

## Chapter

# Contraceptive Implants

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## Abstract

Contraceptive implants or implantable contraceptive are five subdermal implants, rods the size of pencil lead that are embedded just under the skin on the inside of the upper arm. The rods contain etonogestrel, the metabolite of desogestrel, an equivalent progestin. Implants are often used during breastfeeding without an impact on milk production. It was identified that age does not affect the use of contraceptive implants but educational status is significant to its usage; there is an association between the age at first birth and the use of contraceptive implants; the number of liveborn children has a significant impact or influence on the use of implants; etc. This chapter focuses on types of contraceptive implants and its mechanism of action; global statistics on contraceptive implants; side effects; health benefits and positive characteristics of contraceptive implants; those who can and cannot use contraceptive implants; reasons women are not interested in contraceptive implants and factors influencing its usage.

**Keywords:** amenorrhoea, desogestrel, dysmenorrhoea, etonogestrel, implanon, jadelle, levonorgestrel, norplant, progestin, sinoplant-II

## 1. Introduction

Contraception is the act of preventing pregnancy by interrupting the chains of events that lead to conception. It is very paramount in reducing the risk of unintended pregnancies and their attendant complications. It has been estimated that of the 210 million pregnancies that occur annually worldwide, about 80 million (38%) are unplanned, and 46 million (22%) end in abortion. Unintended unprotected intercourse is the primary cause of unwanted pregnancies, and many women with unwanted pregnancies decide to end them by abortion, which is most unsafe. Wider uptake of long-acting reversible contraceptive (LARC) methods is predicted to scale back the high rate of unintended pregnancy [1].

LARCs are defined within the UK National Institute for Health and Care Excellence guideline as contraceptive methods that need administration but once per cycle or month. Included within the category of LARCs are progestin-only contraceptive implants and other methods. Contraceptive implants are progesterone-only contraception that is inserted subdermally or within the skin. They are readily reversible with a return to fertility within days of removal. Moreover, these contraceptive devices are often safely placed within the immediate postpartum period, ensuring good contraceptive coverage [2].

In the same vein, contraceptive implants are subdermal contraception involving the delivering of a steroid progestin from polymer capsules or rods which are

inserted under the skin. The hormone diffuses gradually and slowly at a stable rate, providing effective contraception within five (5) years. The safe period depends upon the precise progestin and therefore, the sort of polymer. The advantages of these implants includes the long term contraceptive action, low dose of highly effective contraception, and quick reversal to fertility after the removal of implants [3].

Furthermore, it is recorded that contraceptive implants are safe, highly effective, and long-term methods of contraception that are widely applicable to any reproductive-aged woman. Implanon is currently approved for three (3) years of use, provides excellent efficacy throughout its use, and is straightforward to insert and remove. Implants require minimal user compliance and are cost-effective. Implanon has been shown to be safe to use during lactation, may improve dysmenorrhoea (painful menstruation), and does not significantly affect bone mineral density, lipid profile, or liver enzymes. The progestin-only implants are safe options for various women including adolescents, postpartum (after birth), breastfeeding, those that are medically complicated, or those that have contraindications to or intolerance of oestrogen-containing contraceptives.

In addition, contraceptive prevalence rate is the percentage of women (15–49 years) who are in union using any type of contraception either traditional or modern. The unmet need for family planning is the ratio of women (15–49 years) not using any contraceptive methods but are either married or in a union, and who are sexually active and able to give birth to children, but do not want children again, or would really prefer to space the birth of another baby for at least two years [4, 5].

This chapter focuses on types of contraceptive implants and its mechanism of action; the side effects of contraceptive implants; health benefits and positive characteristics of contraceptive implants; those who can and cannot use contraceptive implants; reasons women are not interested in implants and factors influencing its usage.

### **1.1 Types of contraceptive implants and outline**

The historical background of the contraceptive implants shows that Norplant was the earliest implant and it had been first produced in Finland in 1983 with a 5-year lifespan. It contained six rods, each containing levonorgestrel (LNG). Continuing research centered on reducing the amount of units to facilitate easier insertion and removal led to its successor, Norplant-2 or Jadelle (two-rod implant), which was approved within the U.S. in 1996 but its production was discontinued globally in 2008. Implanon was launched in 1999 as one rod of etonorgestrel, with contraceptive efficacy of three (3) years. Its successor, Implanon NXT (Nexplanon), with a redesigned applicator to ease its insertion, was introduced in 2010. It is replacing Implanon in many countries. Other implants like Nesterone™ and Capronor™, consisting of various progestins, biodegradable rods, pellets, and microcapsules remain in development. Advancement during this area has also produced male contraceptive implants MENT acetate that contains 7 $\alpha$ -methyl-19-nortestosterone, although still undergoing approval processes [1].

In view of the above records, the following are the identified kinds of implantable contraceptives [1, 6]:

- i. **Norplant:** The Norplant contraceptive implant consists of six silastic capsules, each contains 36 mg of LNG (levonorgestrel), and when inserted under the

skin, provides endless release of LNG at the rate of 30 mcg/day. It provides protection against pregnancy for 5–7 years. The associated pregnancy rate varies between 0.2 and 1.3 per 100 women-years. Its use and acceptability was hampered by the six rods with associated difficult insertion and removal, which led to its abandonment in many countries. This was discontinued in 2008 and is not any longer available for insertion.

- ii. **Norplant-2 (Jadelle/Sinoplast-II):** This method comprises two-rod silastic implants each measuring 43 mm long and a couple of 2.5 mm in diameter. Each rod contains 75 mg of LNG (levonorgestrel) with a calculated mean daily in vivo release rate of about 100 µg/day at the first month, followed by a gradual decline to about 40 µg/day at 12 months, and to about 30 µg/day at 24 months, with stabilisation thereafter at about 30 µg/day. Jadelle was initially licenced for 3 years; this has been extended to five years in most countries. Levoplast (Sino-implant II) is licenced for 4 years. Jadelle has been extensively evaluated, along side its predecessor Norplant, and had been found to be safe and highly effective.
- iii. **Nexplanon (Implanon NXT):** These are single-rod contraceptive implants with special applicator for easier and safe insertion. Each rod measured 40 mm × 2 mm, it is embedded with 68 mg of etonogestrel (formerly called 3-ketodesogestrel) and covered by a 0.6 mm rate-controlling ethylene-vinyl acetate membrane. Nexplanon also contains 15 mg barium sulphate, making the rod radiopaque and this aids easy removal. It is as effective as Implanon. This has replaced the Implanon in most developed countries. It is labelled for up to three (3) years of use (a recent study shows it is going to be highly effective for five years). Implanon NXT are often seen on X-ray and has an improved insertion device.
- iv. **Implanon:** It is recorded that implanon may be a subdermal contraceptive that is effective for three (3) years. The single-rod implant, which is inserted on the inner side of the woman's upper arm, contains etonogestrel (ENG), a progestin. Implanon may be a non-biodegradable implant, which contains 68 mg of etonogestrel. The rod features a length of 40 mm and a diameter of 2 mm. A daily release rate of roughly 30 µg etonogestrel inhibited ovulation within the majority of women of childbearing age and within eight hour (8 hr) of insertion, etonogestrel levels are sufficient to supply contraceptive protection. Endless release of etonogestrel is maintained for three (3) years. Within one (1) week after removal, etonogestrel is not any longer detectable in human serum. Implanon is easier to insert and remove than the initial or former six-capsule levonorgestrel implant (Norplant). Implanon functions to prevent or delay pregnancy by suppressing and/or interrupting ovulation and thickening of the cervical mucus which hinders sperm penetration. Etonogestrel is processed by the liver though hepatic-enzyme inducers and some anti-epileptic substances may interfere with the effectiveness of contraceptives. The side effects included bleeding irregularities frequently occur during the beginning of several months after insertion; amenorrhoea becomes more common with increasing duration of use. Other symptoms include emotional lability, weight increase, headache, depression, dysmenorrhoea and acne. The effectiveness rates approach is 100% [1, 7].

This contraceptive is acceptable for women (14–49 years) who desire long-acting reversible contraception (LARC). It must be removed and replaced every three (3) or five (5) years. Ovulation returns within three (3) to six (6) weeks after the removal of Implanon. Implantable contraceptives provides no protection against Sexually Transmitted Infections (STIs) or Human Immunodeficiency Virus (HIV) [7].

v. **Capronor:** This is a biodegradable polymer system for the sustained subdermal delivery of contraceptive steroids. Capronor is a 4-cm rod made from a polycaprolactone capsule containing 21.6 mg of LNG (levonorgestrel). It provides 1-year contraception, but it is not currently in routine use.

vi. **Nestrone:** This is a single-rod implant containing 93 mg of nestrone (16-methylene-17-acetoxy-19 norprogesterone), which releases about 40 µg of nestrone per day. Duration of effectiveness is 2 years.

vii. **MENT (Subdermal Implants for Men):** Male contraceptive methods under development at the population council believe MENT acetate (7 $\alpha$ -methyl-19-nortestosterone), a year implant that is placed under the skin of the upper arm of the intending male user. MENT is made from an artificial steroid that resembles testosterone. If approved by regulatory authorities, MENT would be the leading long-acting reversible male contraceptive [1, 7].

## 1.2 The mechanism of action of contraceptive implants

The progestin-containing implantable contraceptives inhibit ovulation and restrict sperm penetration through sticky cervical mucus. This is done as a result of the antiestrogenic actions of the progestins, which affect the cervical mucus by making it sticky or glutinous, scanty, and impassable to sperm therefore preventing or hindering fertilisation of the ovum. High doses of progestins also prevent gonadotropin secretion, thereby halting the maturation of the follicles and ovulation. This double effect allows the efficacy and effectiveness of implantable contraceptives to be maintained though ovulation is not consistently altered in etonorgestrel implantable contraceptive users towards the end of the 3-year period of use. Oocytes are not fertilised even if the follicles grow while using progestin implantable contraceptives. Even if the follicle ruptures, the abnormalities of the ovulatory cycle or phases prevent the release of a viable ovum or egg. Although progestin suppresses endometrial activity, this is often not a contraceptively significant effect since the most mechanisms of action prevent fertilisation. There has never been any signs of embryonic development found among contraceptive implant users, showing that progestin implants are not medication or substances that cause pregnancy to terminate prematurely. Implants are simpler, easier and safer to use than other contraceptive methods because they do not require regular action by the user [8].

## 1.3 Advantages of contraceptive implants

The following advantages of contraceptive implants had been identified [9, 10]:

- i. High effectiveness of up to 99 percent within seven days of implant insertion;
- ii. Very inexpensive method of longterm contraception, like intrauterine devices;

- iii. It is convenient to use or adopt by all women of childbearing age (i.e. from age 14–49 years);
- iv. It is very safe for women of childbearing age;
- v. It is very efficacious for three years;
- vi. It could be easily removed when pregnancy is expected by women;
- vii. It provides continuous contraception;
- viii. The anonymity of use is provided;
- ix. It is safe during breastfeeding period for women;
- x. It relieves excessive and difficulty menstruation in some women;
- xi. Amenorrhoea which is experienced in some women using contraceptive is often perceived to be a benefit;
- xii. It reduces the risk of pelvic inflammatory disease in women;
- xiii. It is good for conditions which prevent the use of combined hormonal contraceptive;
- xiv. There is quick return of fertility after the removal of contraceptive implant;
- xv. Some women experience improvement in acne following the use of the implant; and
- xvi. Some protection against endometrial cancers.

#### **1.4 Disadvantages of contraceptive implants**

The following are the disadvantages of contraceptive implants [9, 10]:

- i. There is no protection against sexually transmitted infections (STIs) when using contraceptive implant;
- ii. There is a contra-indication with anticonvulsants, some antibiotics, or St. John's wort;
- iii. It does not proffer immediate protection when inserted, hence, another type of effective contraceptive must be used for at least seven days following the insertion;
- iv. It has some nauseating side effects;
- v. It diminishes sexual pleasure in some frigid women; and
- vi. It encourages promiscuity in some sexually active women.



### **1.5 The side effects of contraceptive implants**

The side effects of implants include the following: changes in bleeding patterns, including (a) lighter bleeding and fewer days of bleeding; prolonged bleeding; irregular bleeding; infrequent bleeding; and no monthly bleeding (within a year period); (b) lighter bleeding and fewer days of bleeding; irregular bleeding; infrequent bleeding; and no monthly bleeding (after a year period); (c) users of Implanon and Implanon NXT are more likely to experience infrequent bleeding, prolonged bleeding, and/or no monthly bleeding than irregular bleeding; (d) other side effects are: headaches; abdominal pain; acne (can improve or worsen); weight change; breast tenderness; dizziness; mood changes; nausea; and enlarged ovarian follicles. The bleeding changes are normal and are not harmful. It also included skin atrophy at the site of insertion; impalpable implants; neurovascular injury; fractured implants; and abnormal uterine bleeding, as the risks or side effects of contraceptive implants [1, 6].

### **1.6 Health benefits of contraceptive implants**

The benefits of implantable contraceptives are: it helps protect against risks of pregnancy, including ectopic pregnancy; it protects against symptomatic pelvic inflammatory disease; it is going to help protect against iron-deficiency anaemia; and it reduces the risk of ectopic pregnancy. Contraceptive prevents pregnancy; reduces unintended pregnancy and abortion; reduces pregnancy-related morbidity and mortality; improves birth outcomes; helps women and couples time and space their pregnancies; improves maternal health behaviours; reduces cancer risk; improves mental health-related outcomes; and treats menstrual-related symptoms and disorders [6, 11].

Furthermore, it was discovered that the use of contraceptive implants brings harmony between the couples, which invariably promotes their mental health; and contraceptive implants are the most cost-effective method of family planning because it prevents unintended pregnancies and abortion among women of childbearing age [10].

### **1.7 Positive method characteristics of contraceptive implants**

It had been postulated in some studies that contraceptive implants is safe; highly effective; it is convenient; it facilitates harmony between the couples. In the same vein, implants have many positive characteristics that contribute to their rapidly rising popularity [10, 12]:

- i. Implants can be quickly, safely, and easily inserted by medical and community health workers.
- ii. Whichever contraceptive implant a client chooses, women can be assured with highly effective contraception for up to five (5) years.
- iii. Implants have the highest effectiveness of all methods.
- iv. Implants do not entail pelvic examination or abdominal surgery (like intrauterine devices (IUDs) and feminine sterilisation).
- v. Removal is typically a fast and uncomplicated procedure.

- vi. There is prompt return to fertility.
- vii. Implants are appropriate for limiting further births.
- viii. Implants generally have high client satisfaction, as implied in their high continuation rates.
- ix. Implants provision requires less health system infrastructure and less-highly trained staff than other provider-dependent clinical methods.

### **1.8 Those who can and cannot use contraceptive implants**

It has been stated that almost all women of childbearing age can use implantable contraceptives safely and effectively, including women who: (a) have or have not had children; (b) are married or unmarried; (c) are of any age (e.g. adolescents and women over 40 years old); (d) have just undergone an abortion, miscarriage, or ectopic pregnancy; (e) smoke cigarettes; (f) are breastfeeding; (g) have anaemia; (h) have varicositis; (i) and are living with HIV [6].

In furtherance to the above reports, implantable contraceptive should be considered for women who: (a) desire a long-acting and highly effective contraception; (b) experience serious or minor side effects of oestrogen and/or oestrogen-progestin contraception; (c) are interested in a contraceptive method that does not require continuous adherence; (d) love a non-coitus-related type of contraceptive; (e) have completed childbearing but not ready for permanent sterilisation; (f) have a history of anaemia with abnormally heavy bleeding at menstruation; and (g) have chronic illnesses which threaten pregnancy [8].

However, contraceptive implants should not be considered for women: known or suspected of pregnancy; having current or past history of thrombosis or thrombo-embolic disorders; having hepatic tumour or active liver disease; having undiagnosed abnormal genital bleeding; having known or suspected breast cancer or history of breast cancer; and having hypersensitivity to any component of the method [8].

### **1.9 Factors influencing the acceptance of contraceptive implants**

Some studies identified the demographic factors influencing the use of contraceptive as age; parity; marital status and marriage type e.g. polygamy has been associated with lower levels of contraceptive use. A study from Northeast Nigeria reported that women in polygamous unions are less likely to use contraceptives compared with women in monogamous unions. Polygamy, when coupled with youthful age at marriage and with a wide differences in age between spouses, may inhibit husband-wife interactions and perpetuate male dominance within the marriage. This was in line with the study carried out in Ethiopia that showed that woman's age, number of children alive, couple's intention for more children and discussions about contraceptive use among the couple were significantly associated with demand for modern contraceptives among women. Also, it was agreed that religion, education status and age at marriage were significantly associated with contraceptive usage. Furthermore, in a study, it was discovered that age does not affect contraceptive implants use; educational status is significant to the usage of contraceptive implants; there is an association between the age at first birth and the use of contraceptive implants, which indicates that age at first birth influences the use of contraceptive implants;

and the number of liveborn children has a significant impact or influence on the use of implants. A study also indicates that any categories of women of childbearing age could use or utilise contraceptive implants [10, 13–15].

It has been stressed that age of women, the level of education of women, the religion of women, marital status of women, health care visits during antenatal care and childbirth were significantly associated with the use of any contraceptive method [16].

It had been discovered that socio-demographic factors may be alleviated by biological and behavioural factors, such as sexual activity, fecundity and desire for children. African societies as pro-natalist, believe that children are a gift from God and as such are social and economic investments; this has undesirable influence on the use of contraceptives. Studies have found that an inverse relationship exists between the number of living children and use of modern contraceptives. Evidence from variety of nations has pointed towards the partner's disapproval and his desire for more children as key factors for non-use of contraception [13].

Furthermore, it has been stressed that there has been found a strong relationship between women's education, especially completed primary education and entry into secondary level, and fertility reduction. Several studies have reported that women's education has a strong positive impact on contraceptive use). In Nigeria, education has been found to increase contraceptive use. Nigerian women with tertiary level education are one-and-a-half times more likely to have ever used contraception than women with secondary education. Partner's level of education is equally important, because it may operate through many of an equivalent pathways (childbearing preferences) because the woman's own education, as long as education levels of husbands and wives are positively correlated. Results from some studies conducted showed that older female adolescents were quite three (3) times likely to practice contraceptive use than younger female adolescents. The findings also revealed that the level of education, working status, knowledge of ovulatory cycle, visit of the health facility and marital status were the determinants for contraceptive use among female adolescents [13, 17].

The extent of education may be a predictor of socio-economic status, which correlates with contraceptive use. It showed that women of lower socio-economic status have lower uptake rates of contraceptives. Also, exposure to mass media has strong effects on attitudes towards family planning through ideation. However, a study identified the following as reasons for rejecting contraceptive implants among women of childbearing age: fear of side effects; lack of interest; husband's refusal; lack of information; religion influence; contraceptive failure; lack of regular sex; and it diminishes sexual pleasure [10, 13].

### **1.10 Attitude and practice of women of childbearing age to contraceptive usage**

It has been discovered in some studies that some women were afraid of the side effects of contraceptives; some want to conceive; familial pressure; lack of knowledge, are the reasons some women of childbearing age do not accept contraceptives. Also, a research showed that the fear of side effects is the main reason for low contraceptive prevalence among young female students. However, the results of a study carried out indicated that the main reasons for switching to implant contraceptive among women of childbearing age were: convenience, contraceptive failure and experienced side effects with other contraceptive methods.



Furthermore, some studies found out in their studies that women of childbearing age who were not using any form of contraceptive was as a result of lack of knowledge; negative perception of contraceptive side effects; lack of interest; lack of regular sex; husband's refusal; expectant of becoming pregnant; and some could not afford it. A study also showed that any categories of women of childbearing age could use or utilise contraceptive implants, they identified the following reasons women of childbearing age are not interested in contraceptive implants: fear of side effects; it diminishes sexual pleasure; it encourages promiscuity; lack of information about the contraceptive implants; expectant of becoming pregnant; contraceptive failure; husband's refusal; lack of regular sex; lack of interest in the use of contraceptive implants; religion influence; and cultural background [10, 15–16, 18–19].

### **1.11 Recommendations for the acceptance of contraceptive implants**

The following recommendations for the acceptance of contraceptive implants among women of childbearing age [10]:

- i. All health workers should intensify efforts by properly informing women of childbearing age concerning contraceptive implants;
- ii. During antenatal and postnatal visits, women should be health educated on the benefits, the cost-effectiveness and minimal side effects of contraceptive implants;
- iii. There is the need for couples to understand each other and decide on the use of contraceptive implants, which is safe, convenient and highly effective for the family circuit.
- iv. There should be more public enlightenment campaigns on the use of contraceptive implants most especially the sexually active teenagers, so as to prevent teenage pregnancies and teenage motherhood.
- v. Regular jingles should be on radio and television, so as to improve the knowledge of women of childbearing age towards the acceptance of contraceptive implants.
- vi. Husbands should be carried along during counselling before choosing any contraceptive implants for their spouses.
- vii. All myths, rumours and misconceptions against contraceptive implants should be dispelled by the government either through regular jingles or through the use of mass media and billboards.
- viii. Contraceptive implants and its attendant services should be rendered free to all women of childbearing age.
- ix. Any woman with the side effects of contraceptive implants should be treated or managed freely in the health institutions.

## **2. Conclusion**

This chapter has shown that contraceptive implants or implantable contraceptive are five subdermal implants, rods the size of pencil lead that are embedded just under the skin on the inside of the upper arm. The chapter further indicated the types of contraceptive implants which included Norplant, Norplant-2 (Jadelle/Sinoplant-II), Nexplanon (Implanon NXT), Implanon, Capronor, Nestrone, and MENT (subdermal implants for men).

Furthermore, the mechanism of action of contraceptive implants, the advantages and disadvantages of contraceptive implants had been discussed including its side effects. The health benefits of the implantable contraceptive including the positive method characteristics of contraceptive implants have been well stated in the chapter.

This chapter also discussed those who can and cannot use implantable contraceptives as well as the factors influencing the acceptance of contraceptive implants. The attitude and practice of women of childbearing age to contraceptive usage had been discussed, likewise, some recommendations which would promote the use of contraceptive implants among women of childbearing age had been extensively stated in this chapter.

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There is no conflict of interest as far as this work is concerned.


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