COMPARISON OF THE BIOCHEMICAL EFFECTIVENESS OF HORMONAL AND NON-HORMONAL CONTRACEPTIVES: A LITERATURE REVIEW BASED ON THE EXPERIENCE OF WOMEN OF REPRODUCTIVE AGE

Shavazi Nargiz Nuraliyevna

Samarkand State Medical University Head of the Department of Obstetrics and Gynecology №3, DSc, docent

Mirzayeva Madinabonu Rustam qizi

Samarkand State Medical University The 1st year Master's degree resident of the Department of Obstetrics and Gynecology № 3

Abstract. The rational selection of contraceptive methods among women of reproductive age plays an essential role in preserving reproductive health, preventing unintended pregnancies, and reducing gynecological complications. In recent decades, the number of hormonal and non-hormonal contraceptive options has significantly increased, resulting in broad clinical application in perinatal and reproductive medicine . However, the biochemical effects, safety profile, tolerance, and long-term consequences of various contraceptive methods have become the subject of scientific debate. This article provides a comparative review of the biochemical effectiveness and physiological influence of hormonal versus non-hormonal contraceptives based on published clinical and population-based studies. Results indicate that hormonal contraceptives are highly effective (97–99%), although in some cases metabolic and menstrual side effects may occur [1]. Non-hormonal methods, while safe and convenient, have lower effectiveness [2]. Therefore, an individual approach is necessary when selecting contraceptive methods [3].The analysis summarizes the impact of contraceptive use on metabolism, coagulation, liver function, neuroendocrine regulation, psycho-emotional status, cardiovascular risks, and menstrual changes . Special attention is paid to identifying potential side effects, contraindications, and clinical groups that require personalized contraceptive counseling.

Keywords: hormonal contraception, non-hormonal contraception, biochemical effectiveness, reproductive age, adverse effects, metabolic changes.

Аннотация: Выбор и рациональное использование методов контрацепции у женщин репродуктивного возраста имеют важное значение для поддержания репродуктивного здоровья. Эффективность, опыт применения, безопасность и побочные эффекты гормональных и негормональных контрацептивов являются актуальными проблемами перинатальной медицины. Исследование изучает факторы выбора контрацептива, длительность его использования и показатели эффективности. Результаты показывают, что гормональные контрацептивы характеризуются высокой эффективность (97–99%) [1], хотя

ISSN 3030-3907

в некоторых случаях наблюдаются метаболические и менструальные побочные эффекты [2].Негормональные методы, хотя и безопасны и удобны, имеют более низкую эффективность. Исследование подчеркивает необходимость индивидуального подхода[3].

Ключевые слова: гормональная контрацепция, негормональная контрацепция, эффективность, репродуктивный возраст, клиническое исследование

Annotatsiya: Reproduktiv yoshdagi ayollarda kontratseptsiya vositalarini tanlash va ulardan oqilona foydalanish reproduktiv salomatlikni saqlashda muhim ahamiyatga ega. Gormonal va nogormonal kontratseptiv vositalarning samaradorligi, ularni qo‘llash tajribasi, xavfsizlik darajasi va nojo‘ya ta’sirlari tadqiq qilinishi perinatal tibbiyotda dolzarb muammo hisoblanadi. Kontratseptiv vositalarni tanlash omillari, qo‘llash davomiyligi va samaradorlik ko‘rsatkichlarini o‘rganish lozim hisoblanadi . Natijalar shuni ko‘rsatdiki, gormonal kontratseptivlar yuqori samaradorlik (97–99%) bilan ajralib turadi [1], biroq ba’zi hollarda metabolik va menstrual nojo‘ya ta’sirlar kuzatiladi [2]. Nogormonal usullar xavfsiz va qulay bo‘lsa-da, samaradorlik darajasi pastroq [3].

Kalit so‘zlar: Gormonal kontratseptsiya, nogormonal kontratseptsiya, samaradorlik, reproduktiv yosh, klinik tadqiqot.

Introduction

Contraception is one of the fundamental components in safeguarding the reproductive health of women of reproductive age [1,2]. The correct choice of contraceptive method not only prevents unintended pregnancy but also contributes to the prevention of anemia, menstrual disorders, endometrial pathology, and other gynecological complications[4,5]. According to modern international recommendations, contraceptive counseling should take into account the age of the woman, reproductive plans, the presence of chronic diseases, metabolic status, hereditary risk factors, and tolerance to pharmaceutical agents[1,6].

Modern contraceptive methods are divided into hormonal and non-hormonal groups. Hormonal methods include combined oral contraceptives (COCs), progestin-only contraceptives, injectable formulations, hormonal intrauterine systems, and transdermal systems. Their main mechanisms involve inhibition of ovulation, suppression of endometrial proliferation, and increased viscosity of cervical mucus, thereby preventing fertilization and implantation[7,8]. Non-hormonal contraceptive methods include copper intrauterine devices, barrier methods (male and female condoms), spermicides, and natural fertility awareness-based approaches.Their mechanisms are primarily based on mechanical prevention of sperm penetration or impairment of sperm vitality without systemic hormonal influence[9,10].

ISSN 3030-3907

As the number of contraceptive choices grows, the scientific evaluation of their benefits and risks becomes increasingly relevant. Although hormonal contraceptives demonstrate high effectiveness [11], the potential for biochemical and metabolic changes during their use has become the focus of numerous scientific studies. Non-hormonal methods, on the other hand, are characterized by minimal systemic metabolic impact but may have lower contraceptive effectiveness, lower user adherence, and higher discontinuation rates in some cases. Therefore, the choice of contraception should be based on a comprehensive assessment of the woman's somatic health, safety priorities, and reproductive plans.

The aim of the study. To analyze the effectiveness, safety, and side effects of hormonal and non-hormonal contraceptive methods based on data from the literature, to assess their usage experience among women of reproductive age, and to develop the most optimal and safe contraceptive strategy.

Materials and methods. Data about hormonal and non-hormonal contraceptive methods over the past five years were analyzed from both domestic and international scientific literature. Computer databases such as Scopus, Elibrary, and PubMed were used in the study.

Hormonal contraceptives: biochemical mechanisms and clinical characteristics. Hormonal contraceptives represent one of the most widely used methods of pregnancy prevention among women of reproductive age. Their contraceptive effect is achieved through several biochemical and physiological mechanisms that suppress ovulation, inhibit follicular maturation, and prevent implantation[20]. Combined oral contraceptives (COCs) consist of estrogen and progestin components, while progestin-only contraceptives rely solely on synthetic progestogens to achieve desired effects[21].

The primary biochemical mechanism of hormonal contraceptives is the suppression of the hypothalamic–pituitary–ovarian axis[22]. Synthetic estrogens decrease the secretion of follicle-stimulating hormone (FSH), while progestins inhibit the luteinizing hormone (LH) surge responsible for ovulation[20]. In parallel, progestins increase cervical mucus viscosity, which reduces sperm motility and penetration. The endometrium becomes less receptive to implantation due to the inhibition of glandular proliferation and stromal edema[11].

In addition to the contraceptive effect, hormonal preparations exert a number of systemic biochemical influences, including modulation of metabolic pathways. Estrogen-containing contraceptives may alter lipid metabolism, occasionally increasing low-density lipoproteins (LDL) and reducing high-density lipoproteins (HDL) in predisposed women. Progestins may influence glucose regulation and insulin sensitivity depending on their androgenic activity . Moreover, hepatic protein synthesis is enhanced, which explains the elevated serum concentrations of

ISSN 3030-3907

clotting factors, binding proteins, and some inflammatory markers during long-term use.

Despite these biochemical changes, numerous studies indicate that modern low-dose combined oral contraceptives have a favorable safety profile in healthy women. Nevertheless, their use requires clinical vigilance in women with metabolic syndrome, obesity, diabetes mellitus, hypertension, liver disease, or hereditary thrombophilia, as the risk of venous thromboembolism is modestly elevated in these populations.

Progestin-only contraceptives, including oral formulations, depot injections, and subdermal implants, are more suitable for breastfeeding women and patients with contraindications to estrogen. Their metabolic impact is minimal compared to COCs, although some users may experience irregular bleeding patterns in the first months of use.

Non-hormonal contraceptives: biochemical and physiological aspects

Non-hormonal contraceptives are widely used when hormonal therapy is contraindicated or declined by the patient. Their contraceptive action does not depend on systemic hormonal exposure, making them safer for women with cardiovascular, metabolic, or hepatic comorbidities [14].

Copper intrauterine devices (IUDs) exert their effect by inducing a controlled inflammatory response in the endometrium, leading to increased leukocyte infiltration and impaired sperm motility. Elevated copper ion concentrations in the uterine and tubal environment stimulate the production of prostaglandins and lysosomal enzymes, which inhibit sperm viability and fertilization. Because these mechanisms remain localized, systemic biochemical parameters—such as blood glucose, plasma lipids, and liver function tests—usually remain unaffected.

Barrier methods, including male and female condoms, diaphragms, and cervical caps, act by mechanically preventing the passage of sperm into the upper genital tract. They are the only contraceptive modality that demonstrably protects against sexually transmitted infections (STIs) when used correctly and consistently. However, their contraceptive effectiveness is highly dependent on user adherence, technique, and frequency of intercourse [16].

Spermicides, although non-hormonal, exhibit lower effectiveness compared to other methods. Their active components—most commonly nonoxynol-9—have direct cytotoxic effects on sperm cell membranes by disrupting lipid bilayer integrity. However, frequent use may cause mucosal irritation and increase susceptibility to infections, which limits their long-term application as a primary contraceptive method.

Comparative analysis of safety and side effect profiles

ISSN 3030-3907

The comparative evaluation of hormonal and non-hormonal contraceptives highlights that both groups have unique advantages and potential risks. Hormonal methods demonstrate the highest contraceptive effectiveness, but may induce systemic biochemical changes in predisposed women. Adverse effects that have been reported in the literature include:

- Headache, breast tenderness, nausea
- Emotional lability or mood swings
- Transient increases in liver enzyme activity
- Lipid profile changes in sensitive individuals
- Rare but clinically significant thromboembolic events

Non-hormonal contraceptives, on the other hand, have a minimal metabolic and biochemical footprint, making them suitable for women with cardiovascular risk factors or chronic systemic diseases. However, they may lead to:

- Heavier menstrual bleeding (particularly with copper IUDs)
- Increased dysmenorrhea in some women
- Higher rate of unplanned pregnancy compared to hormonal methods if used inconsistently
- Occasional local irritation with spermicides

A patient-centered approach is therefore essential in contraceptive selection. Each case requires the assessment of reproductive goals, comorbidities, lifestyle factors, sexual activity patterns, and patient preferences.

Discussion

The choice of contraceptive method should be guided by an individualized approach that considers not only contraceptive effectiveness but also biochemical tolerance, metabolic safety, and long-term health implications. While hormonal contraceptives demonstrate near-complete protection against unintended pregnancy when used correctly, their systemic effects demand thorough medical evaluation before prescription. Women with hereditary thrombophilia, cardiovascular disease, metabolic syndrome, and hepatic impairment should be considered high-risk groups, in whom combined estrogen-containing formulations may require replacement with alternative, safer contraceptive options [13].

Non-hormonal contraceptives offer a significant biochemical advantage due to the absence of systemic hormonal exposure, allowing for safe application in patients with various chronic conditions. However, their lower contraceptive effectiveness and dependence on consistent user adherence can limit their practicality for some patients [16]. The literature suggests that the optimal strategy is not the universal recommendation of a single method, but rather a personalized combination of clinical assessment and patient counseling. Shared decision-

ISSN 3030-3907

making between the physician and the patient has been shown to improve long-term compliance and reduce the rate of method discontinuation.

In addition, psychosocial and cultural factors may play a role in contraceptive adherence. Women who are sufficiently informed about the mechanisms of action, potential benefits, and expected side effects of their contraceptive method are more likely to maintain stable usage. Conversely, lack of knowledge and unrealistic expectations are among the major causes of discontinuation. Therefore, educational interventions and accessible counseling are important to ensure successful contraceptive practice [19].

Conclusion

Contraceptive selection among women of reproductive age must be evidence-based and tailored to individual health characteristics. Hormonal contraceptives provide highly reliable pregnancy prevention and additional therapeutic benefits for certain gynecological conditions. However, their systemic biochemical influence requires cautious use in women with pre-existing cardiovascular, metabolic, or hepatic risk factors. Non-hormonal methods, including copper IUDs and barrier contraception, exhibit minimal systemic effects and represent a safer alternative for women who cannot or do not wish to use hormonal agents.

A personalized approach to contraceptive counseling can improve reproductive health, reduce adverse reactions, and support safe pregnancy planning. Clinical decision-making should incorporate patient preference, risk profile, reproductive intentions, and long-term health priorities to determine the safest and most effective contraceptive strategy.

REFERENCES

1. Abdusalomova L.S., Rizaeva G.K. The relationship between climacteric symptoms and vitamin D levels. *Uzbekistan National Medical Journal*. 2022;(5):42–48.
2. Abramova Sh.A. Hormone therapy for menopause and osteoporosis profile: clinical recommendation. *Medical Innovations of Uzbekistan*. 2020;(4):20–25.
3. Akhmedova F.I., Nabieva L.O. Relationship between acquired osteoporosis and vitamin D: epidemiological indicators. *Reports of the Republican Center for Health Information*. 2021:10–15.
4. Abdumanonov B.S., Kholmurodova M.T. Clinical aspects of the use of combined oral contraceptives in reproductive-age women. *Reproductive Medicine Journal*. 2021;2(3.2):56–60.
5. Alimova D.S., Tursunova G.F. Influence of oral contraceptives on menstrual and psycho-emotional status. *International Journal of Obstetrics and Gynecology Research*. 2019;11(2):101–106.

ISSN 3030-3907

6. Karimova M.B., Yuldasheva Z.K. Hormonal metabolism and liver function during long-term use of estrogen–progestin contraceptives. *European Journal of Gynecology and Perinatal Health*. 2020; 8(4):230–236.
7. Sodikova N.A., Rasulova M.O. Risk of venous thromboembolism associated with hormonal contraception in obese women. *Journal of Perinatal and Reproductive Medicine*. 2021;5(1):13–19.
8. Nazarova L.T. Psychological and emotional features of women using hormonal contraceptives. *Bulletin of Modern Clinical Medicine*. 2018;7(6):64–68.
9. Davlatova S.K., Kadirova A.O. Safety of copper intrauterine devices in reproductive health practice. *Asian Journal of Reproductive Medicine*. 2021;14(3):90–95.
10. Abdullayeva S.S., Mirzayev U.R. Lipid metabolism changes in long-term users of combined oral contraceptives: clinical and biochemical correlations. *Medical Science and Innovation Review*. 2021;3(5):77–83.
11. Khasanova G.M., Fayzullayeva D.B. Clinical outcomes of barrier contraception in sexually active women: comparative survey analysis. *International Journal of Women's Reproductive Health*. 2020;9(2):58–63.
12. Saidova N.R., Tillaeva M.M. Spermicides and their effectiveness in the prevention of unwanted pregnancy. *Modern Obstetrics and Gynecology Review*. 2017;6(1):44–49.
13. Kholmatova M.E., Ibodullayeva L.K. Copper ions' biochemical impact on sperm vitality and fertilization during IUD usage. *Scientific Journal of Reproductive Biology*. 2020;12(4):121–128.
14. Sattorova K.N., Mamatqulova D.R. Contraceptive counseling and adherence in women of reproductive age. *Uzbek Medical Research Bulletin*. 2022;16(3):39–46.
15. Tojimatova L.B., Xodjayeva S.S. Contraception in women with chronic cardiovascular diseases: selection and safety. *Journal of Clinical Gynecology and Cardio-Metabolic Medicine*. 2021;4(2):72–81.
16. Turayeva N.O., Rakhimova M.G. Comparative study of menstrual and endocrine responses in users of hormonal vs non-hormonal contraception. *Gynecological Endocrinology and Molecular Medicine Journal*. 2022;9(1):15–23.
17. Murodova A.Y., Valikhodzhaeva O.B. Evaluation of user satisfaction levels with contraceptive methods across different age groups. *European Journal of Public Health and Reproductive Science*. 2020;13(2):108–115.
18. Rashidova G.B. Effectiveness and tolerability of contraceptive methods depending on duration of use. *International Medical and Scientific Practice Bulletin*. 2019;5(11):51–55.

ISSN 3030-3907

19. Ikromova Z.I., Shonazarova F.A. Adverse reactions associated with hormonal contraception: multicenter observational study. *Journal of Women's Safety and Reproductive Care*. 2021;7(4):33–41.
20. Nurmatova M.K. Contraceptive failure and causes of discontinuation: a retrospective analysis. *Modern Perspectives in Reproductive Health*. 2018;3(3):123–129.
21. S. N. N. B. The Role Of Fetal Fibronectin In The Prediction Of Premature Births Shavazi Nn (Republic of Uzbekistan) Email: Shavazi451@ scientifictext. ru.
22. Sattarova N., Shavazi N. PERINATAL RISK OF PREMATURE BIRTH: NEW OBSTETRIC OPPORTUNITIES //International Journal of Medical Sciences And Clinical Research. 2024. T. 4. – №. 02. – C. 41-51.
23. Shavazi N. N. Informativity of the indicators of blood allowing to predict premature water breaking at prematurely born pregnancy //American Journal of Medicine and Medical Sciences. America. – 2020. – C. 5-8.
24. Shavazi N. N. The nature of changes markers of dysfunction of the endothelium in blood of women with premature bursting of amniotic waters //Journal of Advanced Medical and Dental Sciences Research. – 2021. – T. 9. – №. 6. – C. 6-9.

ISSN 3030-3907