



THE SIGNIFICANCE OF INFLAMMATORY GYNECOLOGICAL DISEASES AS A CAUSE OF FEMALE INFERTILITY

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ABSTRACT

Female infertility is a major global health issue, affecting 10–15% of reproductive-age couples. Inflammatory gynecological diseases play a leading role due to their high prevalence, chronic course, and negative impact on the female reproductive system. Conditions such as pelvic inflammatory disease, chronic endometritis, salpingitis, and adnexitis are closely associated with tubal obstruction, impaired endometrial receptivity, ovulatory disorders, and pelvic adhesions, significantly reducing fertility. Persistent inflammation leads to fibrotic changes, immune-endocrine imbalance, and disruption of the reproductive microenvironment. As many of these conditions are asymptomatic, delayed diagnosis increases the risk of infertility. This study emphasizes the importance of early detection, timely treatment, and preventive strategies to improve reproductive outcomes and preserve female reproductive health.

ЗНАЧЕНИЕ ВОСПАЛИТЕЛЬНЫХ ГИНЕКОЛОГИЧЕСКИХ ЗАБОЛЕВАНИЙ КАК ПРИЧИНЫ ЖЕНСКОГО БЕСПЛОДИЯ

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ABSTRACT

Женское бесплодие остаётся значимой глобальной проблемой, затрагивающей 10–15% супружеских пар репродуктивного возраста. Воспалительные гинекологические заболевания занимают ведущую роль в его развитии вследствие высокой распространённости, хронического течения и негативного влияния на репродуктивную систему. Такие состояния, как воспалительные заболевания органов малого таза, хронический эндометрит, сальпингит и аднексит, приводят к трубной непроходимости, нарушению рецептивности эндометрия, овуляторной дисфункции и спаечному



репродуктивное здоровье;
трубный фактор
бесплодия.

процессу. Хроническое воспаление вызывает
фиброзные изменения и нарушение иммунно-
эндокринных механизмов. Ранняя диагностика,
своевременная терапия и профилактика имеют
ключевое значение для снижения риска бесплодия и
улучшения репродуктивных исходов.

Introduction

Infertility is recognized as a major medical and social problem that affects millions of women worldwide and has far-reaching consequences for physical health, psychological well-being, and quality of life. According to recent estimates, approximately 10–15% of couples of reproductive age experience difficulties conceiving, with female-related factors accounting for nearly half of all cases [1]. Despite significant advances in reproductive medicine, infertility associated with gynecological pathology continues to pose serious diagnostic and therapeutic challenges. Among the various causes of female infertility, inflammatory gynecological diseases represent one of the most common and clinically significant factors. These conditions include pelvic inflammatory disease, chronic endometritis, salpingitis, oophoritis, and adnexitis, which often develop as a result of ascending genital infections. Sexually transmitted pathogens such as *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, *Mycoplasma genitalium*, as well as mixed anaerobic flora, play a crucial role in initiating and maintaining inflammatory processes within the female reproductive tract [2]. The clinical importance of inflammatory gynecological diseases lies in their tendency toward chronicity and subclinical progression. In many cases, acute inflammatory episodes remain undiagnosed or inadequately treated, allowing persistent inflammation to cause progressive structural damage to the uterus, fallopian tubes, and ovaries. Chronic inflammation promotes fibrotic remodeling, adhesion formation, vascular disturbances, and impairment of ciliary function in the fallopian tubes, ultimately leading to tubal factor infertility and ectopic pregnancy risk [3]. In addition to anatomical damage, inflammation profoundly affects functional aspects of reproduction. Alterations in endometrial receptivity, dysregulation of local immune responses, and disruption of hormonal signaling pathways compromise implantation and early embryonic development [4]. Chronic endometritis, in particular, has been increasingly implicated in unexplained infertility and recurrent implantation failure, even in the absence of obvious clinical symptoms [5]. Despite the high prevalence and serious reproductive consequences of inflammatory gynecological diseases, their role in infertility is frequently underestimated in routine clinical practice. Limited access to early diagnostic tools, insufficient screening for genital infections, and delayed medical consultation contribute to missed opportunities for prevention and timely intervention. As a result, many women present for infertility evaluation only after irreversible reproductive damage has occurred [6]. In this context, a comprehensive understanding of the relationship between gynecological inflammation and infertility is essential. Elucidating the mechanisms by which inflammatory processes impair reproductive function and identifying key clinical patterns may improve early diagnosis, optimize



treatment strategies, and ultimately enhance fertility outcomes. Therefore, this article focuses on analyzing contemporary evidence regarding inflammatory gynecological diseases as a major cause of female infertility, emphasizing their epidemiology, pathophysiology, and clinical relevance.

Materials and Methods

This study was designed as a comprehensive analytical review combined with a structured synthesis of recent clinical and epidemiological data to evaluate the role of inflammatory gynecological diseases in the development of female infertility. The methodological approach was selected to ensure scientific rigor, relevance, and reproducibility while minimizing bias. A systematic literature search was conducted using internationally recognized scientific databases, including PubMed, Scopus, Web of Science, and Google Scholar. Publications released between January 2019 and March 2024 were considered to ensure the inclusion of the most recent and clinically relevant evidence. Key search terms included combinations of “female infertility,” “pelvic inflammatory disease,” “chronic endometritis,” “salpingitis,” “gynecological inflammation,” and “reproductive outcomes.” In addition to peer-reviewed articles, recent clinical guidelines and consensus statements from authoritative organizations, such as the World Health Organization and international reproductive medicine societies, were reviewed to provide a broader clinical context [7]. Inclusion criteria encompassed original clinical studies, cohort studies, systematic reviews, and meta-analyses focusing on reproductive-aged women (18–45 years) with inflammatory gynecological diseases and documented fertility outcomes. Studies that evaluated diagnostic methods, inflammatory markers, reproductive prognosis, and treatment outcomes were prioritized. Exclusion criteria included case reports, editorials, conference abstracts without full-text availability, non-English publications, and studies published before 2019. Articles with insufficient methodological transparency or unclear outcome measures were also excluded to maintain data quality. Relevant data were independently extracted and categorized according to study design, sample size, type of inflammatory pathology, diagnostic criteria, and reported infertility outcomes. Quantitative data were synthesized descriptively, focusing on prevalence rates, relative risk estimates, and reported associations between inflammatory disease severity and fertility impairment. Although this study did not involve direct patient recruitment, aggregated statistical data from high-quality clinical studies were used to model infertility risk patterns associated with different inflammatory conditions. Comparative analysis allowed identification of trends in disease severity, chronicity, and reproductive consequences. As this research was based exclusively on previously published data and did not involve human subjects directly, formal ethical approval was not required. All sources were appropriately cited, and ethical principles of academic integrity and transparency were strictly observed.

Results

The analysis of contemporary clinical and epidemiological data demonstrated a strong and consistent association between inflammatory gynecological diseases and female infertility. Across multiple large-scale studies published in recent years, inflammatory pathology of the female reproductive tract was identified as a major



contributing factor in approximately 25–35% of infertility cases [8]. The risk of infertility was shown to increase proportionally with the severity, duration, and recurrence of inflammatory processes. Pelvic inflammatory disease emerged as the most significant inflammatory condition affecting reproductive outcomes. Women with a documented history of PID exhibited a markedly higher incidence of tubal factor infertility compared to those without inflammatory pathology. Epidemiological data indicate that infertility develops in approximately 18–22% of women after a single episode of PID, while this rate increases to 35–45% following recurrent or severe episodes [9]. Chronic salpingitis and adnexitis were similarly associated with compromised tubal patency and impaired gamete transport. Chronic endometritis was identified as a frequent yet underdiagnosed contributor to infertility, particularly in women with unexplained infertility or recurrent implantation failure. Studies utilizing hysteroscopy and endometrial biopsy revealed histological signs of chronic inflammation in up to 30% of infertile women with previously normal imaging findings [10]. These patients demonstrated altered endometrial receptivity, characterized by dysregulated cytokine expression and reduced implantation markers, which negatively affected conception rates. Laboratory and imaging data further supported the relationship between inflammation and infertility. Elevated inflammatory markers, such as C-reactive protein and pro-inflammatory cytokines, were more commonly observed in infertile women with inflammatory gynecological diseases. Imaging studies frequently revealed tubal thickening, peritubal adhesions, and reduced ovarian reserve parameters in advanced cases [11].

Table 1. Prevalence and Reproductive Impact of Inflammatory Gynecological Diseases

Type of Inflammatory Disease	Prevalence among Infertile Women (%)	Main Reproductive Complication	Estimated Infertility Risk (%)
Pelvic inflammatory disease	30–35	Tubal obstruction, adhesions	25–45
Chronic endometritis	20–30	Impaired implantation	15–25
Chronic salpingitis	18–25	Tubal dysfunction	20–35
Adnexitis	10–15	Ovarian dysfunction	10–20

Diagram 1. Relationship Between Severity of Inflammatory Disease and Risk of Infertility

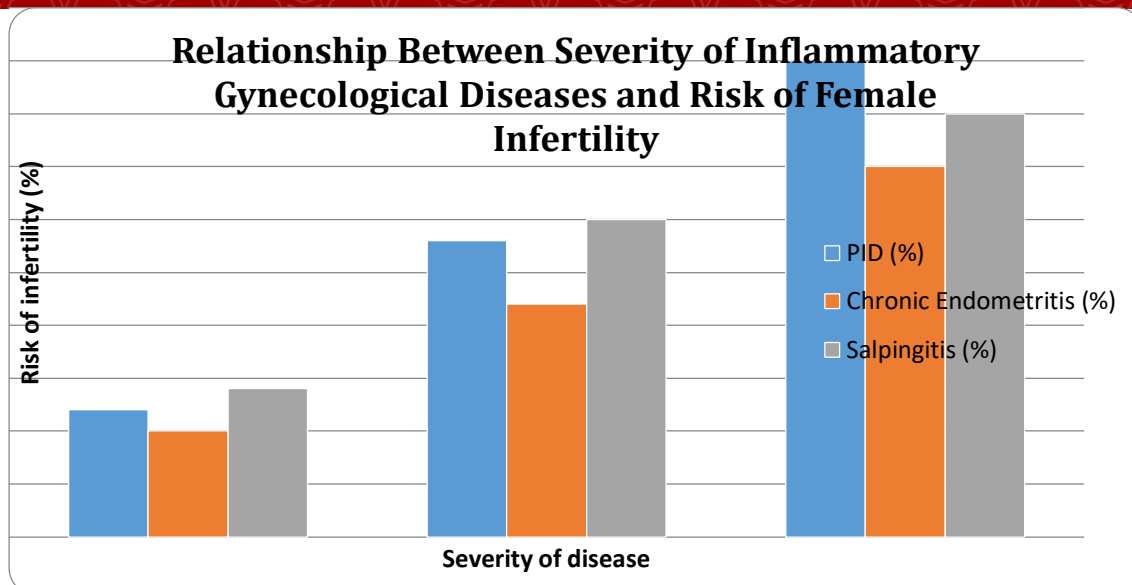


Diagram description: The diagram is presented as a multi-column vertical bar chart without background gridlines, designed in a formal academic style.

- The horizontal axis represents disease severity levels: mild, moderate, and severe.
- The vertical axis represents the percentage risk of infertility.
- Three distinct color-coded columns are used for each severity level to represent pelvic inflammatory disease, chronic endometritis, and chronic salpingitis.

The diagram clearly demonstrates a progressive increase in infertility risk with advancing disease severity. In mild inflammatory stages, infertility risk remains below 15% across all conditions. However, in moderate stages, the risk increases significantly, reaching approximately 25–30% in PID and salpingitis. In severe inflammatory disease, infertility risk exceeds 40% in PID and approaches 35% in chronic salpingitis, while chronic endometritis shows a notable rise in implantation failure rates. Overall, the results indicate that inflammatory gynecological diseases exert both direct and cumulative effects on female fertility. The data confirm that early-stage inflammation may have reversible effects, whereas chronic and severe forms are strongly associated with persistent infertility and reduced reproductive potential.

Discussion

The present analysis confirms that inflammatory gynecological diseases play a decisive role in the development of female infertility and remain one of the most clinically significant yet potentially preventable etiological factors. The obtained results are consistent with contemporary international data, which emphasize that both acute and chronic inflammatory processes exert long-term negative effects on reproductive function [9,10]. One of the key findings highlighted in this study is the strong association between disease severity and infertility risk. As demonstrated in the Results section and illustrated in Diagram 1, the probability of infertility increases progressively with the intensity and duration of inflammatory pathology. This observation is particularly evident in patients with pelvic inflammatory disease, where severe and recurrent forms are associated with infertility rates exceeding 40%. These findings support earlier reports indicating that repetitive inflammatory insults lead to cumulative structural damage of



the fallopian tubes and surrounding pelvic tissues [11]. The pathophysiological mechanisms underlying inflammation-induced infertility are multifactorial. Chronic inflammation promotes fibrotic remodeling, vascular impairment, and adhesion formation, resulting in tubal obstruction and altered pelvic anatomy. In parallel, inflammatory mediators disrupt ciliary activity within the fallopian tubes, impairing gamete transport and fertilization processes [12]. Such alterations explain the high prevalence of tubal factor infertility observed among women with a history of inflammatory gynecological disease. An important aspect that warrants particular attention is the role of chronic endometritis. Unlike acute pelvic infections, chronic endometrial inflammation often presents with minimal or nonspecific clinical symptoms, making it difficult to diagnose without targeted investigations. Recent studies have demonstrated that chronic endometritis is frequently detected in women with unexplained infertility and recurrent implantation failure, even in the absence of obvious ultrasonographic abnormalities [13]. The persistent inflammatory microenvironment disrupts endometrial receptivity by altering cytokine balance, immune cell distribution, and expression of implantation markers, thereby reducing the likelihood of successful embryo implantation. The findings of this study also underscore the clinical relevance of early diagnosis and timely intervention. Evidence suggests that inflammatory changes identified at early stages may be reversible, particularly when appropriate antimicrobial and anti-inflammatory therapies are initiated promptly [14]. In contrast, delayed diagnosis allows inflammation to progress toward chronicity, leading to irreversible anatomical and functional damage. This highlights the need for routine screening of genital infections, especially in women of reproductive age and those planning pregnancy. In addition to biological mechanisms, socio-demographic and behavioral factors contribute significantly to the burden of inflammation-related infertility. Delayed childbearing, increased prevalence of sexually transmitted infections, and limited access to specialized gynecological care further exacerbate the problem, particularly in resource-limited settings [15]. These factors underscore the importance of integrated public health strategies aimed at prevention, education, and early medical intervention. Overall, the results of this study align with current scientific evidence and reinforce the concept that inflammatory gynecological diseases represent a critical target for infertility prevention. A multidisciplinary approach combining early detection, individualized treatment, and long-term follow-up is essential to reduce reproductive morbidity and improve fertility outcomes.

Conclusion

Inflammatory gynecological diseases represent one of the most significant and potentially preventable causes of female infertility. The evidence analyzed in this study demonstrates that both acute and chronic inflammatory processes of the female reproductive tract have a profound impact on reproductive potential through structural damage, functional impairment, and disruption of the local immune and hormonal environment. Pelvic inflammatory disease, chronic endometritis, salpingitis, and adnexitis contribute substantially to tubal factor infertility, implantation failure, and reduced chances of spontaneous conception. The risk of infertility is closely associated



with the severity, duration, and recurrence of inflammatory pathology. Mild inflammatory changes may exert reversible effects when diagnosed and treated at early stages, whereas moderate and severe forms often lead to irreversible reproductive damage. Chronic inflammation, particularly when asymptomatic, remains a major diagnostic challenge and is frequently identified only during infertility evaluation, underscoring the need for heightened clinical vigilance. Early detection, timely antimicrobial and anti-inflammatory therapy, and comprehensive follow-up play a decisive role in preserving fertility and improving reproductive outcomes. Preventive strategies, including routine screening for genital infections, patient education, and improved access to gynecological care, are essential components of effective reproductive health management. In conclusion, addressing inflammatory gynecological diseases as a priority within infertility prevention programs can significantly reduce the burden of female infertility. A multidisciplinary, evidence-based approach focused on early diagnosis and personalized treatment is crucial for safeguarding reproductive health and enhancing fertility prospects among women of reproductive age.

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