

Update on contraception

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Contraception is an important health issue in preventive medicine because it protects women globally from the effects of unwanted pregnancy and allows them to integrate in the society. Uncontrolled childbearing in underdeveloped countries carries a significant risk of maternal death. Available methods are not ideal and are a result of a compromise between efficacy and safety. In assessing risks, the consequences of inadvertent pregnancy should not be taken into consideration. Natural methods have a failure rate of 6-25%. Condom demands motivation but protects from sexual transmitted diseases and can be used in combination with the pill or alone with a failure rate of 12% (3-15%). Barrier methods have failure rates up to 25%. Hormonal contraception is the most efficacious (above 99%) but questions of safety and minor side effects (nausea, headaches, break through bleeding) result in discontinuation rates of at least 30%. The combined contraceptive pill has been scrutinized and found safe and practical for women under 35 with no significant cardiovascular risk. Thrombosis is slightly increased, with an absolute risk of 1-10 more cases in 100,000 women. Increased age, obesity, smoking and hypertension alone or in combination increase the risks significantly and are the main contraindications for its use. Breast and cervical cancer risks are slightly increased but the absolute risks are small, occur after 5 years of use and are reversible. Other hormonal methods with injectable and implantable progestins are safe and practical but not readily reversible and produce menstrual irregularities and sometimes amenorrhea. Hormonal methods have several benefits on reproductive problems such as dysmenorrhea, menorrhagia and ovarian cysts. Intrauterine contraceptive devices (IUCD) are safe and effective with a failure rate of 0,1-1,5% but demand skill in application and selection of patients (monogamous, preferably parous) to avoid infection that is increased only around insertion. Emergency postcoital contraception in the form of high dose combined pill or high dose progestins or insertion of IUD is effective and should be widely available. Teenage pregnancy is a serious health problem of modern societies and contraception in this age group demands special non-didactic counseling, education and parent involvement. The pill or/and condom are the methods used commonly. *Hippokratia* 2005, 9 (1): 35-40

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The necessity for contraception

A woman in the reproductive age has three options: uncontrolled reproduction, sexual abstinence or contraception. Uncontrolled childbearing has important consequences globally with the ecologic destruction and the lack of resources. It is also a major health problem since pregnancy is an important cause of maternal mortality and morbidity in underdeveloped countries, where there is no access to professional health care and safe abortion¹. Pregnancy carries a 1:13 risk of dying in Africa. In developed countries the ability to control pregnancy allowed women to work, to educate and to pursue a career and separate sexuality from reproduction. It is calculated that about 50% of births result from an unplanned pregnancy. Unwanted pregnancy that ends in abortion is quite common reaching 30% in ages 25-35 years old and is proportional to the lack of adequate health education on contraception².

General aspects of contraception

The ideal contraceptive method must be 100% safe,

without health hazards, without adverse effects, 100% efficient, not related with coitus, reversible, easy to use, cheap and widely available if possible without medical intervention and acceptable by all religions and political systems. Obviously, available methods are far from ideal and are a result of compromise between efficacy and safety.

The efficacy of a method is calculated with the number of pregnancies occurring in 100 women in one year (100 women years) and is referred as a Pearl index. Life table analyses would be more useful because with increasing use the couple acquires more experience and the fecundity per cycle lessens with advancing age^{1,3}. There is a disparity between efficacy from ideal use and true efficacy from typical use (Table 1).

Natural Methods

The fertile days in the menstrual cycle start at the 7th day of the cycle and extends to the 16th day of a regular 28 days cycle because of variations in ovulation day and because of the ability of spermatozoa to live up to 7 days^{1,3}.

Table 1. Contraceptive efficacy of various methods calculated with Pearl Index

Method	% pregnancy			Continu- ance of the method in the first year (%)
	Typical use	Ideal use	Variations in different studies	
No contraception				
age (years)				
before 40	80-90			
40	40-50			
45	10-20			
Coitus interruptus	19	4	8-19	
Natural methods				
Periodic abstinence	15.5		6-25	67
Calendar		9		
mucous		3		
Temperature		2		
post ovulatory		1		
Barrier methods				
Condom	12	3	2-15	63
cervical cap	18-36	9-29		45
diaphragm	18	6	2-15	58
sponge	11	13.2	9-25	
Spermicides	11.9	-	4-25	43
Hormonal contraception				
combined oral	0.25	0.1	0.1-1	
contraceptive pill				
progesterone only pill	2.5	0.5	0.3-5	70
Depot Provera	-	0.3	0-1	85
implants (Norplant)	0.3	0.3		
Intrauterine devices				
Copper IUD	1.5	0.6	0.3-4	78
levonorgestrel IUD	0.1	0.1		81
Sterilization				
female	0.4	0.4	0-0.05	
male	0.15	0.10	0-0.02	

Motivated women can detect the consistency of cervical mucous (thin and transparent) manually and of the cervix (softer with an open os). A basal body temperature elevation of 0,2-0,6° C is an indication of ovulation⁴. Coitus interruptus is the commonest method used especially among married couples³. Although it is criticized as being inefficient by literature its efficacy can reach 8/100, close to the condom and the diaphragm. It interferes with sexual pleasure but in a study where 31% of couples found it annoying the corresponding numbers for the condom were 54%. It is certainly better than no contraception at all¹.

Barrier Methods

The male condom is the contraceptive method more commonly used. It is manufactured with latex and covered with spermicide. If properly used it tears only in 3% but oily lubricants increase tears^{1,4}. Used alone or

with the spermicide nonoxynol-9 reduces the transmission of sexual transmitted infections as chlamydia, gonorrhoea, hepatitis B, HSV and HIV. Regular use decreases cervical intraepithelial neoplasia and cervical cancer by 60-80%⁴. It is dependent on motivation and proper use so its efficacy varies from 5/100 to 21/100. In married couples with regular use the Pearl index is 0,7/100¹.

Other barrier methods include diaphragm, contraceptive sponge and cervical cap have decreased efficacy (6-25/100) and should be combined with a spermicide. They are more efficient in older women with less fecundity^{1,4}. Diaphragm is associated with an increase in urinary tract infections.

Intrauterine contraceptive device (IUD)

IUDs are small devices designed for intrauterine application for contraceptive reasons. It is the most widely used method globally with 100 million users worldwide. Sixty seven percent of users are in China but it is also widely used in Scandinavia where 28% of married women use it⁵. Older devices with polyfilament strings increased the incidence of pelvic infections, discredited the method and decreased substantially its use in USA because of fear for litigation³.

Modern IUDs are of two types, either coated with copper in various doses (TCu 220, TCu 380) that increases contraceptive efficacy or coated with the progestagen levonorgestrel (LNG-IUD) that is released gradually causing endometrial atrophy³.

IUDs act by creating a sterile inflammatory response in the endometrial cavity that is inhabited by macrophages, fibrin and proteolytic enzymes. The endometrium becomes hostile to implantation^{1,3,4}. It also has a cytotoxic effect on spermatozoa and inhibits their way to the fallopian tube. The progestagen acts mainly by endometrial atrophy, by increasing the cervical mucous thickness and by inhibiting ovulation in some patients.

IUCD is indicated in monogamous women regardless of parity, especially those that have sporadic intercourse and forget taking pills^{1,4,5}. Women with menorrhagia may benefit from the levonorgestrel IUCD⁵. Contraindications are reviewed in Table 2.

It can be useful as a postcoital contraceptive if inserted within 5-7 days of unprotected intercourse in properly selected candidates^{5,7}. It can be inserted at the time of a first trimester termination of pregnancy or evacuation of retained products without increased risk of expulsion or failure. Modern IUCD s provide excellent, long term contraception with low failure rates even at 5 and 10 years comparable to sterilization⁵. WHO Annual Technical Report in 1999 showed pregnancy rates of 0,4% at 4 years and 0,5% at 9 years⁶. Increased menstrual loss by 70-100% is universal with all devices except the LNG- IUD and persists for 1 year. It can be treated effectively with tranexamic acid and NSAIDs but is a cause of discontinuation in 5-20% of patients^{1,3-5}.

Table 2. Contraindications in the use of IUD

<p>Absolute contraindications</p> <ul style="list-style-type: none"> - Pregnancy known or suspected - Undiagnosed vaginal bleeding - Suspected malignancy - Active pelvic inflammatory disease - For copper devices Wilson disease or copper allergy.
<p>Relative contraindications</p> <ul style="list-style-type: none"> - previous ectopic pregnancy - distortion of the uterine cavity by congenital abnormalities, leiomyomas, etc - menorrhagia - Risk of PID History of PID in < 6 months, or STD in the last 12 months Active vaginal/cervical infections Young nulliparous women with multiple sexual partners - Medical history of: Anemia, valvular heart disease (prophylactic antibiotics at the insertion), immunosuppression

Hormonal contraception

It can be administered by mouth in the form of combined (estrogen and progestogen content) oral contraceptive (COC) pill, or the progesterone only pill (mini pill). Parenteral steroid contraception is available in the form of vaginal rings, monthly injections and subcutaneous implants.

The combined oral contraceptive pill

The turn of this century marked the fourth decade

of oral contraceptive use. Although there has been a wealth of literature that has shown the pill to be safe and effective, there continues to be some controversy about some aspects of safety. The major new developments in the past decades include reduction in the dosage of ethinyl estradiol from 50 µg to 20 µg per pill and the introduction of new progestins, ie, desogestrel and norgestimate, with the aim of decreasing side effects and increasing safety.

Combined oral contraceptives (COC) suppress ovulation by diminishing the frequency of gonadotropin-releasing hormone pulses and halting the luteinizing hormone surge^{1,3,4}. They also alter the consistency of cervical mucous, affect the endometrial lining and alter tubal transport. When administered correctly and consistently, they confer a greater than 99% effectiveness in preventing pregnancy^{1,3}. Unfortunately, problems with compliance, frequently secondary to side effects such as abnormal bleeding, have led to a significantly reduced use-effectiveness¹ (Table 3)⁸. Risks of COC have been established only in association with vascular disease and although they are real they should be put into perspective by comparison with the risks of other methods and with pregnancy should a less effective method fail^{9,10,11}.

Venous thromboembolism (VTE) is increased by oral contraceptives because ethinylestradiol promotes coagulation by altering clotting factor levels and by modifying platelet function. This is partly compensated by increased fibrinolytic activity and is reversed completely 4 weeks after stopping COC¹¹⁻¹³. Because the actual incidence of VTE is very low in young women the increase in relative risk leads to 1-10 more cases in 100,000 women annually

Table 3. Risks and benefits of combined oral contraceptives (COC)

Established benefits	Possible benefits	Established risks	Possible risks
Contraceptive efficacy <i>Convenience Reversibility</i>	Decreased risk of colorectal cancer	Increased venous thromboembolism	Breast cancer
Menstrual benefits <i>Regularity</i> <i>Decreased menstrual loss, less anemia</i> <i>Less dysmenorrhea and ovulation pain</i>	Increased peak bone mass Less symptoms from leiomyomas Less symptoms from endometriosis	Increased myocardial infarction in older women with other risk factors (eg. smoking)	Carcinoma of the cervix Liver tumors Adenoma/carcinoma Inflammatory bowel disease
Protection from endometrial and ovarian cancers	Less acne/seborrhea/hirsutism	Increased ischemic and hemorrhagic stroke in older women with other risk factors (eg. smoking)	Jaundice Gallstones Diabetes mellitus
Less ovarian cysts	Less premenstrual syndrome	Hypertension	Depression Chorea and benign intracranial hypertension Ulceration with contact lens Retinal artery or vein thrombosis Chloasma/melasma Melanoma
Less PID from other organisms than chlamydia	Less thyroid disease Rheumatoid arthritis		
Less benign breast diseases	Peptic ulcer		

and it is less than the risk in pregnancy^{8,10}. The more recent oral contraceptives (3rd generation COCs) have been implicated as more thrombogenic but this is widely disputed. Lately there has been an awareness of factor V Leiden mutations that lead in excessive cardiovascular and pregnancy complications. At a prevalence of approximately 5%, the risk for reproductive-aged women who were not using oral contraceptives was 5.7 venous thromboembolic events per 10,000 woman-years. In contrast, among oral contraceptive users with the mutation, the rate increased to 28.5 events per 10,000 woman-years. However the absolute risk of venous thromboembolism among such women is quite low. For example, one investigator determined that screening one million potential users for all known coagulation factor deficiencies or mutations would identify approximately 50 women at risk, but also would result in approximately 62,000 women having false-positive results¹⁰.

Arterial disease The risk of myocardial infarction is not increased substantially in young women (Table 3) taking 3rd generation contraceptives but is increased in women above 35 yrs old with other risk factors (obesity, smoking, hypertension) by 2-10 fold⁸. The slight increase in ischaemic stroke applies in younger users while older users that smoke have 2-3 fold risk and women with migraines, especially when they have aura (focal symptoms) have an even higher risk and they should not be using the COC pill. The risk of hemorrhagic stroke is increased only in older women that smoke and is 10-fold higher when they have hypertension. One percent of women become hypertensive when they initiate COC and the risk of hypertension doubles especially when there is older age, obesity or family history^{8,14,15}.

Breast and cervical cancer. The association of breast cancer with exposure to estrogens is well established (reduced risk with late menarche, oophorectomy, etc.). In 1996 the Collaborative Group on Hormonal Factors in Breast Cancer established a link with the COC¹⁶. Duration of use and age at first use had no additional effect. These findings suggest that the risk is increased slightly and can be attributable to a promoter of growth of an existing tumor or a screening bias. Several recent studies have shown that COC increases the risk of in situ and invasive cervical neoplasia by 1.3-2.5 especially after 5 years of use. COCs promote carcinogenesis through interaction with HPV, by enlarging the area of cervical ectopy or altering the immune response. COC users have more frequent smears and preinvasive disease is detected most commonly. COC users should be advised to use barrier protection if they have multiple sexual partners^{16,17}.

Side Effects. Spotting and heavy or prolonged menstrual periods are associated with missing pills during a cycle. Bleeding irregularity was the side effect most frequently cited as being associated with oral contraceptive discontinuation. Other side effects cited included nausea, weight gain, mood changes, and breast tenderness^{8,10,18}.

Other hormonal methods

Depo-Provera (DMPA) acts by inhibiting ovulation. Injection of 150 mg of DMPA every 3 months provides extremely high contraceptive efficacy. In clinical trials, failure rates ranging from 0.0 to 0.7 per 100 woman-years have been reported. Repeat injections of DMPA are administered every 12 weeks or 3 months^{1,4,19}. Return of fertility may be delayed, however, regardless of the duration of DMPA use²⁰. Menstrual changes commonly are reported by women using DMPA and are the most frequent cause for dissatisfaction and discontinuation^{1,19}. After 3 months use, almost one half of women receiving DMPA injections report amenorrhea, with most of the remainder noting irregular bleeding/spotting. This injectable progestin may be appropriate for a diverse group of women, including contraceptive candidates as well as those with a variety of gynecologic and nongynecologic disorders. DMPA represents an appropriate choice for women for whom use of combination OCs is contraindicated because of increased cardiovascular risk^{4,19}. Women currently using DMPA, have decreased bone mineral density but it recovers after discontinuation²⁰. DMPA may be considered the contraceptive of choice in women with seizure disorders²¹.

Long acting progestagen contraceptive implants (e.g. Norplant) have similar efficacy and side effects with DMPA but are implanted in the skin^{4,22,23}.

*Other hormonal delivery systems*²³. The vaginal ring releases 150 mg levonogestrel and 20 µg ethinyl estradiol into the systemic circulation each day for 21 days. The steroids are encased in a flexible ring that has an outer diameter of 54 mm and a cross-sectional diameter of 4 mm. The ring is user controlled and can be easily inserted into the vagina and removed by the woman herself.

A weekly transdermal delivery system or contraceptive patch delivers continuous daily systemic doses of 150 mg norelgestromin (NGMN) and 20 mg ethinyl estradiol (EE) for 7 days through a 20 cm² patch. In an analysis of clinical trials, it was reported that the patch may be less effective in women weighing 90 kg or more.

Male contraception

Occlusion of the vas deferans is used by 5-10% of couples in the USA, UK, Netherlands, China and India. Several methods are applied with removal of a piece of vas, occlusion with occlusive agents or silicone plugs. Failure rate is < 1% although it may be higher due to late recanalization. It should be noted that it takes several weeks before the residual spermatozoa are emptied from the ejaculatory system, so a man is asked to use other methods of contraception for at least 20 ejaculations or have two consecutive semen analyses with azoospermia. The method is considered permanent^{1,4,24}.

Hormonal methods are based on the suppression of GnRh (gonadotropic releasing hormone) with subsequent decrease in synthesis and secretion of FSH and LH resulting in low intratesticular testosterone that, in

combination with reduced FSH, will result in reduced spermatogenesis with programmed cell death of spermatides and spermatocytes^{24,25}. Their action is reversible after discontinuation because spermatogonia is not affected but it can take 8-12 weeks before maximum suppression is observed. This is achieved by the administration of an androgen alone, or the combination of an androgen plus a gonadotropic suppressive agent (progesterone or GnRh antagonist)²⁴.

Although there is a lot of research in hormonal methods for males the currently available methods for male contraception are condoms and vasectomy.

Female sterilization

Surgical tubal sterilization is the most common method of fertility control in USA. In our country it is not common because of the lack of reversibility. Sterilization regret can occur in women less than 30 yrs especially when there is divorce and remarriage^{1,4}. Although it can be reversed in up to 75% of cases success is not guaranteed, especially when a lot of tissue is ablated.

It is usually done at the time of cesarean section, as a postpartum mini laparotomy, and as an interval mini laparotomy or commoner laparoscopy. There are various techniques of tubal ligation designed to avoid reapproximation of the tubal ends and canalization with the least efficient being laparoscopic bipolar coagulation which can result in ectopic pregnancy. Failure rates are 1-4 /1000 women and can increase to 8/1000. Studies in third world found a 4.7/100.000 risk of dying⁴. Benefits of sterilization are avoiding unwanted pregnancy and decreased risk of ovarian cancer. Increased menstrual bleeding and pelvic pain that have been associated with sterilization in uncontrolled studies were actually caused by discontinuing the COC and the artificial cycle it produces. In controlled studies of the same women before and after sterilization at 3-4.5 years there were no differences in bleeding and pain^{1,4}.

Emergency contraception (EC)

Sometimes referred to as "morning after" or post-coital contraception, is used to prevent pregnancy after intercourse has occurred. By giving women a second chance, it occupies a unique and important alternative among fertility control options. EC is particularly important for women who experience contraceptive failure or do not use a method, as well as for women who have unplanned intercourse, including through coercion or rape. The two most widely accepted methods of EC are contraceptive pills and postcoital insertion of IUDs^{27,28}.

The *Yuzpe regimen* consists of an increased dose of combined oral contraceptives – estrogen and progestin – taken within 72 hours (three days) of unprotected intercourse, followed by a second dose 12 hours later. The Yuzpe dose consists of 200 µg of ethinyl estradiol and 1.0 mg of levonorgestrel or 2.0 mg of norgestrel. Side effects include nausea and about one quarter re-

port vomiting, which can be treated with anti-emetic drugs. Emergency contraceptive pills may also disrupt the menstrual cycle, making the next menses early or late. It is estimated that on average, 8 of 100 women will become pregnant following one act of unprotected intercourse in the second or third week in a cycle. With ECP use, that number would be expected to drop to around 2 of every 100 women²⁸.

Progestin-only pills are available in high doses suitable for EC, labeled for routine postcoital contraception in women who have infrequent intercourse. The levonorgestrel-containing pills, marketed as NorLevo or Postinor, are labeled for use no more than four times per month. A recent study showed that the progestin-only regimen significantly reduced the side effects associated with the combined regimen, most notably cutting the rates of nausea and vomiting with better efficacy than the Yuzpe regimen and less irregular bleeding problems²⁹. There is some evidence that using more than four doses per cycle increases side effects, including intermenstrual bleeding and nausea.

An antiprogestone that can be used as an abortifacient, may also have potential as an emergency contraceptive.

An IUD can be inserted postcoitally up to seven days after unprotected intercourse. Its main advantage, in addition to the longer window of opportunity it offers, is that the IUD can then be used as an ongoing method of contraception. This method is extremely effective in preventing pregnancy, with failure rates reported at less than 1%.

Contraceptive issues in adolescents

Adolescent pregnancy continues to be a serious public health problem¹. In 1995 in USA the percent of 15 to 19-year-old women who have ever had coitus decreased slightly to 50%. Sexually transmitted diseases are common in the sexually active adolescent population. In a recent study the Chlamydia prevalence was 9.2%³⁰. Almost 10% of sexually active females between the ages of 15 and 19 years have had more than one sexual partner in the last 3 months, a pattern that has been called serial monogamy⁴.

Abstinence deserves emphasis, especially in young teenagers. Almost half of all teens who had sex say they have performed something that they were not ready to do. Clinicians should begin counselling preteens and young adolescents by interactive techniques that teach them to "know how to say no" to sex. Programs that were abstinence-only have not been effective, but some programs that had abstinence promotion in addition to contraception information and skills were effective in increasing abstinence³⁰.

Oral contraceptives and condoms are the most common contraceptive methods chosen by teens. The main concern adolescents have regarding COCs is that they will gain weight. Another specific problem that adolescents have is remembering to administer the pill daily.

Open phone lines appear especially critical in continuation of COCs. A pelvic examination is not required for a COC prescription initially.

All adolescents should know *that emergency contraception* is available and when it is appropriate how to access emergency contraception²⁶.

The role of parents. A high level of parent–family connection and a greater number of shared activities are correlated with delay in coitus and protective against pregnancy. Parents can help their children avoid risky situations by structured after-school activities or supervision and by reducing the opportunities of adolescents to be exposed to alcohol and drugs.

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