

MODERN APPROACHES TO THE DIAGNOSIS AND MANAGEMENT OF POLYCYSTIC OVARY SYNDROME IN WOMEN OF REPRODUCTIVE AGE

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Received: 2026-03-18 · Accepted: 2026-04-27

Abstract

Polycystic ovary syndrome is one of the most common endocrine and metabolic disorders affecting women of reproductive age and is characterized by hormonal imbalance, ovulatory dysfunction, hyperandrogenism, menstrual irregularities, metabolic disturbances, and reproductive complications. The syndrome demonstrates complex multifactorial pathophysiology involving genetic predisposition, insulin resistance, neuroendocrine dysregulation, ovarian dysfunction, chronic low-grade inflammation, and environmental influences. Clinical manifestations vary significantly among affected individuals and frequently include oligomenorrhea, amenorrhea, infertility, obesity, hirsutism, acne, alopecia, metabolic syndrome, and psychological disturbances. Early diagnosis and comprehensive management are critically important because untreated polycystic ovary syndrome increases the risk of infertility, type 2 diabetes mellitus, cardiovascular disease, endometrial hyperplasia, pregnancy complications, and long-term metabolic dysfunction. Modern diagnostic approaches involve integrated evaluation of clinical manifestations, biochemical hormonal assessment, ultrasonographic examination of ovarian morphology, and exclusion of other endocrine disorders. Laboratory analysis commonly includes measurement of luteinizing hormone, follicle-stimulating hormone, testosterone, dehydroepiandrosterone sulfate, insulin, glucose metabolism parameters, lipid profile, and anti-Müllerian hormone concentrations. Transvaginal ultrasonography remains an essential imaging method for identification of polycystic ovarian morphology and follicular abnormalities. Contemporary management strategies focus on individualized multidisciplinary treatment aimed at restoration of ovulatory function, reduction of hyperandrogenic symptoms, improvement of metabolic health, and prevention of long-term complications. Lifestyle modification involving dietary regulation, weight reduction, and physical activity remains the first-line therapeutic approach for overweight and obese patients. Pharmacological interventions include insulin-sensitizing agents, combined oral contraceptives, antiandrogen therapy, ovulation induction medications, and emerging hormonal treatments targeting metabolic and reproductive dysfunction. Advances in reproductive medicine, endocrinology, molecular diagnostics, and metabolic research have significantly improved understanding of disease mechanisms and optimization of therapeutic strategies. Comprehensive individualized management therefore plays a fundamental role in improving reproductive outcomes, metabolic stability, hormonal regulation, and quality of life in women affected by polycystic ovary syndrome.

Keywords: Polycystic ovary syndrome, reproductive endocrinology, hyperandrogenism, insulin resistance, infertility, ovarian dysfunction, hormonal imbalance, ultrasonography, metabolic syndrome, ovulation induction

1. Introduction

Polycystic ovary syndrome represents one of the most prevalent endocrine disorders affecting women during reproductive age and constitutes a major cause of menstrual irregularities, infertility, metabolic dysfunction, and hormonal imbalance worldwide. The syndrome is characterized by heterogeneous clinical manifestations resulting from complex interactions among genetic susceptibility, insulin resistance, ovarian hyperandrogenism, neuroendocrine abnormalities, inflammatory mechanisms, and environmental factors. Prevalence estimates vary among populations; however, polycystic ovary syndrome affects a substantial proportion of reproductive-age women and significantly influences reproductive health, metabolic stability, cardiovascular risk, and psychological well-being. Pathophysiological mechanisms involve dysregulation of hypothalamic-pituitary-ovarian function leading to excessive androgen production, impaired follicular maturation, chronic anovulation, and abnormal ovarian morphology. Hyperinsulinemia associated with insulin resistance further contributes to ovarian androgen synthesis and suppression of sex hormone-binding globulin production, thereby increasing circulating androgen concentrations and worsening metabolic dysfunction. Clinical manifestations are highly variable and frequently include oligomenorrhea, amenorrhea, infertility, hirsutism, acne, obesity, androgenic alopecia, acanthosis nigricans, and emotional disturbances such as anxiety and depression. Metabolic abnormalities associated with polycystic ovary syndrome additionally include impaired glucose tolerance, dyslipidemia, hypertension, chronic inflammation, and increased risk of type 2 diabetes mellitus and cardiovascular disease. Long-term reproductive complications may involve infertility, recurrent pregnancy loss, gestational diabetes, preeclampsia, and endometrial hyperplasia resulting from prolonged unopposed estrogen exposure. Accurate diagnosis remains clinically challenging because of phenotypic heterogeneity and overlap with other endocrine disorders including thyroid dysfunction, congenital adrenal hyperplasia, hyperprolactinemia, Cushing syndrome, and androgen-secreting tumors. Contemporary diagnostic criteria emphasize integrated assessment of hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphology identified through ultrasonography. Biochemical hormonal analysis plays a critical role in evaluation of androgen excess, gonadotropin imbalance, insulin resistance, and metabolic dysfunction. Advances in laboratory endocrinology and imaging technology have substantially improved diagnostic precision and identification of early metabolic complications. Modern management approaches focus on individualized multidisciplinary treatment strategies aimed at normalization of menstrual function, restoration of ovulation, reduction of androgenic manifestations, improvement of insulin sensitivity, and prevention of long-term metabolic and cardiovascular complications. Lifestyle modification involving weight reduction, nutritional regulation, and physical activity remains the cornerstone of therapy, particularly in overweight patients. Pharmacological treatment frequently includes combined oral contraceptives for menstrual regulation and androgen suppression, insulin-sensitizing agents such as metformin, antiandrogen medications, and ovulation induction therapy for infertility management. Emerging research increasingly explores molecular mechanisms, inflammatory pathways, genetic influences, gut microbiota alterations, and novel targeted therapies in polycystic ovary syndrome. Comprehensive understanding of endocrine, metabolic, reproductive, and psychological aspects therefore remains essential for effective diagnosis, treatment, and long-term management of women affected by polycystic ovary syndrome.

2. Materials and Methods

The study involved comprehensive clinical and laboratory evaluation of women of reproductive age diagnosed with polycystic ovary syndrome according to established international diagnostic criteria. Clinical assessment included analysis of menstrual irregularities, infertility history, body mass index, hirsutism severity, acne manifestations, alopecia, metabolic abnormalities, and reproductive history. Hormonal laboratory investigations included measurement of luteinizing hormone, follicle-stimulating

hormone, total testosterone, free testosterone, dehydroepiandrosterone sulfate, prolactin, thyroid-stimulating hormone, fasting insulin, fasting glucose, glycated hemoglobin, and lipid profile. Insulin resistance was evaluated using metabolic indices and glucose tolerance testing. Transvaginal ultrasonography was performed to assess ovarian volume, follicular number, stromal echogenicity, and endometrial thickness. Comparative analysis was conducted between hormonal findings, metabolic parameters, ultrasonographic characteristics, clinical symptoms, and therapeutic response following lifestyle intervention and pharmacological treatment. Management strategies included dietary modification, physical activity programs, insulin-sensitizing therapy, hormonal treatment, and ovulation induction protocols depending on individual reproductive and metabolic goals.

3. Results

Clinical evaluation demonstrated that menstrual irregularities, chronic anovulation, hirsutism, obesity, and infertility represented the most common manifestations among women with polycystic ovary syndrome. Laboratory analysis revealed elevated androgen concentrations, increased luteinizing hormone to follicle-stimulating hormone ratio, hyperinsulinemia, impaired glucose tolerance, and dyslipidemia in a substantial proportion of patients. Insulin resistance showed significant association with obesity severity, metabolic syndrome, and reproductive dysfunction. Ultrasonographic examination frequently demonstrated enlarged ovarian volume, multiple peripheral follicles, increased stromal echogenicity, and characteristic polycystic ovarian morphology. Lifestyle modification involving weight reduction and increased physical activity significantly improved menstrual regularity, insulin sensitivity, and metabolic parameters in overweight patients. Metformin therapy contributed to reduction of insulin resistance, improvement of ovulatory function, and stabilization of glucose metabolism. Combined oral contraceptive therapy effectively reduced hyperandrogenic symptoms including acne and hirsutism while regulating menstrual cycles. Ovulation induction therapy demonstrated positive reproductive outcomes in infertile patients seeking pregnancy. Comprehensive individualized treatment approaches significantly improved hormonal balance, metabolic health, reproductive function, and quality of life.

4. Discussion

The findings confirm that polycystic ovary syndrome represents a complex endocrine-metabolic disorder requiring comprehensive multidisciplinary diagnostic and therapeutic approaches. Insulin resistance and hyperandrogenism appear to play central roles in disease pathophysiology and contribute significantly to reproductive dysfunction, metabolic abnormalities, and long-term cardiovascular risk. Early diagnosis remains critically important because delayed intervention increases the likelihood of infertility, type 2 diabetes mellitus, endometrial pathology, and metabolic syndrome. Integrated evaluation involving clinical examination, hormonal analysis, metabolic assessment, and ultrasonographic imaging substantially improves diagnostic accuracy and facilitates individualized treatment planning. Lifestyle modification remains the foundation of management because weight reduction and physical activity significantly improve insulin sensitivity, ovulatory function, and hormonal regulation. Pharmacological interventions including insulin-sensitizing agents, hormonal contraceptives, antiandrogen therapy, and ovulation induction medications provide effective symptom control and reproductive improvement when tailored according to patient-specific goals. Contemporary research increasingly emphasizes the importance of chronic inflammation, oxidative stress, genetic predisposition, and gut microbiota alterations in disease progression and therapeutic response. Advances in endocrinology, reproductive medicine, molecular biology, and metabolic research continue to improve understanding of polycystic ovary syndrome and support development of more targeted individualized therapeutic strategies. The findings confirm that polycystic ovary syndrome represents a multifactorial endocrine-metabolic disorder requiring comprehensive multidisciplinary evaluation and individualized therapeutic management. Insulin resistance and hyperandrogenism appear to be central pathophysiological mechanisms responsible for reproductive dysfunction, chronic anovulation, metabolic abnormalities, and cardiovascular risk progression. Early identification of endocrine and metabolic disturbances remains critically important because delayed diagnosis contributes to infertility, type 2 diabetes mellitus, chronic inflammation, endometrial pathology, and cardiovascular complications. Integrated diagnostic evaluation combining clinical assessment, biochemical hormonal analysis, metabolic investigation, and ultrasonographic

imaging significantly improves diagnostic precision and facilitates early therapeutic intervention. Lifestyle modification remains the foundation of management because body weight reduction and increased physical activity substantially improve insulin sensitivity, endocrine regulation, ovulatory function, and reproductive outcomes. Pharmacological interventions including insulin-sensitizing therapy, hormonal contraceptives, antiandrogen medications, and ovulation induction agents provide effective symptom control when individualized according to patient-specific reproductive and metabolic objectives. Recent advances in endocrinology and molecular medicine increasingly emphasize the roles of oxidative stress, inflammatory cytokines, adipokine imbalance, and gut microbiota dysregulation in disease progression. Ongoing scientific research continues to improve understanding of molecular mechanisms underlying polycystic ovary syndrome and contributes to development of targeted therapeutic approaches aimed at optimizing endocrine balance and metabolic health.

5. Conclusion

Polycystic ovary syndrome is a multifactorial endocrine and metabolic disorder associated with reproductive dysfunction, hyperandrogenism, insulin resistance, and increased long-term metabolic risk in women of reproductive age. Comprehensive diagnosis involving hormonal evaluation, metabolic assessment, ultrasonographic examination, and clinical analysis is essential for accurate identification and effective management. Individualized multidisciplinary treatment approaches including lifestyle modification, pharmacological therapy, and reproductive intervention significantly improve hormonal balance, ovulatory function, metabolic stability, and quality of life. Early recognition and appropriate long-term management reduce the risk of infertility, cardiovascular complications, type 2 diabetes mellitus, and endometrial pathology. Continued advances in reproductive endocrinology, molecular diagnostics, and metabolic medicine will further enhance understanding and treatment of polycystic ovary syndrome in contemporary clinical practice. The findings confirm that polycystic ovary syndrome represents a multifactorial endocrine-metabolic disorder requiring comprehensive multidisciplinary evaluation and individualized therapeutic management. Insulin resistance and hyperandrogenism appear to be central pathophysiological mechanisms responsible for reproductive dysfunction, chronic anovulation, metabolic abnormalities, and cardiovascular risk progression. Early identification of endocrine and metabolic disturbances remains critically important because delayed diagnosis contributes to infertility, type 2 diabetes mellitus, chronic inflammation, endometrial pathology, and cardiovascular complications. Integrated diagnostic evaluation combining clinical assessment, biochemical hormonal analysis, metabolic investigation, and ultrasonographic imaging significantly improves diagnostic precision and facilitates early therapeutic intervention. Lifestyle modification remains the foundation of management because body weight reduction and increased physical activity substantially improve insulin sensitivity, endocrine regulation, ovulatory function, and reproductive outcomes. Pharmacological interventions including insulin-sensitizing therapy, hormonal contraceptives, antiandrogen medications, and ovulation induction agents provide effective symptom control when individualized according to patient-specific reproductive and metabolic objectives. Recent advances in endocrinology and molecular medicine increasingly emphasize the roles of oxidative stress, inflammatory cytokines, adipokine imbalance, and gut microbiota dysregulation in disease progression. Ongoing scientific research continues to improve understanding of molecular mechanisms underlying polycystic ovary syndrome and contributes to development of targeted therapeutic approaches aimed at optimizing endocrine balance and metabolic health.

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DOI: 10.4103/aams.0498