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Introductory Chapter: Family Planning

Zouhair Amarin

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1. Overview

Men and women have used contraception, in one form or another, for thousands of years. Most individuals at some time in their lives will use contraception. The worldwide trend towards delayed onset of childbearing and smaller families means that many women will need to use contraception for up to 30 years and will use different methods at different stages of their lives [1].

The ideal contraceptive method needs to be highly effective with no side effects, cheap, independent of intercourse, rapidly reversible, widely available, acceptable to all cultures and religions, and easily distributed and can be administered by non-healthcare personnel [2].

2. Classification and key points

Contraceptives are classified into hormonal, in the form of combined oral contraceptives (COCs), combined hormonal patches, progesterone only preparations, that include injectables and subdermal implants, intrauterine contraception in the form of copper intrauterine contraceptive devices (IUCD) and hormone releasing IUCDs, barrier methods in the form of male and female condoms, coitus interruptus, natural family planning, emergency contraception, female sterilisation and vasectomy [1–3].

Natural methods are physiologic-based methods that use neither chemical nor mechanical contraceptive method. These are least effective and not reliable. Fertility awareness and periodic abstinence emphasise avoidance of intercourse shortly before and after estimated ovulation period, therefore it is important to decide the fertile window of the cycle [4–10].

Fertility awareness and periodic abstinence relate to the fertile window of the cycle through the assessment of cervical mucus and the basal body temperature [1–3].

The calendar (rhythm) method is based on the assumptions that a human ovum is capable of fertilisation only for approximately 24 h after ovulation, that spermatozoa can retain their fertilising ability for only 48 h after coitus, and that ovulation usually occurs 12–16 days before the onset of the subsequent menses [1–4].

The menses are recorded for six cycles to approximate the fertile period. The earliest day of the fertile period is determined by the number of days in the shortest menstrual cycle subtracted by 18. The latest day of the fertile period is calculated by the number of days in the longest cycle subtracted by 11. After determining the earliest and latest days of the fertile window as mentioned above, abstinence should be for 2 days before the earliest day and 2 days after the latest day of the fertile period depending on spermatozoa viability [1–4].

Regarding cervical mucus, when a woman is not fertile, the mucus is light or sticky. During the day before and the day of ovulation, the most fertile time period, the increase in oestrogen levels causes more copious mucus that is clear and slippery [3–6].

The basal body temperature method stems from the fact that 2 or 3 days after ovulation, hormonal changes cause a rise in body temperature between 0.3 and 0.9°C, when measured as the first thing in the morning before getting out of bed [3].

Symptothermal methods include checking for breast tenderness or mittelschmerz (the lower abdominal pain or cramping some women feel around the time of ovulation) [3].

The advantages of the fertility awareness and periodic abstinence relate to the non-use of hormones, no side effects, enables a woman to understand her body's cycles, promotes cooperation between partners, and is useful in couples with religious or cultural beliefs not meeting with hormonal or barrier contraception [6–9].

The disadvantages are due to the need for varying amounts of training, and are difficult to use in cases of recent childbirth, breastfeeding, recent menarche, approaching menopause, recent discontinuation of a hormonal method, irregular cycles, and being unable to interpret fertility signs [6–9].

The lactational amenorrhea method (LAM) is the use of breastfeeding as a contraceptive method. Elevated prolactin levels and a reduction of gonadotropin-releasing hormone from the hypothalamus during lactation suppress ovulation. To use breastfeeding effectively as a contraceptive requires mothers either feed the baby nothing but breast milk or, at the very least, breastfeed for almost all feedings. In addition, the baby must be less than 6 months old, and the mother should have amenorrhea. As soon as the first menses occurs, she should start using another method of contraception [4, 10–14].

Withdrawal (coitus interruptus) is a traditional family planning method in which the man completely removes his penis from the woman's vagina before he ejaculates. As a result, spermatozoa do not enter the vagina and fertilisation is prevented. The failure rate of this method is around 20%. Effectiveness depends largely on the man's capability to withdraw prior to ejaculation [3].

Barrier methods include male condoms, female condoms, diaphragms with spermicides, cervical caps, creams, and foams [3].

Male condoms act as a physical barrier that prevents pregnancy by blocking the passage of semen. The available types include latex (natural rubber), natural membrane (lamb intestine), and polyurethane [3].

Advantages of the male condom include male participation, very inexpensive, effective in preventing pregnancy when used correctly, minimal side effects, protection against sexually transmitted infections, except HPV and HSV. Disadvantages include reduced sensitivity, erection problems, lack of cooperation, not very effective with wrong use, and latex allergy [3].

To minimise user error, male condoms should be used with every act of intercourse, used 'from start to finish', rim being held during withdrawal to prevent slippage or leakage, usage of appropriate lubricants (oil-based lubricants may damage the condom, and correct storage. The failure rate with perfect use is 2%, and with typical use is 15% [3].

Female Condoms are 'one-time use', they include a lubricant, spermicides are not recommended, can be inserted up to 8 h prior to intercourse, and can remain in place for up to 8 h. They protect against sexually transmitted infections. The failure rate with perfect use is 5%, and with typical use is 20% [3].

Female condoms contain two flexible rings and measures 7.8 cm in diameter and 17 cm long. The ring at the closed end of the sheath serves as an insertion mechanism and internal anchor that is placed inside the vaginal canal. The other ring forms the external patent edge of the device and remains outside of the canal after insertion [3].

The diaphragm is a dome-shaped latex (rubber) cup which is inserted into the vagina before intercourse and covers the cervix. Diaphragms prevent sperm from gaining access to the upper reproductive tract (uterus and fallopian tubes) and serve as a holder of spermicide. It must be inserted no longer than 6 h prior to coitus and left in the vagina at least 6 h but not longer than 24 h [1–3].

The cervical cap is a small, soft, rubber cap that fits directly over the cervix acting as a barrier to sperms. It is introduced 8 h before intercourse and left for 48 h. It is small, and works for 48 h. It must be fitted by a physician, and does not protect against sexually transmitted infections. The failure rate is 15–20% [1–3].

The mechanism of action of the spermicide nonoxynol-9 is by the virtue of its surfactant effect that destroys the sperm cell membrane. Its advantages include ease of use, and can use intermittently without advance planning. Its disadvantages include not providing protection against sexually transmitted infections, and its frequent use (more than twice per day) may cause tissue irritation that could increase susceptibility to HIV. Failure rates (when used alone) are about 20% with perfect use, and 30% with typical use [1–3].

Injectable progestin (depot medroxyprogesterone acetate 150 mg IM q 12 weeks) has the advantages of being highly effective, discreet and private, its use is not linked to coitus, and it does not require users to remember (only four times a year). Disadvantages include irregular periods or amenorrhea, delayed return to fertility, adverse effects on lipids, and decreased bone mineral density with long-term use [1–3].

Subdermal implants contain levonorgestrel and are inserted subcutaneously in the upper arm. Their use lasts between 3 and 5 years, according to the type [2, 3].

Transdermal patches release 150 mg norelgestromin and 20 mg ethinylestradiol daily. They form a 4.5 cm square that can be worn on the lower abdomen, buttocks, upper outer arm, upper torso (except breasts). One patch is applied every week for 3 weeks, followed by a patch-free week. They are as reliable as combined oral contraceptives, but may cause allergy, and breast tenderness [15–18].

Vaginal rings release etonogestrel 120 mg, and ethinylestradiol 15 mg daily. The ring is used continuously for 3 weeks, removed, and a new ring is inserted 1 week later. They too are as reliable as combined oral contraceptives [15–18].

Intrauterine contraceptive devices are long-acting contraceptives intended to be used for several years. They can be inert, copper releasing, or progesterone releasing devices.

Copper T 380 is a T-shaped IUCD that is made of polyethylene with fine copper wire wrapped around the vertical stem. This device consists of 380 mg of copper covering portions of its stem and arms. Its contraceptive effectiveness continues for 10 years; after which time it must be replaced [2, 3].

Progesterone releasing devices are intrauterine systems that release 20 mcg of levonorgestrel per day into the uterine cavity for as long as 5 years. The direct effect on the lining of the uterus results in less bleeding, than experienced with other IUCDs. They act through fertilisation inhibition, cervical mucus thickening, inhibition of sperm motility and function, endometrial suppression, induction of weak foreign body reaction, and the inhibition of ovulation in some cycles [15–18].

Intrauterine contraceptive devices produce no adverse systemic effects, do not require daily attention, easy to use, not linked with sexual intercourse, provides long acting contraception, can be inserted immediately following an uncomplicated abortion in an uninfected uterus, and allow for rapid return to fertility. Their failure rate is between 0.1 and 0.6%. Ectopic pregnancies are reduced overall; however, the ratio of extrauterine to intrauterine pregnancy is increased if conception does occur [2, 3].

The disadvantages of intrauterine contraceptive devices are that they must be inserted and removed by a trained health care provider, are associated with a risk of uterine perforation at the time of insertion, increased dysmenorrhea occurs with the copper IUDs, and increased menstrual blood loss occurs in the first few cycles. Whether IUCDs increase the risk of pelvic inflammatory disease (PID) is controversial. They do not have any of the potential non-contraceptive benefits of hormonal contraceptives, and may be expelled unnoticed, and they do not protect against sexually transmitted infections [15–18].

Contraindications to the use of intrauterine devices include a history of previous PID in the past year or active PID, active cervical or endometrial infections, abnormal or distorted uterine cavity, undiagnosed genital bleeding, uterine or cervical malignancy, a history of ectopic pregnancy, increased susceptibility to infection (e.g., those with leukaemia, diabetes, valvular heart disease, or AIDS), Wilson disease, and known or suspected pregnancy [15–18].

Combined oral contraceptives were first licenced in early 60s of the last century. Millions of women worldwide have taken it since. They contain synthetic oestrogen and a progestogen (synthetic derivative of progesterone). Oestrogens are mainly ethinylestradiol: 20, 30, 35, 50 µg, and mestranol 50 µg [2, 3].

Second-generation progestogens include norethisterone acetate 0.5, 1.0, 1.5 mg, and levonorgestrel 0.15, 0.25 mg. Third-generation progestogens include gestodene 0.075 mg, desogestrel 0.15 mg, norgestimate 0.25 m, anti-mineralocorticoid and anti-androgenic: drospirenone 3 mg [2, 3].

Combined oral contraceptives are metabolised in the liver and are excreted by the kidney. Their types include monophasic, biphasic, and triphasic. Most brands contain 21 pills and 7 days' pill-free interval. Some are taken every day with seven placebo pills. Oestrogens inhibit ovulation by suppressing FSH and LH, thus making the endometrium atrophic. Progestins suppress LH, and thicken cervical mucus (making it less penetrable by sperms).

Counselling topics of COC users should include safety and efficacy (depends on the right use of the pill), how COCs work, possible side effects, what to do with the missed pill, when to consult a physician, and special circumstances (diarrhoea, vomiting, and medication) [2, 3].

The 'must ask questions' before prescribing COCs include the personal characteristics of age, weight, smoker, previous family planning, obstetrics and gynaecology history [(last menstrual period, last delivery or miscarriage, breast feeding, dysfunctional uterine bleeding), past medical history (breast disease, liver disease, gall bladder disease, headache, epilepsy, diabetes, hypertension, cardiac disease, DVT, stroke) and drug history (anti epileptics, antibiotics, anticoagulants)] [15–18].

The WHO issued a list of medical conditions that are considered contraindications for COC prescription. If the woman answers yes to any of the following questions, it is the responsibility of the health care professional to refer her to a physician:

- Do you think you could be pregnant?
- Do you have high blood pressure?
- Do you have diabetes?
- Have you ever had stroke, blood clot in your leg, or other heart problems?
- Do you have breast mass or known breast disease?
- Do you have liver disease, hepatitis, jaundice, or gallbladder disease?
- Do you have migraine headaches?
- Do you have abnormal vaginal bleeding?
- Are you breast feeding?
- Are you above 35 yrs. and smoke >15 cigarettes per day?
- Are you going for a major surgery soon?

Common questions that are posed by users include missing pills, break through bleeding, when to start the pill, what pill is the best, and side effects. Most side effects are minor. A woman should stop the pill immediately when she develops abdominal pain, chest pain, headache, eye symptoms (blurred vision, brief loss of vision), and sharp leg pain.

When non-menstrual problems arise, such as dizziness, women should be reassured as this usually diminishes over time. If there is nausea and vomiting, then pills should be taken with foods. If there is weight gain, women should be counselled about healthy eating habits and exercise. If side effects persist and are unacceptable, switching pill formulation or adopting another method should be considered [1–3].

In cases of unexplained vaginal bleeding or amenorrhea, the cause should be assessed (pregnancy or disease). Reinforcement of correct pill taking should be considered in women with breakthrough bleeding. Non-steroidal anti-inflammatory medication may be administered, or the use more potent progestins may be used in women with prolonged bleeding. In case of amenorrhea, women should be reassured, with no need for medical treatment. If side effects persist and are unacceptable there might be a need to switch to another method [1, 2].

After making sure that the woman is not pregnant, COCs are started in the first 5 days of menstrual cycle. After day 5, a backup method should be used for 7 days. Postpartum, and non-breast feeding women, delay for 3 weeks, and if breast feeding, delay for 6 months [2, 3].

When one or two active pills are missed, the missed pill should be taken as soon as remembered, and other pills should be taken on schedule with no need for a backup method. If three or more pills are missed, then a pill should be taken as soon as it is remembered, to be continued for at least 7 days, and to use back up measures for at least 7 days. The take-home message is to always take the missed pill as soon as remembered, continue taking the pill as usual, with three or more missed pills, backup measures until the woman has 7 days of pills [15–18].

Deciding on what pill is the best is a matter of trial. A woman can switch pills anytime she chooses, and anytime is a good time to stop. On the other hand, there is no need to take a break from the pill once in a while [16].

Some antibiotics and antiepileptic drugs known to induce hepatic cytochrome P450 (CYP450) isoenzyme cause decreased sex hormone levels in women taking oral contraceptives, raising the potential for decreased effectiveness of oral contraceptives and increased risk of unplanned pregnancy. Drugs that do not induce this hepatic isoenzyme are not thought to compromise the effectiveness of oral contraceptives.

Although fertility declines with age, effective contraception is still required in women over 40 years of age who wish to avoid pregnancy. According to International Guidelines, there are no contraceptive methods that are contraindicated based on age alone. However, there are some medical conditions more common in older women that may make the use of some contraceptive methods inappropriate. Effective nonhormonal and progestin-only methods provide safe options for women who should avoid oestrogen-containing contraceptives [15–18].

Lactational amenorrhea method (LAM) is the use of breastfeeding as a contraceptive method. Elevated prolactin levels and reduction of GnRh during lactation suppresses ovulation. For postnatal contraception, LAM users should begin breastfeeding immediately after delivery. It is highly effective for up to 6 months in amenorrheic exclusive breast feeders. As soon as the first menses occurs, the mother should start using another method of contraception [15].

Postnatally, less than 10% of women want another child within 2 years, and about 40% of women in the first year intend to use contraception, but do not do so. Generally, counselling for postnatal contraception should begin antenatally. Some methods are provided at delivery and during hospital stay such as IUCDs, female sterilisation, implants or injectables [15].

For puerperal contraception, spermicides and condoms may be used safely, withdrawal may be a simple but relatively unreliable, and episiotomies may still be tender. Fitting a woman with cervical cap or diaphragm may cause discomfort. The risk of toxic shock syndrome is increased when blood or lochia are present. Copper or progesterone releasing IUCDs may be inserted immediately after delivery, after caesarean section or within 48 h of delivery, otherwise insertion at 6 weeks. In menstruation, insertion is advisable on day 5 of the cycle [15–18].

The health benefits of oral contraception include a decrease in ovarian and endometrial Ca, ectopic pregnancy, anaemia, dysmenorrhoea, functional ovarian cysts, benign breast disease, and salpingitis [2, 3].

Absolute contraindications for oral contraception include venous thromboembolism, pulmonary embolism, cardiovascular disease, cerebrovascular accident, pregnancy, malignancy, hepatitis, tumours, and abnormal liver function tests [3].

Relative contraindications for oral contraception include fibroids, lactation, diabetes mellitus, sickle-cell disease, hypertension, over 35-year-old smokers, over 40-year-old and risk of vascular disease, anovulation, depression, migraine, severe varicose veins, and hyperlipidaemia [2, 3].

Complications of oral contraception include thromboembolism, cerebrovascular accident, hypertension, post pill amenorrhoea, cholelithiasis, and benign hepatic tumours [2, 3].

Combined oral contraception should be avoided in breast feeders for 6 months. In lactational amenorrhoea, it is started when weaning begins. In non-breast feeders, it is started 3 weeks postpartum [3].

Progestin-only contraceptives (POCs) are produced in the form of implants, Depo-Provera and mini pills. Breast feeders should avoid using the progesterone only pills (mini pills) before 6 weeks postpartum. The mini pills can be used after 6 weeks up to 6 months. In lactational amenorrhoea, POCs may be delayed until 6 months. The main side effect of POCs is irregular bleeding [11].

Injectable Progestins include medroxyprogesterone (Depo Provera) 150 mg IM—3 months, norethisterone enanthate 200 mg IM—2 months. They should be considered when women have difficulty remembering, do not tolerate estrogenic, and are lactating [10].

Emergency contraception is the use of a drug or device to prevent pregnancy after unprotected sexual intercourse. The indications for its use include contraceptive failure (condom broke, pills forgotten), error in withdrawal or periodic abstinence, any unintended 'sperm exposure'. Pregnancy is a contraindication for the use of emergency contraception [15–18].

Postcoital emergency contraception includes emergency contraceptive pills, containing estrogenic and progestin. It consists of two pills, and each contains 100 mcg of ethinylestradiol and 0.5 mg of levonorgestrel, ingested 12 h apart for a total of four pills. The first dose should be taken within the first 72 h after unprotected intercourse, or RU 486 (mifepristone) 50 mg single dose up to 96 h following unprotected coitus. Side effects include nausea, vomiting, headache, breast tenderness, abdominal pain, and dizziness [15–18].

Progestin-only postcoital emergency contraception treatment schedule comprises 1 dose of 750 mcg levonorgestrel taken as soon as possible and no later than 48 h after unprotected intercourse, and a second dose taken 12 h later. Side effects include nausea, vomiting, headache, breast tenderness, abdominal pain, and dizziness. Hormonal postcoital emergency contraception is about 90% effective [15–18].

The Copper T380 IUD can be inserted as many as 7 days after unprotected sexual intercourse to prevent pregnancy. Insertion of an IUCD is significantly more effective than other regimens, reducing the risk of pregnancy following unprotected intercourse by more than 99% [1–3].

For permanent contraception, tubal ligation is chosen by about 30% of women in developing countries, and about 10% of men undergo vasectomy. The mechanism of action of fallopian tube sterilisation is by cutting or mechanically blocking them to prevent the sperm and ovum from uniting. Can be performed laparoscopically or through a suprapubic 'mini-laparotomy' incision, or at caesarean section. The failure rate is 0.1% [1–3].

Tubal sterilisation is permanent, highly effective, safe, with quick recovery, lacks significant long-term side effects, cost effective, partner cooperation not required, and is not coitus-linked. Disadvantages include the need for general or regional anaesthesia, possibility of patient regret, difficult to reverse, future pregnancy could require assisted reproductive technology (such as *in vitro* fertilisation and intracytoplasmic sperm injection), and is more expensive than vasectomy [1–3].

At vasectomy, each vas deferens is cut to prevent the passage of sperm into the ejaculated seminal fluid. The failure rate is about 0.1%. Vasectomy is permanent, highly effective, safe, with quick recovery, lacks significant long-term side effects, cost effective, less expensive than tubal ligation, no partner cooperation needed, with removal of contraceptive burden from the woman. Disadvantages include the fact that reversal is difficult, expensive, often is unsuccessful. In addition, patients may regret decision, not effective until all sperm cleared from the tract, with no protection from sexually transmitted infections [2, 3].

For reporting the effectiveness of a birth control method, the Pearl's index is the most common technique used in clinical trials. It is the number of pregnancies occurring in 100 females using a certain contraception method for 1 year [3].

The Pearl index for various contraceptive methods is about 0.5 for COCs, 1 for injectables, implants and IUDs, 2 for progesterone only contraceptives, 2–5 for male condom, 20 for diaphragm, cervical cap and spermicides, and 45 for the rhythm method [2, 3].

The relative cost per patient per year is 1 for vasectomy, 2 for female sterilisation, 2.5 for IUCDs, 8 for COCs, and 14 for barrier methods [2, 3].

Family planning benefits the wellbeing of families throughout the world. Using contraception can avoid unwanted pregnancies and space births, protect against sexually transmitted infections and provide other health benefits [2, 3].

The World Health Organisation and World Bank estimate that \$3 per person per year would provide basic family planning, maternal and neonatal health care to women in developing countries. This would include contraception, prenatal, delivery, and postnatal care in addition to postpartum family planning [1–3].

Author details

Zouhair Amarin

Address all correspondence to: zoamarin@hotmail.com

Department of Obstetrics and Gynecology, Jordan University of Science and Technology, Irbid, Jordan

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