocompatibility and bioavailability of the device. Faster hormone absorption in vaginal epithelium, sustained local release with a lowerrisk of triggering hormonal side effects made the ring more appealing. In addition, long-acting vaginal contraception can significantly improve user compliance compared to subcutaneous implants, thus ensuring better contraceptive outcomes. The vaginal ring is an intra vaginal cyclic contraceptive device made of hormones together with polymeric compounds with slow release capability.^[16]



Fig. 3: Vaginal Ring.

Advantages

- Easy to use and comfortable to wear. You don't have to remember to take it daily.
- It's safe for women with latex allergies.
- It can be removed at any time if you wish to get pregnant.
- Less hormonal side effects than other contraceptives.
- It regulates menstrual cycle.

Disadvantages

- It also doesn't protect against sexually transmitted infection.
- The vaginal ring can be more expensive than the pill.
- There is a small risk of blood clots, heart attack and stroke associated with using the vaginal ring.
- May cause vaginal discomfort.

CONCLUSION

People desires and usage scenarios have resulted in the development of an expanding variety of long-term reversible contraceptive choices and devices. Over the last two decades, the development of numerous types of modern contraceptive methods has improved the inferiority of conventional contraceptive methods, with research demonstrating more effective medication delivery, more stable physical barrier effects, quicker reversible recovery, and less surgical injury. Recent breakthroughs in the creation of highly effective reversible contraceptive methods have mostly focused on improving device insertion and removal ease, making

these procedures more acceptable to young and nulliparous women. Finally, I determined that current contraceptive methods are more effective than traditional methods since they are reversible over time. It is a safer, more effective, and more stable technique.

REFERENCES

1. Abigail R.A. Aiken and James Trussell *et. al.* Recent advances in contraception. *F1000 Prime reports*, 2014; 113(6): 1-6.
2. Agnieszka Skrzeckzkowska, Jerzy Heimrath, Justyne Surdyka *et. al.* Knowledge of contraceptive methods among adolescents or young adults. *Pol J Public health*, 2015; 125(3): 144-148.
3. Alexa Nicole Fiffick, Tara K.Iyer, Tiggany Cochran *et.al.* Update on current contraceptive options; A case-based discussion of efficacy, eligibility, and use. *Cleveland clinic journal of medicine*, 2023; 90(3): 181-190.
4. Amrendra Anand, Vinod Prasad, Mansur Alam *et. al.* Hebal or Modern methods of contraception. *Research gate*, 2015; 4(4): 947-953.
5. Book Winner, Jeffery, Peipert *et.al.* Effectiveness of long-acting reversible contraception. *The New England journal of medicine*, 2012; 366(6): 1998-2007.
6. Fernand Ewerling, Leonardo Z. Ferreira, Lotus Mc Dougal *et.al.* Modern contraceptive use among women in need of family planning in India: an analysis of inequalities related to the mix of methods used. *ReproductiveHealth*, 2021; 173(18): 2-21.
7. Franca Fruzzetti, Tiziana Fidecicchi, Maria Magdalena Montt Guevara *et al.* Estetrol: A new choice for contraception. *Journal of clinical medicines*, 2021; 10(23): 5625-5648.
8. Jan Brynhildsen. Combined hormonal contraceptives: prescribing pattern, compliance, and benefits versus risks. *Pub Med Central*, 2014; 5(5): 201-213.
9. Ksh Beliya Luxmi Devi, Soibam Jibonkumar, Hingneilhai Kipgen *et. al.* Trends in contraceptive use in Manipur, India: A review. *Research gate*, 2021; 11(12): 33-40.
10. Laura E. Britton, Amy Alspaugh, Madelyne Z. Greene *et. al.* An evidence- based update on contraception. *American Journal of Nursing*, 2020; 120(2): 22-33.
11. Luis Bahamondes, M Valeria Bahamondes. New and emerging contraceptives: a state-of-the-art review. *International journal of women's health*, 2014; 6(3): 221-234.
12. Md. Juel Rana, Srinivas Goli, Rakesh Mishra *et.al.* Contraceptive method information and method switching in India, 2021; 13(17): 9831-9842.
13. M.E. Khan and Isha Bhatnagar. Challenges in introducing new contraceptive methods: A case study in India. *Sage journal*, 2015; 35(4): 387-401.
14. Nziavake Masimasi, Mala S. Sivanady, Holly L. Thacker *et al.* Update on hormonal contraception. *Cleveland journal of medicine*, 2007; 74(3): 186-198.
15. Preethy D'souza, Julia V. Bailey, Judith Stephen Son *et.al.* Factors influencing contraception choice and use globally; a synthesis of systematic reviews. *The European journal of contraception & Reproductive health care.*, 2022; 27(5): 364-372.
16. Qihui Zhou, Minngzhe Yan, Yaming Zhihang Wu *et.al.* Recent progress in advanced biomaterials for long-acting reversible contraception. *Journal of Nanobiotechnonology*, 2022; 138(20): 2-29.