

## REVIEW ARTICLE

**WAYS TO IMPROVE NATURAL FERTILITY**

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**INTRODUCTION**

In their daily practice, doctors often encounter patients' requests for advice on optimizing conditions for the implementation of their reproductive function. However, to date, there has not been developed single evidence-based clinical guidelines that would clearly regulate this issue. Therefore, at the beginning of 2017, the American Society for Reproductive Medicine (American Society for Reproductive Medicine) and the Society for Reproductive Endocrinology and Infertility (Society for Reproductive Endocrinology and Infertility) published their findings on ways to increase the incidence of pregnancy in family couples / individuals in the absence of of them proven reasons for infertility.

**THE AIM**

Based on retrospective analysis, optimize ways to improve natural fertility.

**MATERIALS AND METHODS**

Data from the American Society for Reproductive Medicine and the Society for Reproductive Endocrinology and Infertility were used to investigate this problem. The work envisages measures to ensure human health, human dignity and moral and ethical standards in accordance with the principles of the Helsinki Declaration of Human Rights, the Council of Europe Convention on Human Rights and Biomedicine and relevant laws of Ukraine (opinion of Danylo Halytsky Lviv National Medical University Bioethics Commission).

**REVIEW AND DISCUSSION****FERTILITY AND AGE**

Fertility is defined as the ability to procreate. With the probability of conception remaining relatively constant from cycle to cycle in some individuals, in general in the population it is usually the highest during the first months of regular sexual life without the use of contraceptives or the entry of sperm to the female genital tract, then gradually decreases. About 80 % of couples manage to conceive a baby in the first 6 months since the beginning of the attempts. The monthly fertility rate is highest in the first 3 months. Fertility is reduced by about half of the women below the age of 40 compared with persons aged 20 years and older.

Fertility varies among different groups of people and decreases with age in both men and women, but the effect of aging is much more pronounced among females. In women, the chances of getting pregnant are significantly reduced after 35 years. Although men also after age 35 begin to deteriorate spermogram parameters, their fertility is not disturbed to about 50 years.

Infertility is defined as the inability of couples in the reproductive age to conceive a child during regular sexual life without the use of contraceptives throughout the year. The appointment of an examination and treatment at an earlier date may be justified by individuals on the basis of their anamnesis and shown to women who are 35 years of age and over after 6 months of unsuccessful attempts to become pregnant in view of the age-related decline in fertility.

## FREQUENCY OF SEXUAL ACTS

Over the past decade, a certain amount of literary data has been accumulated concerning the optimal frequency of sexual relations. While sexual restraint over 5 days may adversely affect sperm count, similar intervals of up to 2 days are associated with their normal density. The false idea is that frequent ejaculation reduces malnutrition. E. Levitas et al. (2015) in a retrospective study, analyzing about 10,000 samples of semen, found that the concentration of sperm and their mobility remained normal even with daily ejaculation.[1] The researchers also found that the above-mentioned indicators for men with oligozoospermia may be the highest in daily ejaculation. Non-spontaneous sexual restraint does not mainly affect the morphology of sperm, but if it lasts more than 10 days, then the spermogram parameters begin to deteriorate. Despite the fact that the definition of indicators of spermogram gives valuable quantitative data, with their help can not make an exact conclusion about the fertility of sperm.

Although evidence suggests that daily sexual intercourse has little benefit in terms of successful fertilization, the need to exercise them on certain days or even at certain times of the day can cause severe stress. Stress associated with attempts to conceive can adversely affect the quality of sexual life, reduce sexual desire, lead to a decrease in the frequency of sexual acts. These events can become even more acute when coitus schedules are scheduled based on a predicted ovulation time [2]. Marital couples should be informed that reproductive capacity is increasing with increasing frequency of sexual acts and is the highest if they occur every 1-2 days. It should be noted that the optimal frequency of sexual relations is determined according to their own preferences.

## FERTILITY WINDOW

«Fetal window» or «Fertility window» is a period of time that includes five days before and on the day of ovulation, they denote a 6-day interval that ends on the day of ovulation. Theoretically, the viability of both oocytes and sperm is maximal during this time. From the clinical point of view, the maximum fertility interval can be determined by analyzing the duration of the menstrual cycle (MC), the results of ovulation tests and the characteristics of the mucus of the cervical canal.

A sexually transmitted infection with the highest probability may end with fertilization if it occurs within a 3-day interval ending on the day of ovulation. In a study by A.J. Wilcox et al. (1995) with the participation of 221 fertile women, fertility was maximal if sexual intercourse was preceded by ovulation (in 2 days) (Fig. 1).[3] Another study (Dunson D. B. et al., 2010), devoted to family planning, analyzed the results of two cohorts of the subjects surveyed [4]. In one, basal temperature was measured to determine the ovulation time, while in the other, the content of estrogen / progesterone metabolites in the urine was measured. Probability of pregnancy was the highest if sexual intercourse occurred the day before ovulation, and began to decrease on the foreseeable day of its onset.

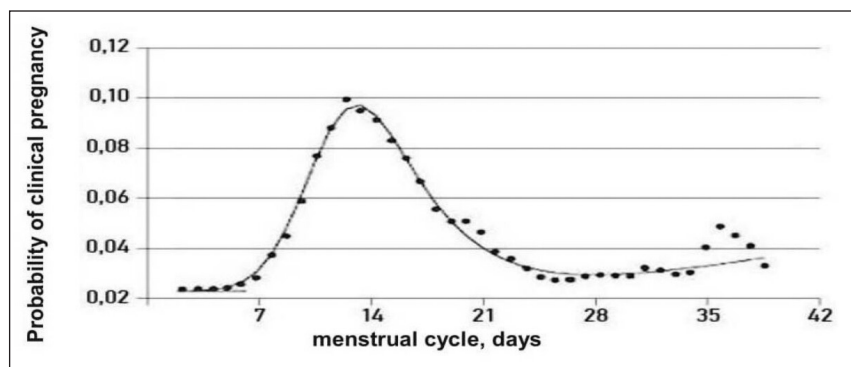
Among women who described their MC as generally regular, the likelihood of conception as a result of a one-time sexual intercourse increased during a prolonged period [5]. The probability of clinical pregnancy increased from 3.2 % on the 8th day of the cycle to 9.4% on the 12th and decreased to <2 % on the 21st day of MC. It also shows a reduction in the chances of conception when increasing the age of women (Fig. 2). However, the ability to fertilize increases with an increase in the frequency of sexual intercourse during the fertility window [6]. As it is unpredictable to predict the day of ovulation, it is difficult to use any of the available methods for determining it, family pairs should be encouraged to intensify their sexual life shortly after menstruation and up to ovulation (provided that the MC is regular in women). Due to the fact that the duration of the productive window in women may be different, the probability of conception in them also varies [7]. That is why regular sexual activity is the best advice to increase the chance of a pregnancy.

## DEFINITION OF OVULATION

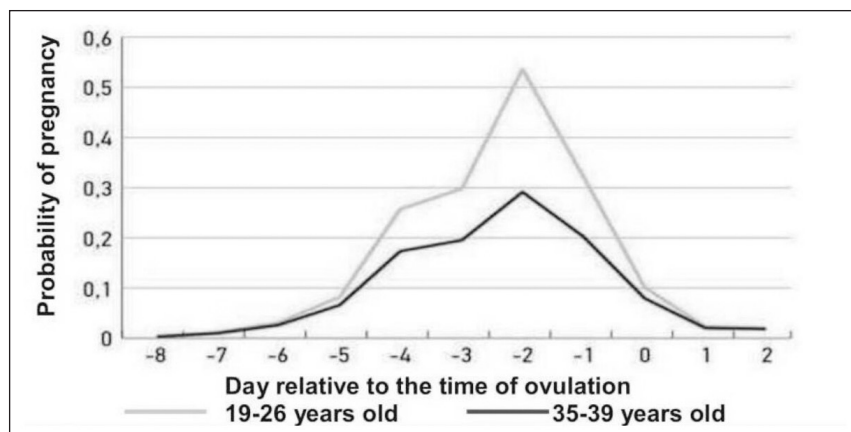
The peak of the fertile period can change significantly even in women with regular MCs. Those who monitor their cycle and monitor changes in cervical mucus, libido, pain and mood can accurately predict the time to ovulate only in half of the cases. Although there is no evidence that the definition of ovulation increases the ability to conceive, the time of sexual intercourse is important and, therefore, should be determined by various methods of predicting ovulation.

A study of cervical mucus is a simple and effective way to determine ovulation (Fig. 3). The estimated probability of conception is the highest, if the mucus is delicate and transparent, but the detection of such secretions is not a prerequisite for the onset of pregnancy. The amount of cervical mucus increases with an increase in the concentration of estrogens in the plasma during 5-6 days preceding ovulation, and reaches its peak within 2-3 days after it. D. B. Dunson et al. (2011) in a prospective study, which included an estimate of 2832 MCs, found that changes in cervical mucus are closely correlated with basal temperature, and with this method, it is possible to predict the peak of the fertile period more precisely than during the menstrual calendar.[8].

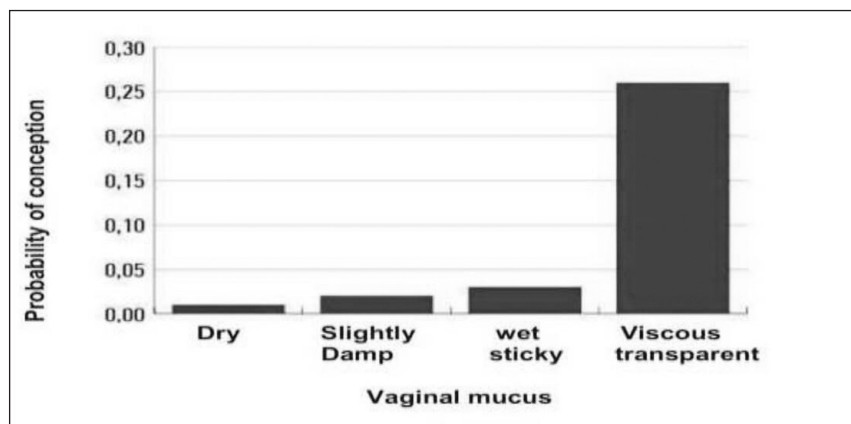
Ovulation tests, including luteinizing hormone (LH) levels in urine, are widely used to determine the period of maximum probability of conception. Although numerous studies have confirmed the accuracy of methods for determining the peak of LH in urine in the middle of MC, ovulation can occur at any time during the next 2 days, and false-positive results occur in approximately 7 % of cycles. Although the monitoring of urinary LH levels can help reduce the time interval before conception in pairs with infrequent sexual intercourse, in a large study by J. L. Bigelow et al. (2014) found that changes in cervical mucus during MC can predict the days of the highest probability of fertilization with the same or even greater accuracy than



**Fig. 1.** Probability of the onset of pregnancy depending on the day of the menstrual cycle with a one-time sexual intercourse. Adapted for Dunson et al. (1999).



**Fig. 2.** Probability of the onset of pregnancy depending on the day of the menstrual cycle, including repeated sexual intercourse, in patients of all ages. Adapted for J. B. Stanford, D.B. Dunson (2007).



**Fig. 3.** Estimation of the probability of conception on the characteristics of vaginal secretion on the day of sexual intercourse. Adapted for Scarpaet al. (2006).

when measuring basal temperature and monitoring the level of LH in urine.[9].

### FEATURES OF THE SEXUAL LIFE OF THE MARRIED COUPLE

Many women believe that staying in a lying position after sexual intercourse facilitates the transport of sperm and prevents sperm out of the vagina. However, this representation does not have any scientific basis.

Spermatozoids can be identified in fallopian tubes after 15 minutes after reaching the cervix in the middle of the MC. After that, they pass through the fallopian tube to the abdominal cavity.

There is not enough evidence to suggest that fertility has an effect on the ability to fertilize during sexual intercourse. It is known that sperm can be detected in the cervical canal

a few seconds after ejaculation, regardless of the cohort position. Although female orgasm may contribute to the transport of sperm, correlations between orgasm and fertility are not established. There is also no conclusive evidence of the existence of a link between the characteristics of the sexual behavior of the couple and the child's article.

According to the results of studies on the effects of lubricants on the survival of sperm in vitro, it was concluded that the use of some of them may reduce fertility. While available on sale water-based lubricants inhibit sperm motility in vitro from 60 to 100% for 60 minutes of incubation, canola oil (rape) does not have a similar harmful effect [10]. Unlike mineral oil, a water-based gel-lubricant with no special additives (KY Jelly), olive oil and saliva, diluted to a concentration of <6.25%, negatively affects the mobility and speed of spermatozoa [11]. Lubricants based on hydroxyethyl cellulose also have no noticeable negative

**Table I.** Life style factors that affect fertility

Factor	Effect on Fertility
Obesity (body mass index > 35)	The time required for conception increases by 2 times
Body mass deficiency (body mass index < 19)	The time required for conception increases 4 times
Smoking	The relative risk of infertility increases by 60 %.
Drinking (> 2 servings of drinks / day)*	The relative risk of infertility increases by 60 %.
Caffeine	Ability to fertilize is reduced by 45 %.
Narcotic substances	Relative risk of infertility increases by 70 %.
Toxins, solvents	Relative risk increases by 40 %.

\* 1 portion of alcoholic beverage = 10-12 g of alcohol; This is 1 glass of vodka or cognac (25-30 ml) or 1 glass of wine (100-120 ml), or 1 small beer mug (220-260 ml).

effect on spermogram parameters [12]. Despite the above results of studies on the negative effects of some in vitro sperm liquids, their use in couples trying to conceive a child does not interfere with fertilization [13].

Thus, recommended for use in case of need are lubricants based on mineral oil, canola oil or hydroxyethyl cellulose.

## DIET AND LIFESTYLE

It is known that fertility among women, both overweight and underweight, is reduced. At the same time, data on the correlation of body weight and fertility in ovulating women is very small (Table 1). Increased levels of mercury in the blood due to the consumption of seafood containing heavy metals is associated with infertility [14,15]. Women planning pregnancy should be advised to take folic acid supplements (a minimum daily dose of 400 micrograms) to reduce the risk of developing neural tube defects [16].

## SMOKING

Smoking has been shown to have a negative effect on fertility. In the course of the large meta-analysis (Augood C. et al., 2018), when comparing the health status of 10,928 women smokers with 19,128 non-smokers, it has been found that in the presence of this harmful habit, infertility is much more frequent (odds ratio [VH] 1.60; 95% confidence interval [DII]: 1.34-1.91) [17]. According to research findings menopause occurs on average 1-4 years earlier in female smokers than in non-smokers.[18] This indicates that smoking accelerates the rate of depletion of the follicular apparatus of the ovaries. Although smokers are diagnosed with reduced sperm count, reduced mobility, and morphology, there is no convincing evidence that smoking reduces malnutrition [19,20].

## ALCOHOL CONSUMPTION

The effect of alcohol on female fertility is not surely studied. Meanwhile, some scientists came to the conclusion that it has a negative effect, while others believe that its use can increase fertility. In a Swedish prospective study involving 7393 women, the risk of infertility was substantially increased (BP 1.59; 95% CI: 1.09-2.31) among those who

consumed daily 2 portions of alcoholic beverages.[20] At the same time, this risk decreased (BP 0.64; 95% CI: 0.46-0.90) for those who drank <1 portion of drink per day. Other studies have shown that increased alcohol intake reduces the likelihood of conception [21].

In contrast to the aforementioned data in the Danish study with the participation of 29,844 pregnant women, it was demonstrated that the period before conception was shorter in women who drank wine than those who did not drink alcohol.[22] In a study involving 1769 Italian women in the postpartum period the authors found no link between alcohol intake and conceiving difficulties.[23]

When trying to get pregnant it is advisable to avoid drinking more alcohol (> 2 servings of drinks / day). However, there is limited evidence that its more moderate consumption negatively affects fertility. Undoubtedly, in the course of pregnancy, alcoholic beverages should be completely stopped as they have an established adverse effect on the development of the fetus; At the same time, no «safe» level of their consumption is not defined. In men, the use of alcohol does not aggravate spermogram parameters [24].

## USE OF CAFFEINE

Scientists have found that high levels of caffeine intake (500 mg;> 5 cups of coffee or its equivalent per day) correlate with reduced fertility (VH 1.45; 95 % CI: 1.03-2.04) [25]. In general, moderate consumption of caffeine (from 1 to 2 cups of coffee or its equivalent per day) before or during pregnancy does not cause a clear adverse effect on fertility and the effects of pregnancy. In men, caffeine intake does not change spermogram parameters [26].

On the basis of literature review, it was concluded that attending a sauna does not reduce female fertility and is safe during uncomplicated pregnancy [27]. Recommendations for controlling or reducing the testicular heat effects in healthy men are currently not supported [24]

The impact of environmental toxins today is recognized as a potential cause of reduced fertility. Ability to fertilize can be reduced in women who are exposed to certain toxins and solvents, including those used in the dry-cleaning and printing industry. In addition, men who are in contact with heavy metals are more likely to be diagnosed with abnormal



spermogram parameters [28]. Pesticides can negatively affect the reproductive health of agricultural workers [29].

The impact of environmental toxins today is recognized as a potential cause of reduced fertility. Ability to fertilize can be reduced in women who are exposed to certain toxins and solvents, including those used in the dry-cleaning and printing industry. In addition, men who are in contact with heavy metals are more likely to be diagnosed with abnormal spermogram parameters [28]. Pesticides can negatively affect the reproductive health of agricultural workers [29]. The number of studies on the evaluation of the action of pesticides on the parameters of spermogram is increasing [30]. In addition, studies on animal models have shown that adverse environmental factors can cause serious reproductive impairment [31]. In particular, contact with lead and industrial microwave ovens is likely to be better avoided or minimized [32, 33].

## CONCLUSIONS

- The fruitful window covers a 6-day interval that ends on the day of ovulation, and correlates with the number and characteristics of cervical mucus.
- Frequent sexual intercourse (every 1-2 days) during the «window of fertility» is associated with the highest incidence of pregnancy, but the latter are almost equivalent to less active sexual life (2-3 times a week).
- Accepting certain corytic poses, as well as finding a woman lying in a position after sexual intercourse do not have a significant effect on fertility.
- The use of methods for the detection and prediction of ovulation is appropriate for couples with infrequent sexual relations.
- Moderate alcohol consumption (1-2 servings of drinks per day) and caffeine may adversely affect fertility.
- The period of time required for conception increases with age. For women over 35 years after 6 months of unsuccessful attempts to become pregnant, consultation of the reproductionist is indicated.
- In individuals with regular MC sexual intercourse every 1-2 days from the beginning of the period of the fruitful window can maximize the chances of fertilization.
- Couples who try to conceive a child should avoid smoking, excessive alcohol consumption (> 2 servings of beverages per day), and use of most of the available vaginal lubricants.

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#### **Conflict of interest:**

*The Authors declare no conflict of interest.*

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