



## THE ETIOLOGY OF INFERTILITY ASSOCIATED WITH ANOVULATORY DYSFUNCTION AND THE IMPORTANCE OF MODERN DIAGNOSTIC APPROACHES IN ITS DETECTION

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### Abstract

Anovulatory dysfunction is one of the leading causes of impaired reproductive function in women and represents a major factor contributing to female infertility. Ovulation occurs through the coordinated interaction of the hypothalamic–pituitary–ovarian axis, and disruption at any level of this system may result in ovulatory failure. The etiology of anovulatory dysfunction is multifactorial and includes hormonal disorders, polycystic ovary syndrome, hypothyroidism, hyperprolactinemia, metabolic disturbances, and disorders of the hypothalamic–pituitary system. Modern diagnostic methods, including hormonal evaluation, ultrasound monitoring, and folliculometry, play a crucial role in the early detection of anovulatory dysfunction. This article discusses the etiological factors, clinical manifestations, diagnostic approaches, and the significance of modern diagnostic methods in infertility associated with anovulatory dysfunction.

**Keywords:** anovulatory dysfunction, infertility, ovulation disorders, polycystic ovary syndrome, hypothyroidism, hyperprolactinemia, hormonal imbalance, reproductive endocrinology, folliculometry, reproductive health.

### Introduction

Infertility remains one of the most important and complex problems in modern reproductive medicine. This condition has not only medical, but also social, psychological, and demographic significance. According to the World Health Organization, approximately one in six individuals of reproductive age experiences infertility during their lifetime. One of the major causes of female infertility is anovulatory dysfunction associated with impaired ovulation. Studies indicate that ovulatory disorders account for approximately 25–40% of infertility cases. In anovulatory dysfunction, the maturation of the oocyte, development of the dominant follicle, and release of the ovum from the ovary are disrupted, resulting in failed fertilization. Several pathological conditions contribute to the development of this disorder, including polycystic ovary syndrome, hyperprolactinemia, hypothyroidism, and metabolic or endocrine abnormalities. Among these, polycystic ovary syndrome is considered one of the most common causes of chronic anovulation. Recent advances in reproductive endocrinology and diagnostic technologies have significantly improved the early detection of anovulatory dysfunction.



Hormonal investigations, ultrasound monitoring, and folliculometry have become essential diagnostic tools for evaluating reproductive function and identifying ovulatory disorders.

### **Aim of the Study**

The aim of this study is to analyze the major etiological factors, pathogenetic mechanisms, clinical manifestations, and modern diagnostic approaches associated with infertility caused by anovulatory dysfunction. The study also aims to evaluate the effectiveness of modern diagnostic methods in the early detection of ovulatory disorders and improvement of reproductive outcomes.

### **Materials and Methods**

The study was based on the analysis of contemporary scientific literature, clinical guidelines, and research articles related to anovulatory dysfunction and infertility. Relevant publications from international medical databases, including PubMed, Scopus, Google Scholar, and other scientific sources, were reviewed. The analysis focused on the etiological factors, hormonal disturbances, clinical manifestations, diagnostic criteria, and modern diagnostic approaches associated with anovulatory dysfunction. Particular attention was given to endocrine disorders such as polycystic ovary syndrome, hypothyroidism, hyperprolactinemia, obesity, and metabolic abnormalities. Modern diagnostic techniques, including hormonal investigations, ultrasonography, folliculometry, and assessment of hypothalamic–pituitary–ovarian axis function, were comparatively analyzed to evaluate their role in the early diagnosis of anovulatory infertility.

**Etiology of Infertility Associated with Anovulatory Dysfunction.** Anovulatory dysfunction is one of the most common functional disorders of the female reproductive system and is characterized by the absence or irregular occurrence of ovulation. This condition is a significant cause of infertility among women of reproductive age. Physiologically, ovulation is regulated by the complex neuroendocrine interactions of the hypothalamic–pituitary–ovarian axis. Any disruption in the coordinated activity of this system may impair the ovulatory cycle. In a normal ovulatory cycle, the hypothalamus secretes gonadotropin-releasing hormone, which stimulates the anterior pituitary gland to release follicle-stimulating hormone and luteinizing hormone. Follicle-stimulating hormone promotes follicular growth and maturation, while luteinizing hormone is responsible for triggering ovulation. Disturbances in the secretion of these hormones may impair folliculogenesis and lead to anovulation. One of the primary etiological factors of anovulatory dysfunction is polycystic ovary syndrome. This endocrine disorder is characterized by hyperandrogenism, insulin resistance, and chronic anovulation. In women with polycystic ovary syndrome, multiple immature follicles accumulate within the ovaries, preventing the formation of a dominant follicle and inhibiting ovulation. Hypothyroidism is another important cause of anovulation. Thyroid hormones regulate not only



metabolic processes but also reproductive functions. In hypothyroidism, increased secretion of thyrotropin-releasing hormone stimulates prolactin production, which suppresses gonadotropin secretion and impairs ovulation. Hyperprolactinemia is also considered a common etiological factor of anovulatory dysfunction. Elevated prolactin levels inhibit gonadotropin-releasing hormone secretion from the hypothalamus, resulting in reduced follicle-stimulating hormone and luteinizing hormone production. Metabolic disorders, particularly obesity, contribute significantly to the development of anovulatory infertility. Excess adipose tissue alters estrogen metabolism and promotes insulin resistance, which further disrupts ovulation. Chronic stress, psychoemotional strain, excessive physical activity, diabetes mellitus, and organic disorders of the hypothalamic–pituitary system may also contribute to the development of anovulation.

### **Clinical Manifestations of Anovulatory Dysfunction.**

Clinical manifestations of anovulatory dysfunction vary depending on the underlying etiology, degree of hormonal imbalance, patient age, and duration of disease. The main clinical manifestation is infertility associated with impaired reproductive function. Menstrual irregularities are among the most common symptoms. Patients may present oligomenorrhea, amenorrhea, hypomenorrhea, or dysfunctional uterine bleeding. Some women experience regular menstrual cycles despite the absence of ovulation, a condition known as “silent anovulation.” In patients with polycystic ovary syndrome, hyperandrogenism may lead to hirsutism, acne, seborrhea, and androgenic alopecia. Obesity and insulin resistance are also common findings.

Patients with hypothyroidism-associated anovulatory dysfunction frequently complain of fatigue, drowsiness, weight gain, cold intolerance, dry skin, decreased libido, and infertility. Hyperprolactinemia-related anovulatory dysfunction commonly presents with amenorrhea, oligomenorrhea, galactorrhea, and decreased sexual desire. Long-term anovulation may result in prolonged estrogen exposure, increasing the risk of endometrial hyperplasia and dysfunctional uterine bleeding.

### **Diagnosis of Anovulatory Dysfunction**

Diagnosis of anovulatory dysfunction requires a comprehensive clinical, laboratory, and instrumental evaluation. Detailed medical history, menstrual history, lifestyle factors, stress, weight changes, and endocrine disorders should be carefully assessed. Clinical examination includes evaluation of body mass index, obesity, blood pressure, signs of hyperandrogenism, and galactorrhea.

Hormonal investigations are essential for evaluating hypothalamic–pituitary–ovarian axis function. Measurement of follicle-stimulating hormone, luteinizing hormone, progesterone,



estradiol, prolactin, thyroid-stimulating hormone, and thyroid hormones is important for identifying endocrine abnormalities.

Ultrasound examination and folliculometry are among the most effective methods for monitoring ovulation and assessing follicular development. Pelvic ultrasonography also allows evaluation of ovarian morphology and endometrial thickness. In selected cases, magnetic resonance imaging may be performed to identify hypothalamic–pituitary abnormalities, particularly in patients with markedly elevated prolactin levels.

### **Results**

The analysis demonstrated that polycystic ovary syndrome, hypothyroidism, and hyperprolactinemia are among the most common etiological factors associated with anovulatory infertility. Hormonal imbalance significantly disrupts follicular maturation and ovulation, leading to impaired reproductive function. The findings also showed that hormonal investigations combined with ultrasound monitoring and folliculometry considerably improve the accuracy of diagnosis and facilitate early detection of ovulatory disorders. Assessment of prolactin and thyroid hormone levels plays an important role in identifying endocrine-related causes of infertility. Women with metabolic disorders, obesity, and insulin resistance were found to have a higher risk of chronic anovulation and menstrual irregularities. Early diagnosis and timely correction of endocrine abnormalities contribute to improved ovulatory function and better reproductive outcomes.

### **Discussion**

The interaction between endocrine disorders and reproductive dysfunction represents a complex clinical problem in gynecology and reproductive endocrinology. The present analysis confirms that disturbances of the hypothalamic–pituitary–ovarian axis play a central role in the pathogenesis of anovulatory infertility. Hormonal disorders such as hypothyroidism and hyperprolactinemia suppress gonadotropin secretion and impair normal ovulation. Similarly, insulin resistance and hyperandrogenism associated with polycystic ovary syndrome negatively affect follicular development. Modern diagnostic methods have significantly improved the ability to identify ovulatory disorders at an early stage. Hormonal evaluation, ultrasonography, and folliculometry provide valuable information regarding ovarian function and endocrine status. Comprehensive assessment and early intervention are essential for preventing long-term reproductive complications and improving fertility outcomes in women with anovulatory dysfunction.

### **Conclusion**

Anovulatory dysfunction is one of the leading causes of female infertility and develops because of complex neuroendocrine disturbances within the reproductive system. The etiology of this condition is multifactorial, with polycystic ovary syndrome, hyperprolactinemia,



hypothyroidism, metabolic abnormalities, and functional disorders playing major roles. Clinical manifestations include menstrual irregularities, hormonal imbalance, and impaired reproductive function. Modern laboratory and instrumental diagnostic methods enable early detection of anovulatory dysfunction, identification of etiological factors, and accurate differential diagnosis. Comprehensive investigation of infertility associated with anovulatory dysfunction is of considerable scientific and practical importance for improving reproductive health, enhancing diagnostic accuracy, and reducing long-term complications associated with this condition.

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