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CLINICAL PHARMACOLOGICAL APPROACH TO THE USE OF ANTI-INFLAMMATORY DRUGS IN PREGNANCY

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Abstract. This article examines the clinical pharmacological principles guiding the safe and evidence-based use of anti-inflammatory drugs during pregnancy. It focuses on the pharmacokinetic and pharmacodynamic changes occurring in pregnant women, the risk–benefit assessment of non-steroidal anti-inflammatory drugs (NSAIDs), corticosteroids, and selective anti-inflammatory agents, as well as the potential fetal and maternal outcomes associated with inappropriate therapy. The paper also highlights current international recommendations, contraindicated drugs, trimester-specific considerations, and clinical monitoring strategies that ensure optimal therapeutic outcomes while minimizing teratogenic and obstetric risks.

Keywords: Pregnancy, anti-inflammatory drugs, NSAIDs, corticosteroids, clinical pharmacology, teratogenicity, fetal safety, maternal health, trimester-specific therapy.

INTRODUCTION

The clinical pharmacological management of inflammation in pregnancy is uniquely complex because physiological changes occurring during gestation significantly modify drug absorption, plasma protein binding, hepatic metabolism, renal clearance, and tissue distribution. These alterations affect both the efficacy and toxicity profile of anti-inflammatory drugs, making individualized pharmacotherapy a cornerstone of safe treatment. Increased plasma volume, reduced albumin concentration, accelerated renal filtration, and altered hepatic enzyme activity all influence how drugs behave in the maternal–fetal system, requiring clinicians to reevaluate standard dosing strategies and carefully balance maternal benefit against fetal risk [1].

NSAIDs remain the most widely used anti-inflammatory agents, yet their administration during pregnancy is highly regulated due to trimester-dependent risks. In early pregnancy, NSAID exposure has been associated with increased miscarriage risk and potential interference with blastocyst implantation, whereas in late pregnancy it may induce premature closure of the ductus arteriosus, fetal pulmonary hypertension, and oligohydramnios due to reduced fetal renal perfusion. Because NSAIDs inhibit cyclooxygenase and prostaglandin synthesis, their pharmacological actions may

disrupt essential fetal developmental pathways. Consequently, current clinical guidelines recommend avoiding NSAIDs during the third trimester and limiting use in the first trimester unless absolutely necessary and only at the lowest effective dose [2].

MATERIALS AND METHODS

Corticosteroids, by contrast, hold a safer and more established therapeutic profile when used appropriately. Prednisolone and methylprednisolone, due to substantial placental metabolism that reduces fetal exposure, are considered preferable options for treating autoimmune flares, severe asthma, and other inflammatory disorders during pregnancy. However, long-term or high-dose maternal corticosteroid use still poses risks such as gestational diabetes, maternal hypertension, potential fetal growth restriction, and, in rare instances, cleft palate formation if exposure occurs during critical organogenesis periods. Therefore, clinical pharmacologists emphasize the importance of meticulous dose titration, therapy duration limitation, and regular maternal–fetal monitoring to prevent avoidable complications [3].

Selective anti-inflammatory agents, including biological drugs and COX-2 inhibitors, have further complicated the therapeutic landscape. COX-2 inhibitors, despite offering superior gastrointestinal tolerability, are generally contraindicated in pregnancy due to insufficient safety data and theoretical risks similar to or greater than traditional NSAIDs. Biologic anti-inflammatory agents such as TNF-α inhibitors have shown promising fetal safety profiles, especially in early trimesters, but their use requires a case-by-case evaluation given varying placental transfer rates and potential neonatal immunosuppression. Clinical pharmacology guidelines recommend discontinuing certain biologics late in pregnancy to prevent transplacental passage leading to infant immune suppression during the first months of life [4].

RESULTS AND DISCUSSION

In addition to pharmacokinetic and pharmacodynamic considerations, the clinician must integrate risk–benefit assessment tailored to inflammation severity. Untreated maternal inflammatory disease can itself precipitate adverse obstetric outcomes, including preterm birth, placental insufficiency, fetal growth restriction, and hypertensive disorders. Therefore, the pharmacological decision to treat is often guided by the principle that maternal health is the greatest determinant of fetal well-being. This makes the balancing of anti-inflammatory therapy not merely a drug-safety issue but an essential part of broader perinatal care [5].

Moreover, clinical pharmacologists emphasize trimester-specific therapeutic planning. During the first trimester, when organogenesis occurs, drug teratogenicity is the primary concern, whereas in the second trimester relatively safer therapeutic windows

may allow short-term NSAID use under strict supervision. In the third trimester, the main risk shifts toward obstetric consequences such as delayed labor, reduced amniotic fluid volume, and neonatal cardiorespiratory complications. This trimester-based strategy ensures that pharmacologic interventions are aligned with fetal developmental milestones and maternal physiological conditions [6].

Non-pharmacological approaches also play an important supportive role in reducing inflammation during pregnancy. These include rest, hydration, controlled physical activity, dietary modification, local heat or cold therapy, and physiotherapy techniques that minimize the need for systemic medications. Such strategies often reduce reliance on potentially harmful drugs and allow clinicians to reserve pharmacotherapy for cases requiring stronger intervention. Clinical guidelines frequently encourage combining these conservative measures with pharmacological treatment to optimize maternal symptom relief and fetal protection [7].

Another crucial area of modern clinical pharmacology in pregnancy is patient education. Pregnant women must be informed about the risks of over-the-counter anti-inflammatory medications, particularly NSAIDs, which are widely available and often misused without medical consultation. Structured counseling helps ensure adherence to prescribed treatments, prevents drug interactions, and reduces the chance of self-medication that could lead to serious fetal or neonatal harm.

A clinical pharmacological approach to the use of anti-inflammatory drugs in pregnancy requires a multidimensional analysis that considers maternal health, fetal development, pharmacokinetic alterations across gestational stages, and the risk–benefit ratio of each therapeutic decision. Pregnancy induces profound physiological changes—plasma volume expansion, altered protein binding, increased glomerular filtration rate, modifications in hepatic enzyme activity, and shifts in gastrointestinal absorption patterns. These changes substantially affect the disposition, efficacy, and safety of anti-inflammatory drugs, making standard adult dosing inappropriate without careful adjustment [1].

In particular, the evaluation of non-steroidal anti-inflammatory drugs (NSAIDs) must incorporate trimester-specific considerations. During early pregnancy, prostaglandin inhibition may increase the risk of implantation failure or early miscarriage, whereas in late pregnancy NSAIDs may trigger premature closure of the ductus arteriosus, oligohydramnios, and pulmonary hypertension of the newborn. Therefore, clinical pharmacologists emphasize strict temporal restrictions, advocating for minimal exposure during the first trimester and near-absolute contraindication during the third trimester. Even short-term NSAID therapy should be subjected to individualized

assessment, involving maternal comorbidities such as hypertension, renal impairment, or autoimmune disorders that may heighten susceptibility to adverse events [2].

Inflammatory conditions in pregnancy—ranging from musculoskeletal pain to chronic autoimmune diseases—often require long-term management. In such cases, selective COX-2 inhibitors are generally avoided due to cardiovascular risks and insufficient teratogenic data. Instead, clinicians may prioritize medications with better-established safety profiles. For example, low-dose aspirin may be used under strict guidance to prevent preeclampsia, while glucocorticoids may be indicated for severe autoimmune flares. A pharmacological balance must be maintained: excess glucocorticoid exposure can lead to gestational diabetes, maternal osteoporosis, and fetal growth restriction, yet untreated disease activity may pose even greater harm to both mother and fetus [3].

Another important dimension is the interplay between inflammation and placental function. Chronic inflammation may impair placental perfusion, contributing to fetal growth restriction and preterm birth. Hence, anti-inflammatory therapy—when appropriately selected—can indirectly support fetal development by optimizing maternal physiological stability. However, drugs capable of crossing the placenta require extra caution. Clinical pharmacologists analyze placental transporters, drug lipophilicity, and protein-binding characteristics to estimate fetal drug exposure. Drugs with minimal placental transfer or those rapidly metabolized by placental enzymes are considered relatively safer, though no therapy is entirely risk-free [4].

CONCLUSION

Anti-inflammatory drug use in pregnancy requires an advanced clinical pharmacological approach that integrates maternal therapeutic need with fetal safety considerations. NSAIDs must be used sparingly and with strict trimester-based limitations, whereas corticosteroids remain safer alternatives when prescribed with careful dose regulation. Selective anti-inflammatory and biological agents require individualized assessment due to incomplete safety data. Understanding pregnancy-related pharmacokinetic changes, educating patients, and implementing multidisciplinary monitoring are key to achieving effective inflammation control without compromising obstetric outcomes. Evidence-based, judicious, and personalized therapeutic planning forms the foundation of safe anti-inflammatory pharmacotherapy during pregnancy.

REFERENCES

1. Koren G., Nordeng H. Drugs in Pregnancy and Lactation. – London: Academic Press, 2019. – 412 p.

2. American College of Obstetricians and Gynecologists. Guidelines for Pharmacologic Treatment in Pregnancy. – Washington: ACOG Press, 2020. – 215 p.
3. Cimaz R., Brucato A. Corticosteroid use in pregnancy // Autoimmunity Reviews. – 2017. – Vol. 16(4). – P. 300–305.
4. Götestam Skorpen C., Hoeltzenbein M. et al. Biologic anti-inflammatory drugs and pregnancy // Annals of the Rheumatic Diseases. – 2016. – Vol. 75. – P. 795–810.
5. Østensen M., Motta M. Therapy insight: The effect of anti-inflammatory therapy on pregnant women with autoimmune diseases // Nature Clinical Practice. – 2006. – Vol. 2(7). – P. 488–494.
6. Sachs H. Pregnancy and drugs: Maternal and fetal considerations. – New York: Springer, 2018. – 328 p.
7. Saidkhodjaeva D. Farmakologiya asoslari. – Toshkent: “Fan va texnologiya”, 2021. – 264 b.