Review Article

Contraceptive implants: A review and current perspective in southwest Nigeria

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ABSTRACT

Contraceptive implants are highly cost-effective forms of long-acting reversible contraception. They are the most effective reversible contraceptives and are more effective than sterilization. Pregnancies are rare in women using this method of contraception, and those that do occur must be fully investigated. There are very few contraindications to use of implants, and they have an excellent safety profile with very high acceptability and continuation rate. Other benefits include noninterference with intercourse, immediate onset of action, and return to fertility after removal, improvements in dysmenorrhea, ovulatory pain, and endometriosis. Despite the numerous advantages, the uptake of contraceptive implants is still very low in the southwestern part of Nigeria. This may be due to lack of public awareness about their numerous benefits. Efforts should be made to increase awareness via campaigns and health education. Also, there should be easy accessibility to the contraceptive implants and continuous training of family planning providers on the insertion and removal techniques.

Key words: Contraceptive; etonogestrel; levonorgestrel; long-acting reversible contraception; progestin-only; subdermal implant.

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 its attendant complications especially because of the strict abortion laws in Nigeria. 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.[1] Unintended unprotected intercourse is the primary cause of unwanted pregnancies, and many women with unwanted pregnancies decide to end them by abortion, which is mostly unsafe. The consequences of these clandestine abortions are grave and can be life-threatening, often leading to maternal morbidity and mortality.

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More than 220 million women in developing countries currently have an unmet need for modern contraception, mainly in sub-Saharan Africa,[2] whereas majority of women using contraception rely on the traditional and less effective forms of contraception. Wider uptake of long-acting reversible contraceptive (LARC) methods is expected to reduce the high rate of unintended pregnancy. LARCs have been defined in the UK National Institute for Health and Care Excellence guideline as contraceptive methods that require administration less than once per cycle or month.[3] Included in the category of LARCs are progestin-only contraceptive

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implants and others. Contraceptive implants are progesterone only contraception that are inserted subdermally. They are highly effective, suitable for nearly all women and it is gaining more popularity. It is used to space, or limit pregnancies. Contraceptive implants offer immense potential to meet the need for family planning. They are readily reversible with a return to fertility within days of removal. Moreover, these contraceptive devices can be safely placed in the immediate postpartum period, ensuring good contraceptive coverage. Irregular bleeding is their common side effect.

Historical Background

Norplant[4] was the earliest implant and it was 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 number of units to facilitate easier insertion and removal led to its successor, Norplant-2 or Jadelle® two-rod implant, which was approved in the United States in 1996 but its production, was discontinued globally in 2008. Implanon[5] was launched in 1999 as a single rod of etonorgestrel, with contraceptive efficacy of 3 years. Its successor, Implanon NXT® (Nexplanon®),[5] with a redesigned applicator to ease its insertion, was introduced in 2010. It is replacing Implanon in many countries. Other implants, such as Nesterone™ and Capronor™, consisting of different progestins, biodegradable rods, pellets, and microcapsules remain in development. Advancement in this area has also produced male contraceptive implants MENT acetate that contains 7α-methyl-19-nortestosterone, although still undergoing approval processes.

Prevalence and Types of Implants

The prevalence of use has remained persistently low despite its overwhelming benefits and effectiveness. Contraceptive prevalence in Nigeria is 15.1% and implants accounts for only 0.4%.[6] Ghana has a contraceptive prevalence of 17% with also a very low implant use.[7] In Great Britain, in 2008, 1–2% of women of childbearing age were using the implant.[8] A lot of countries are yet to start using contraceptive implants and countries that have succeeded in raising the prevalence beyond 3% are Burkina Faso, Colombia, Ethiopia, Norway, and Rwanda.[9]

Implants can be biodegradable/nonbiodegradable, LNG/etonorgestrel based or female/male implants. Female implants include Norplant, Norplant-2 (Jadelle), Implanon, Nexplanon, and Capronor. Contraceptive implants differ based on the progestin content and whether they are degradable or nondegradable. Norplant and Jadelle contained LNG that is a second generation progestin whereas Implanon and Nexplanon contained etonorgestrel that is a third generation progestin.

Norplant: The Norplant contraceptive implant consists of six silastic capsules, each contains 36 mg of LNG, and when inserted under the skin, provides a continuous release of LNG at the rate of 30 mcg/day. It provides protection against pregnancy for 5 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,[10] which led to its abandonment in many countries of the world.

Norplant-2 (Jadelle/Sinoplant-11): This method comprises two-rod silastic implants each measuring 43 mm long and 2.5 mm in diameter. Each rod contains 75 mg of LNG with a calculated mean daily *in vivo* release rate of about 100 μg/day at the 1st month, followed by a gradual decline to about 40 μg/day at 12 months, and to about 30 μg/day at 24 months, with stabilization thereafter at about 30 μg/day. Jadelle was initially licensed for 3 years; this has been extended to 5 years in most countries. Sino-implant (ll) is licensed for 4 years. Jadelle has been extensively evaluated, together with its predecessor Norplant, and had been found to be safe and highly effective.[11,12]

Implanon: Implanon is a single rod contraceptive implant and it provides contraceptive protection for 3 years. It is a nonbiodegradable implant, which contains 68 mg of etonogestrel. The rod has a length of 40 mm and a diameter of 2.0 mm. This single-rod implant with etonogestrel was developed in order to achieve complete inhibition of ovulation during the total duration of use. A daily release rate of approximately 30 μ getonogestrel inhibited ovulation in the majority of women and within 8 h of insertion, etonogestrel levels are sufficient to provide contraceptive protection.[13] A continuous release of etonogestrel is maintained for 3 years. Within 1 week after removal etonogestrel is no longer detectable in human serum.[14] It is very effective and safe,[15,16] with a the cumulative pearl index ranging from 0 to 0.38.[17,18] There is no significant difference in pregnancy rates between etonorgestrel and LNG implants.[19]

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 etonorgestrel (formerly called 3-ketodesogestrel) and covered by a 0.6 mm rate-controlling ethylene-vinyl acetate membrane. Nexplanon also contains 15 mg barium sulfate making the rod radiopaque and this aids easy removal. It is as effective as Implanon.[20] This has replaced the Implanon in most developed countries.

Capronor: It is a biodegradable polymer system for the sustained subdermal delivery of contraceptive steroids. It is a 4-cm rod made of a polycaprolactone capsule containing

21.6 mg of LNG.[21] It provides 1-year contraception, but it is not currently in routine use.

Nestrone: It 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.

MENT®: Subdermal Implants for Men: Male contraceptive methods under development at the population council rely on MENT® acetate (7α-methyl-19-nortestosterone),[22] a year implant that is placed under the skin of the upper arm. MENT is created from a synthetic steroid that resembles testosterone. If approved by regulatory authorities, MENT would be the first long-acting reversible male contraceptive.

Mode of Action, Drug Interactions, and Medical Eligibility

The primary mode of action of all subdermal implants is to prevent ovulation.[23] Secondary modes of action include prevention of sperm penetration of the cervical mucus and prevention of implantation by thinning the endometrium.[23] The contraceptive efficacy of the progestin-only implant is reduced by enzyme-inducing drugs such as some antiepileptic drugs, some antibiotics such as rifampicin, and antiretroviral therapy.[23]

There are no age restrictions for use of contraceptive implants, thus its use spans across all ages. There are a few medical conditions for which the risks of implant use generally/usually outweigh the advantages, as defined by the WHO Medical Eligibility Criteria.[24] These include severe hepatic disease, women taking liver enzyme-inducing drugs, ischemic heart disease or stroke, current or past history of breast cancer, and in cases of undiagnosed vaginal bleeding.

Benefits, Effectiveness, Risks, and Cost

The overall pregnancy rate reported in the National Institute for Health and Care Excellence guideline is less than 0.1% over the course of 3 years.[3] For women who have undergone female sterilization, the lifetime percentage rate is 0.5%,[25] and for men undergoing vasectomy, the corresponding figure is 0.05%.[26] Although ovulation is occasionally observed in the 3rd year of use,[27] the implant remains a highly effective contraceptive throughout this time because of the secondary modes of action. Improvement in endometriosis, dysmenorrheal, and ovulatory pain have been noted with implants when there is no underlying pathology.[28]

There is no increased risk of venous thromboembolism, myocardial infarction, stroke, and breast cancer with implant use.[24] Risks include abnormal uterine bleeding that is the most common cause of discontinuation, skin atrophy at the site of insertion, acne, impalpable implants, neurovascular injury, fractured implants. The implant should be removed when pregnancy occurs with an implant *in situ*. There is no evidence of harm to the woman, the progress of her pregnancy, or the fetus if pregnancy occurs while using an implant.[29]

Ovulation returns within 3 weeks of implant removal in more than 90% of women.[30] Return to fertility after discontinuation of implants is no different from other contraceptive methods, excluding injectables.[30] Pregnancies, whether delivered, miscarried, terminated, or ectopic, all have associated costs. Pregnancies averted result in cost savings. Use of the progestin-only implant is cost-effective at 1 year of use.[3] The implant is more cost-effective than even the contraceptive pills.[31]

Situation in Nigeria

Contraceptive implants require the technicality of insertion and removal necessitating the provision only in hospital setting where the trained personnel are available. Some of these centers are not available in every community and in communities with such centers; some are not within the reach of the clients. Although the cost of inserting an implant at the teaching hospital in Ile Ife is 500 naira, it is up to 10 thousand naira in some private hospitals within Ile Ife. There is also aversion for the minor surgical procedure involved in its insertion whereas some religious groups still vehemently reject the idea of modern contraceptive methods. Egede *et al*.[32] and Orji *et al*.[33] concluded from their study that there is a mismatch between awareness of contraceptive options, approval of use, and actual use that means there is a high and widespread awareness but low utilization. Uptake of implants is only 2.3%, 3.3%, 3.6%, 4.1%, and 4.3% of the total number of clients seen at the family planning clinics in Ile Ife,[34] Oshogbo,[35] Ilorin,[17] Port Harcourt,[36] and Ibadan,[37] respectively. This is in contrast to 11.1% in Lagos,[38] 13.4% in Jos,[16] and 55.8% in Sokoto,[39] where it is the most predominant method of contraceptive chosen by new clients. Level of education, awareness, and effectiveness of Implanon has been adduced for this increase.[38] Barriers to use of this effective modern contraceptive option include lack of access, cultural factors, religion, and opposition to use by partners or family members, fear of risks and side effects of contraceptives, educational level, and socioeconomic status of the woman. Oye-Adeniran *et al*.[40] found that patent medicine shops were the most common sources of contraceptive products accounting for why implants were not routinely used, whereas the major source of information

about contraceptive options were from friends[32] leading to distorted information.

Conclusion and Recommendations

Despite the effectiveness and availability of this contraceptive, the uptake is still very low in the southwestern part of Nigeria due to multiplicity of factors. To increase the uptake of contraceptive implants in this part of the country, the following are recommended: improvement in access to contraception, raising the awareness via campaigns, and health education with emphasis on utilization of implants, training of more family planning providers and volunteers on the insertion and removal techniques, involvement of men in the contraceptive campaign, raising women champions, and advocates thereby engendering the political will to provide the contraceptive implant at no cost.

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Conflicts of interest

There are no conflicts of interest.

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