FACTORS ASSOCIATED WITH USE AND DISCONTINUATION OF IMPLANON CONTRACEPTIVE IN JOS, NIGERIA

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ABSTRACT

Background: the contraceptive prevalence (CPR) in sub-Saharan Africa is low at 8-10% for over a decade. There is also the dominance of the less effective short-acting methods such as pills and injectables. The low CPR is the direct cause of the high total fertility of 5.7 in Nigeria**.** The use of contraception is the single most dominant contributory factor in fertility declines world-wide**.** This is especially more true with the use of long acting reversible contraceptive methods like implanon which has the potential to reduce the global burden of disease and mortality associated with a high total fertility rate.

Objective: our aim was to analyse and determine the socio-demographic profiles of implanon acceptors and the factors associated with continuation or discontinuation of its use in the family planning programme of the Jos University Teaching Hospital, Jos Nigeria.

Materials and Methods: This was a retrospective review carried out between March 2007 and March 2014 at the Jos University Teaching Hospital, Jos Nigeria

Results: during the study period, 1482 women accepted implanon with about 85.8% having regular menstrual cycles. Sixty-one percent of these women were breastfeeding at insertion. Their mean age was 31 years with a range of 16 to 53. Christianity was the religion of 87.8% with 12.2% being Muslims. Just under half had tertiary education with over a third having attended secondary school. About 26.7% had no future fertility desires. Over 75% had previously used a contraceptive method. The mean parity in this study was 3.2 with a range of 0 to 12. The mean number of children alive was 2.9.

Both the systolic and diastolic blood pressures were little affected by the use of implanon. However there was a mean weight gain among 900 of the women who came for follow up of 2.4 kg. However the weight change was highly variable with about a third of women losing between 1 to 30 kg, 10% not having any net changes and over 61% having a net weight gain of between 1 to 26 kg. About 3.8% had their implanon removed because of weight gain.

The percentage loss to follow up was 28.2%. The 900 women who had follow up were exposed to the implanon for 2006.6 woman-years or 24,079 cycles. The mean number of months of exposure to the implant was 27.0 ± 14.7 months. The commonest reason for discontinuation was desire for pregnancy (36.1%) followed by those who changed to other methods (27.6%). Menstrual irregularity was the commonest side effect of implanon that led to removal.

Seven in-treatment pregnancies occurred giving a pearl index of 0.35 although only one pregnancy was ultrasonographically-proven to be a method failure of the device.

CONCLUSION: Accepting implanon was influenced by the educational attainment and religion of the women in our unit. The desire for another pregnancy was the commonest reason for discontinuation. However, menstrual irregularity

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was the commonest side effect of the implant that led to its removal especially in the first six months after insertion.

Keywords: Implanon (etonogestrel) contraceptive, continuation rates, discontinuation, reason for discontinuation.

INTRODUCTION

The use of modern contraceptive methods in sub-Saharan Africa has remained relatively low at 8-10% for over a decade. Equally disturbing is the fact that within this low contraceptive prevalence (CPR) is an over-dominance of the less effective short-acting methods such as pills and injectables[1, 2]. These short-acting methods require frequent re-dosing and therefore suffer a constant threat from commodity stock outs, difficulty of frequent clinic visits occasioned with long waiting times for the clients, the unending encounter with the bad ttitudes of health care workers and the ambivalence towards pregnancy/ contraception[1]. The low CPR of 6.8% reported in Nigeria in 1999 and currently 9.7%[3] is the direct cause of the high total fertility of 5.7 with some areas in the North western part of the country reaching 7.3[4]. This is because fertility level is inversely related to the contraceptive prevalence rate[5,6]. This low CPR is partly the consequence of the lack of proper information and access to modern contraceptive methods, desire for large family size, the existence of preconceived ideas and taboos, the inordinate fear of perceived side effects of contraceptives, the dominant power of men to decide for contraception and polygyny. Polygyny sets women in competition with the co-wives to deliver the most number of children in the hope of securing maximally from the husband's resources in the event of his death[7,8].

The use of contraception is the single most dominant contributory factor in fertility declines world-wide[9-13]. It has amply been demonstrated to be very cost effective and relatively inexpensive in comparison to the consequences of unintended pregnancies[1, 14]. The lifetime likelihood of dying from pregnancy in sub-Saharan Africa is 1 in 16[15]. This risk is particularly increased for women less than 25 years of age because this population constitutes about 55% of unsafe abortions in the region[16]. The unfettered access and use of effective methods of contraception especially the long acting reversible contraceptives (LARC) will help to reduce this global burden of disease and mortality[1]. However, the choice of contraceptive method by a woman depends on a constellation of different factors: the woman's educational attainment and fertility desires at a given time, the contraceptive method mix available to her, her awareness of them and where she can obtain them, their cost, the distance to the facility and the influence of the media and perceived general acceptability of family planning[17-19]. In addition, whether the method is user- or provider-dependent, its influence on the spontaneity of coitus, return to fertility after stoppage of its use, protection against sexually transmitted infections and the length of protection it offers against pregnancy are other factors that directly influence personal preferences[20].

Implanon a single-rod non-biodegradable implantable contraceptive containing 68 mg of etonogestrel is a long-acting contraceptive

method with contraceptive efficacy of three years and a quick return to fertility after removal[21]. Like other implants, its potential benefits remained largely underutilized[22]. Knowledge about implants is frequently low, even in areas where there is good general awareness of modern contraceptives[23]. Most of the information currently used to counsel clients in our sub-region are from studies in Europe, Asia, Australia and the Americas[24-26] .We sought to analyse and determine the socio-demographic profiles of implanon acceptors and the factors associated with continuation or discontinuation of its use in the family planning programme of the Jos University Teaching Hospital, Jos Nigeria.

MATERIAL AND METHODS

Design and period of the study

This was a retrospective study carried out between March 2007 and March 2014 at the Family Planning Unit of the Department of Obstetrics and Gynaecology, Jos University Teaching Hospital, Jos Nigeria. It was designed to assess the socio-demographic profile, the continuation rates, the loss to follow-up rate and various reasons given for removal amongst users of implanon

Subjects

Implanon was inserted to all women who had no contraindication to its use, who opted for the implant over all other available method after a comprehensive counselling on the method.

The exclusion criteria were known or suspected pregnancy, hypersensitivity to the drug and being within 6 weeks of delivery.

Implanon, like all other contraceptive methods was provided free by the Federal Ministry of Health except a service charge of about $6 for consumables.

Information gathered

The information on the socio-demographic characteristics, Obstetric and Gynaecological Histories, medical history, pre-existing chronic conditions, drug history, and previous use of contraception were collected. Also, the dates of insertion and removal, complication and adverse effects from the use of the device, discontinuation, reasons for discontinuation and duration of use of the implant were recorded. The blood pressure and weight were measured at each visit. A systolic blood pressure of 140mmHg or more and a diastolic of 90mmHg or more were considered as the cut off for hypertension. Since the efficacy of implanon is said to decrease with any weight above 70 kg, any weight above this was taken as the cut off point for normal weight in our study. A urine pregnancy test was usually carried to rule out any existing pregnancy before insertion. A urine pregnancy test was also repeated once there was any suspicion of a pregnancy with the implant in situ. If the pregnancy test became positive while using the implant, an ultrasound was carried out to date the pregnancy.

Follow-up

The clients were followed up from insertion of implanon to its removal with yearly scheduled monitoring visits. Free access to the unit was made to the clients for any unscheduled visits if they had any complaints with the implant or required its removal at any time.

During the follow up visits, scheduled or unscheduled, the women were asked whether they have had any problems or side effects resulting from the use of the implant.

The time (in months) from the date of insertion to the last visit at the clinic was documented. Those women who were not seen in the clinic

again after insertion were considered as loss to follow up. Every woman who had at least one follow up visit after the month in which the implant was inserted was therefore included in the calculation of period exposed to implanon. The duration of exposure to implanon was expressed in woman-years and the total number of 28-day cycles. A woman-year refers to a period of 365.25 days and this is the equivalence of roughly 13 cycles.

The Contraceptive efficacy of implanon was determined by the number of in-treatment pregnancies that occurred. The pregnancy rate was calculated using the Pearl Index (PI) which is the number of in-treatment pregnancies per 100 woman-years of exposure.

Statistical analysis

The sample size of our study was based on clinical feasibility and not any formal statistical power calculations. Every woman that accepted implanon for contraception was therefore included in the analysis of the socio-demographic characteristics.

Descriptive and analytic statistics were carried out on all data where appropriate using Epi info version 3.5.1 (CDC, Atlanta, GA USA). The descriptive statistics were percentage, mean, median, standard deviation, range and 95% confidence interval. For quantitative variables, a comparative test of averages was carried out and a chi-squared test was performed for the qualitative variables. Significance was established at the level of 0.05 for all analyses.

RESULTS

During the study period, 1482 women accepted implanon over all other available family planning methods. Table 1 shows the socio-demographic characteristics of these women. The majority of the women 1164 (85.8%) had regular menstrual cycle at baseline and the remaining 193 (14.2%) had irregular menstrual flow. About sixty one percent of the women were breastfeeding at the time of implanon insertion while the rest (38.7%) were not.

Table 1 Socio-demographic characteristics of implanon acceptors

Variable	Implanon(N=1482)	
Age(in years)	**Number**	**Percentage**
=19	13	0.9
20-29	604	41.7
30-39	754	51.0
40-49	102	6.9
50-59	5	0.3
Mean ± SD : 31.0±5.6,	*Range: 16 -53*	*Median :30*
RELIGION		
CHRISTIANITY	1286	87.8
ISLAM	178	12.2
EDUCATIONAL STAT US		
No Formal education	22	1.6
Primary Education	179	13.0
Secondary Education	504	36.7
Tertiary Education	671	48.8

Over a quarter of the women (26.7%) had no further wish for bearing more children at insertion while about 73.3% was using implanon for child spacing. More than three quarters of the implanon acceptors had used at least one form of contraceptive method previously while about 22.4% of them were first time users of contraceptives.

The delivery history of the implanon acceptors is depicted in Table 2. Most women accepted implanon after a parity of 3. Less than 1% of the women were nulliparous.

Table 2 : showing the delivery records of the implanon acceptors

Parity	No.	%
0	9	0.6
1	224	15.2
2	347	23.6
3	354	24.1
4	249	16.9
5	134	9.1
=6	154	10.5
Mean ± SD: 3.2 ± 1.73,	*Range: 0-12,*	*Median: 3*
Children born alive		
0	9	0.6
1	221	15.0
2	345	23.4
3	357	24.3
4	258	17.5
5	128	8.7
=6	154	10.3
Mean ± SD: 3.2 ± 1.7,	Range: 0-10	Median: 3
Children still alive		
0	10	0.7
1	236	16.0
2	369	25.1
3	394	26.8

The mean (± SD) Systolic Blood Pressure (SBP) at baseline was 113.1 (± 12.2) mmHg with 4.2% of the women having a SBP ≥140 mmHg. By the last known measurement during follow up, the mean SBP (± SD) became 114.7 (±13.6) mmHg with 7.1% of the clients having SBP ≥ 140 mmHg. This represented a mean increase of 1.6 mmHg in the SBP. The mean Diastolic Blood Pressure (DBP) at baseline was 75.6 mmHg with 16.3% of the women having a DBP ≥90. By the last known measurement during implanon use, the mean (± SD) DBP increased to 76.3 (±11.0) with 19.1% of the women having DBP ≥90 mmHg. The average increase in DBP was therefore 0.7 mmHg.

Table 3 shows the different body weight categories and their frequency of occurrence. At baseline over a quarter of the women weighed more than 70 kg. However, by the last documented follow up visit, over a third of the women weighed more than 70 kg. The mean weight gain for all the 900 women who had at least one follow up visit was 2.4 Kg. About a third (28.8%) of the women had a net weight loss ranging from -1kg to -30 kg. Exactly 10.0% had no net change in weight. The remainder of the women (61.2%) had a net increase in body weight ranging from 1kg to 26 kg (36% had an increase less than 5kg while 25.2% had more than 5kg increase). The mean change in body weight after years 1, 2, 3, and 4 were 0.8kg, 1.6kg, 3.2kg and 3.3 kg respectively. About 3.8% of the women who had their implanon removed were on account of weight gain (Table 4 below).

Table 3 showing the number and percentages of the different weight categories at baseline and at the final known follow up visit

	BASELINE WEIGHT		**FINAL WEIGHT FOUND**	
WEIGHT GROUP(kg)	No.	%	No.	%
31-40	7	0.8	3	0.4
41-50	96	10.7	82	9.6
51-60	273	30.5	215	25.2
61-70	265	29.6	243	28.5
71-80	164	18.3	181	21.2
81-90	66	7.4	93	10.9
91-100	14	1.6	25	2.9
101-110	8	0.9	9	1.1
111-120	1	0.1	2	0.2
121-130	0	0	1	0.1
Mean (± SD)	64.4±12.1 Kg		66.9±13.3 Kg	
Range	36-112 Kg		35-135 Kg	
Median	63 Kg		66 Kg	

Two hundred and forty six women accepted implanon within the last year of the study period. Out of this number, 9 have had at least a follow up visit. We assume that the remaining had no reason to return to the clinic before their scheduled follow up visit at one year. Therefore, 349 women who were due for at least their first follow up visit did not return. This represents a 28.2% loss to follow up rate. They were however very similar to those women who came for follow up in their socio-demographic profiles and their delivery history. Nine hundred women had at least one follow up visit after insertion of implanon. They were all exposed to the implanon for 2006.6 woman-years or 24,079 cycles. The mean number of months of exposure to the implant was 27.0 ± 14.7 months. The cumulative continuation rates in this study were 78.4%, 54.5% and 21.6% at 1, 2 and 3 years respectively.

Over 650 women had their implant removed for various reasons. Table 4 shows the different reasons proffered for implanon removal. Over a third (36.1%) of the women had the implant removed on account of wanting another child. Amongst those who changed to another method, just under half (48.2%) changed to Jadelle, another implant, while over a quarter (26.2%) changed to an injectable. The Intrauterine contraceptive device (IUCD), condoms and pills were switching destinations for 12.8%, 4.3% and 3.7% respectively. In 8 (4.9%) women, the new method was not stated.

Table 4: Showing the reasons for the removal of implanon

Reasons for Removal	No.	Percentage
Desire for Pregn ancy	237	36.1
Changed Method *[a]	177	27.6
Menstrual Irregularities	62	9.5
Implant Expired	62	9.5
Husband Requests Removal	26	4.0
Weight Gain	25	3.8
Implant no longer needed * [b]	14	2.1
Elevated Blood Pressure	8	1.2
Headache	8	1.2
Others *[c]	37	5.6
TOTAL	**656**	**100**

*[a] Changed to Jadelle, Injectables, IUCD, Condoms, Pills

*[b] **Divorced** or widowed

* [c] Others: low libido, method failure, breast lump, menopause, ill health, dysmenorrhoea, loss of last baby, thyroid enlargement, pain at site of insertion

There were 7 in-treatment pregnancies that occurred while using implanon in this study. This gives a pearl index of 0.35. Ultrasonography for dating of the pregnancies however confirmed that 6 out of these 7 women were most probably pregnant before the insertion of the implanon. The only woman who probably had a method failure had a negative urine pregnancy test at baseline. This became positive at six weeks. She weighed 51kg at the time the method failed.

DISCUSSION

Women who accepted implanon in our study tended to be somewhat more educated with 85.5% having upto secondary school education or more. There was also a preponderance of Christian acceptors of implanon (87.8%) in the cohort than their Muslim counterparts (12.2%). Putting religion in context, 54.4% and 45.6% respectively of antenatal clinic attendees in 2007 were Muslims and Christians respectively. Yet implanon was accepted by 19.1% and 80.9% of Muslims and Christians respectively in that year. This may be a reflection of the varying desire for different family sizes and/ or polygyny alluded to earlier[7].

A significant finding in our study was the fact that about 73.3% of women who accepted implanon have future fertility desires. This was despite the fact that all the women had a mean of 2.9 children alive. This future desire for more children not only negatively affected the continuation rates for using implanon in this study but was also the dominant reason for discontinuation of the method. This was different from many international studies where the major reason for discontinuation was menstrual irregularities[27-29]. In our study, only 62 women (9.5%) discontinued due to menstrual irregularities. However, menstrual irregularity was the commonest cause of discontinuation (40.5%) in the first six months of use. Other side effects of implanon that led to premature discontinuation were weight gain (3.8%), elevated blood pressure (1.2%) and headache (1.2%). Body weight tended to increase significantly with implanon use in about 21% of users[30]. Some comparative studies however suggested that this weight increase can only be partly attributed to the implanon[31]. A quarter of the women in our study had a weight increase of 5kg and above. Four percent of the reasons for removal of the implant were partner's request. This reflects the dorminant role that men play in their wives' accepting or continuing with a contraceptive method in our deeply patriarchal region[7].

A high rate of loss to follow up was another major observation in this study with well over a quarter of the acceptors failing to return to the clinic. While this may be an indirect measure of satisfaction with the method for some of the clients, this exposes one of the defects of service provision in our family planning unit. This has to do with the absence of a mechanism to track and remind clients about their follow up appointments to the clinic and indeed the approaching due date for the removal of the implants. Other researchers have also found that loss to follow up was very common in normal practice outside the somewhat artificial context of clinical trials[29]. Some of our clients may therefore be carrying their implants many years after its expiration date. This was the experience in our unit with Norplant where some women were known to have deliberately carried their Norplant for 13 years (unpublished data).

This study has a high external validity since it looked at real-life situations which are radically different from the conditions in clinical trials where stringent inclusion criteria eliminated many categories of women. For instance, in most of the clinical trials on implanon, the implant was only inserted between days 1 to 5 of the menstrual cycle. This completely eliminated the possibility of an ongoing pregnancy before the insertion of the implant. Also women who were more than 130% of their normal body weight were purposively excluded from most clinical trials[29].

As earlier mention, the continuation rate for

implanon in our study was low. The mean number of months of usage was 27.0 months. The continuation rate was 78.4% at 1 year, 54.5% at 24 months and 21.6% by the end of the third year. These rates were much lower than those in most clinical trials where over 80.0% of clients were still using their implant at the end of two years. Continuation rates were particularly noted to be very high in the People's Republic of China with rate of over 90%[26]. Stringent inclusion and loose exclusion criteria of clinical trials tended to select women who had the most motivation and/or willingness to continue using the method[29]. Furthermore, the strict protocol of insertion of implanon in the first five days of the menstrual cycle ensures that pregnancy is almost completely ruled out before insertion. This aided the high efficacy profile seen in many clinical trials where no pregnancy occurred in over 4,103 woman-years. The Pearl index of implanon was therefore 0.0 for these trials[32]. In our study however, 7 in-treatment pregnancies occurred in 2006 woman-years giving a high PI of 0.35. In about 21% of the in-treatment failures with implanon seen during the post marketing surveillance study in Australia for implanon, the women were already pregnant[27]. In our series, six of the pregnancies were later proved ultrasonographically to have predated the implanon insertion. This seemed a drawback in our setting where implanon was inserted beyond days 1-5 of the menstrual cycle as long as pregnancy was thought to be reasonably excluded. This policy was adopted in order to remove all encumbrances to accepting implanon by reducing the number of screening visits for the implant. This was because whilst the implant itself was free, the cost of transportation to the clinic for multiple visits and opportunity cost lost with those visits could be prohibitively too expensive for some women.

Besides the liberal insertion of implanon beyond the first five days of the menstrual cycle once pregnancy test was 'negative', our study also had other methodological limitations. It was a retrospective review and therefore the quality of the data was dependent on information that was earlier collected within the setting of clinical consultation. Moreover, since some of the data relied on follow up visits, the fact that almost a quarter of the women did not return to the clinic may have affected the continuation rates, efficacy, reasons for removal and possibly other variables. This high rate of loss to follow up was compounded by the absence of a tracking system for the acceptors of the implant. Also, we did not collect data on the women's height and therefore we were unable to calculate the Body Mass Index.

Without prejudice to the above limitations however, this study has afforded us the opportunity to review and analyse our present clinical practice. It has given us local analysed data on our clients that would enhance future counselling of potential acceptors of implanon and help other providers within the Nigerian context.

CONCLUSION

Accepting implanon was influenced by the educational attainment and religion of the women in our unit. Implanon was used mostly for child spacing and the major reason for discontinuation in our study was the desire for another pregnancy. However, menstrual irregularity was the commonest side effect of the implant that led to its removal especially in the first six months after insertion.

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REFERENCES

1. Hubacher D, Olawo A, Manduku C, Kiarie J, Chen P. Preventing unintended pregnancy among young women in Kenya: prospective cohort study to offer contraceptive implants. Contraception 2012; 86: 511-517.
2. Cleland J, Bernstein S, Ezeh A, Faundes A, Glasier A, Innis J. Family planning: the unfinished agenda. Lancet 2006; 368: 1810-27.
3. National Population Commission (NPC) [Nigeria] and ICF Macro. 2009. Nigeria Demographic and Health Survey 2008. Abuja, Nigeria: NPC and ICF Macro.
4. Ishaku S, Ramarao S. Technical Report: Country Mapping of Nigeria. New York, Population Council. 2012.
5. Mauldin W P, Segal S J. Prevalence of contraceptive use: Trends and issues. Studies in Family Planning, 1988; 10: 335-353
6. Mauldin W P, Rise J A. Family Planning Program Effort and Results. Studies in Family Planning, 1991; 22: 350-367.
7. Izugbara, C.O. and A.C. Ezeh. 2010. "Women and high fertility in Islamic Northern Nigeria," *Studies in Family Planning* 41(3): 193–204.
8. Caldwell, J.C. and P. Caldwell. 1987. "The cultural context of high fertility in sub-Saharan Africa," *Population and Development Review* 13(3): 409–437.
9. Blanc A K, Poukouta P V. Components of unexpected fertility decline in sub-Saharan Africa. Demographic and Health surveys. Analytic Reports, Calverton, Maryland, Macro Int., 1997; 5: 29
10. Feyisetan B, Casterline J B. Fertility preferences and contraceptive change in developing countries. Policy Research Division Working Paper No. 130 New York, Population council, 1999: 30.
11. Kirk D, Pillet B. Fertility levels, trends and differentials in sub-Saharan Africa in the 1980s and 1990s. Studies in Family Planning, 1998; 29: 1-22.
12. Weinberger M B. Recent trends in contraceptive use. Population Bulletin of the United Nations, 1994; 36: 55-80.
13. Jejeebhoy S J. Women's education, fertility and the proximate determinants of fertility. United Nations, 1992: 40.
14. Lipetza C, Phillips CJ, Fleming CF. The cost-effectiveness of a long-acting reversible contraceptive (Implanon) relative to oral contraceptive in a community setting.

Contraception 2009; 79: 304-309.

15. Ronsmans C, Graham WJ. Maternal mortality: who, when, where, and why. Lancet 2006; 368:1189–200.

16. Grimes DA, Benson J, Singh S, et al. Unsafe abortion: the preventable pandemic. Lancet 2006;368:1908–19.

17. Heaton T B, Forste R. Education as policy: The impact of education on marriage, contraception, and fertility in Colombia, Peru and Bolivia. Social Biol, 1998; 45: 194-213.

18. Castro M T. Women's education and fertility: Results from 26 Demographic and Health Surveys. Studies in Family Planning, 1995; 26: 187- 202

19. Clark S. Son preference and sex composition of children: Evidence from India. Demography, 2000; 37: 95-108.

20. Abasiattai AM, Utuk MN, Ojeh SO, Eyo UE. Combined Oral Contraceptive Pills: Profile of Acceptors in a Tertiary Hospital in South-South Nigeria. Nigerian Medical Journal, 2011; 52: 19-23.

21. Funk S, Miller MM, Mishell DR, Jr. Safety and efficacy of Implanon, a single-rod implantable contraceptive containing etonogestrel. Contraception 2005; 71:319–26.

22. Tumlinson K, Steiner MJ, Rademacher KH, Olawo A, Solomon M, Bratt J. The promise of affordable implants: is cost recovery possible in Kenya? Contraception 2011; 83: 88-93.

23. Chikamata DM, Miller S. Health services at the clinic level and implantable contraceptives for women. Contraception 65 (2002) 97–106

24. Rehan N, Inayatullah A, Chaudhary I. Efficacy and continuation rates of Norplant in Pakistan. Contraception 1999;60:39–43.

25. Affandi B, Hoesni HM, Barus RP, et al. A multicentred phase III comparative study between single-implant containing 3-ketodesgestrel (Implanon) and implants containing levonorgestrel (Norplant). II. Vaginal bleeding patterns. Med J Indonesia 1999;8:56–61.

26. Sivin I, Campodonico I, Kiriwat O, et al. The performance of levonorgestrel rod and Norplant contraceptive implants: a 5-year randomized study. Hum Reprod 1998;13:3371–8.

27. Isley M. Implanon: The Subdermal Contraceptive Implant. J Paediatric Adolescent Gynaecology, 2010; 23: 364-367.

28. Zheng S, Zheng H, Qian S, Sang G and Kaper RF. A Randomized Multicenter Study Comparing the Efficacy and Bleeding Pattern of a Single-Rod (Implanon) and a Six-Capsule (Norplant) Hormonal Contraceptive Implant. Contraception 1999; 60:1–8.

29. Glasier A. Implantable contraceptives for women: effectiveness, discontinuation rates, return of fertility, and outcome of pregnancies. Contraception 2002; 65: 29–37.

30. Edwards JE, Moore A. Implanon: A review of clinical studies. Br J Fam Plann 1999; 24:3

31. Urbancsek J. An integrated analysis of non-menstrual adverse events with Implanon. Contraception 1998; 58(suppl):109S–15S.

32. Croxatto HB, Makarainen L. The pharmacodynamics and efficacy of Implanon; an overview of the data. Contraception 1998; 58 (Suppl): 91-7.