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POLYCYSTIC OVARY SYNDROME: ITS ASSOCIATION WITH METABOLIC SYNDROME AND INSULIN RESISTANCE

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ABSTRACT

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders affecting women of reproductive age. It is characterized by hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphology. Increasing evidence suggests a strong association between PCOS, metabolic syndrome (MetS), and insulin resistance (IR). These interconnected conditions significantly increase the risk of type 2 diabetes mellitus, cardiovascular diseases, and long-term morbidity. This article aims to analyze the relationship between PCOS, metabolic syndrome, and insulin resistance by reviewing current clinical and epidemiological data. The findings highlight the importance of early screening and multidisciplinary management strategies.

Keywords: PCOS, insulin resistance, metabolic syndrome, hyperandrogenism, obesity, diabetes

INTRODUCTON

Polycystic ovary syndrome (PCOS) is a complex endocrine-metabolic disorder affecting approximately 6–15% of women worldwide. According to the World Health Organization, PCOS is a leading cause of infertility and metabolic dysfunction among women of reproductive age.

PCOS is not only a reproductive disorder but also a systemic metabolic condition. A significant proportion of women with PCOS exhibit insulin resistance (IR), regardless of body mass index (BMI). Insulin resistance plays a central role in the pathophysiology of PCOS and contributes to the development of metabolic syndrome (MetS), which includes central obesity, hypertension, dyslipidemia, and impaired glucose tolerance.

Understanding the interplay between PCOS, insulin resistance, and metabolic syndrome is crucial for effective clinical management and prevention of long-term complications.

MATERIALS AND METHODS

This study is based on a narrative review of scientific literature from databases such as PubMed, Scopus, and Web of Science.

Inclusion Criteria:

- Studies published between 2010 and 2024
- Women diagnosed with PCOS (Rotterdam criteria)
- Studies addressing insulin resistance and metabolic syndrome

Diagnostic Criteria:

- **PCOS (Rotterdam criteria):** At least two of the following:
  - Oligo/anovulation
  - Clinical or biochemical hyperandrogenism
  - Polycystic ovaries on ultrasound
- **Metabolic Syndrome (IDF criteria):**

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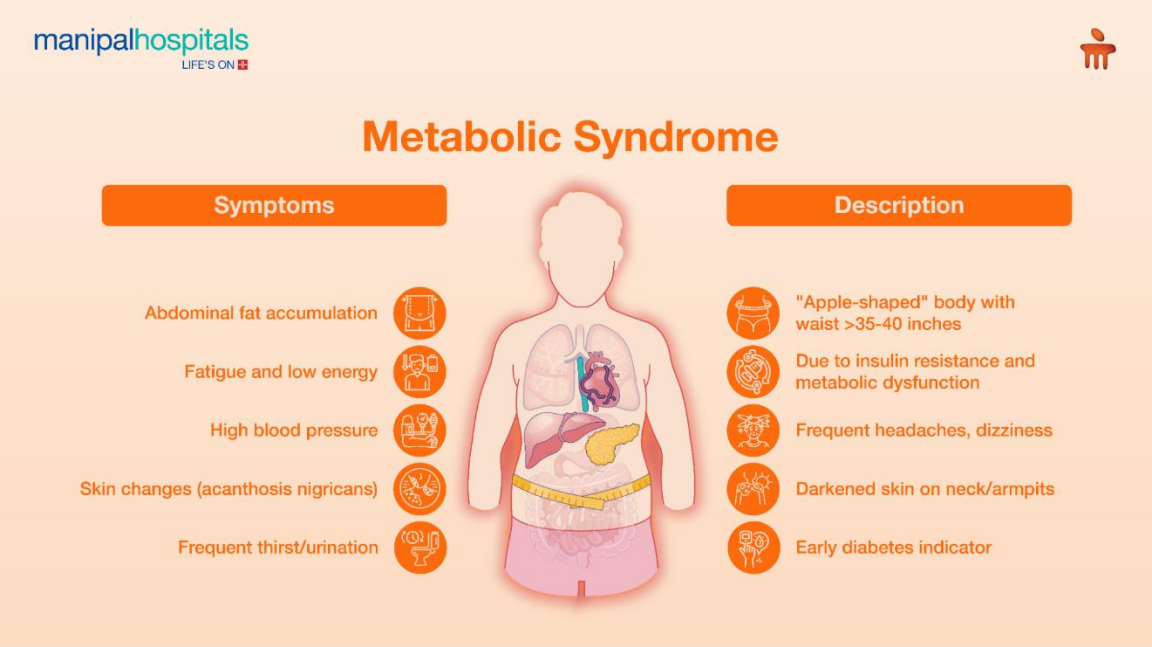
- Central obesity + at least two of the following:
  - Elevated fasting glucose
  - High triglycerides
  - Low HDL cholesterol
  - Hypertension

RESULTS

1. Prevalence of PCOS and Metabolic Syndrome

PCOS affects approximately 1 in 10 women globally. Among these:

- 50–70% exhibit insulin resistance
- 30–50% develop metabolic syndrome



2. Insulin Resistance in PCOS

Insulin resistance is a hallmark feature of PCOS and occurs independently of obesity.

Mechanisms:

- Defects in insulin receptor signaling
- Post-receptor signaling abnormalities
- Increased serine phosphorylation

Hyperinsulinemia leads to:

- Increased ovarian androgen production
- Decreased sex hormone-binding globulin (SHBG)
- Exacerbation of hyperandrogenism

3. Metabolic Syndrome in PCOS

Women with PCOS are at significantly higher risk of developing metabolic syndrome.

Key Components:

- Central obesity
- Dyslipidemia (↑ triglycerides, ↓ HDL)
- Hypertension
- Impaired glucose tolerance

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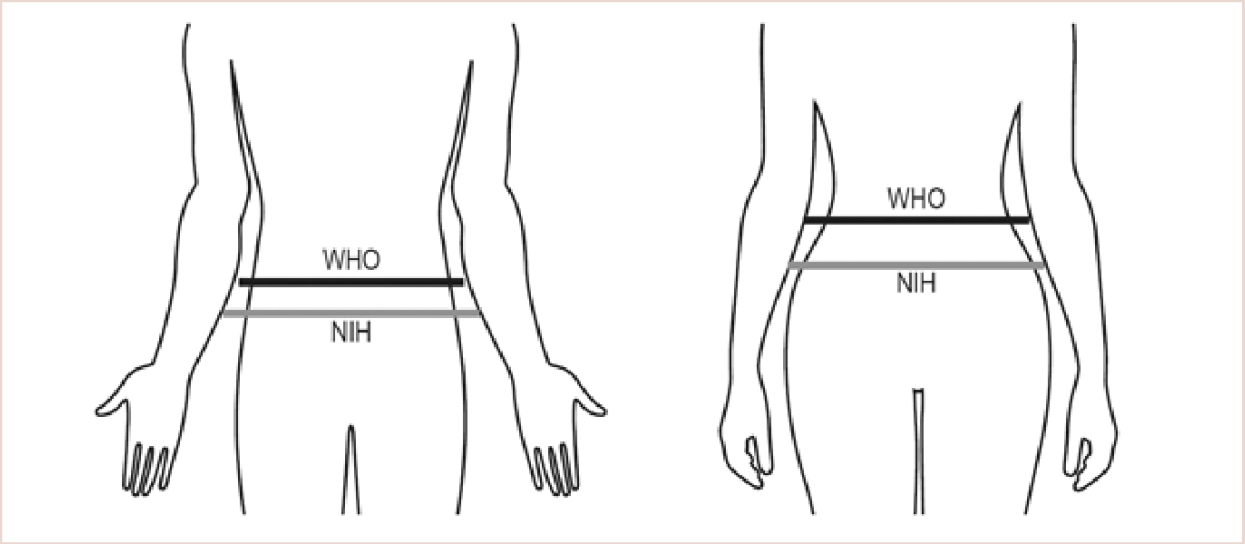

Figure 1: Waist circumference measurement sites for men and women based on World Health Organization (WHO) and National Institutes of Health (NIH) protocols[14]
Note: Following the WHO protocol, measure is taken midway between the highest point of the iliac crest and the bottom of the ribcage. Following the NIH protocol, the measure is taken at the highest point of the iliac crest.

LIPID PROFILE

	DESIRABLE	BORDERLINE	HIGH RISK
Cholesterol	<200 mg/dl	200-239 mg/dl	240 mg/dl
Triglycerides	<150 mg/dl	150-199 mg/dl	200-499 mg/dl
HDL cholesterol	60 mg/dl	35-45 mg/dl	<35 mg/dl
LDL cholesterol	60-130 mg/dl	130-159 mg/dl	160-189 mg/dl
Cholesterol/ HDL ratio	4.0	5.0	6.0

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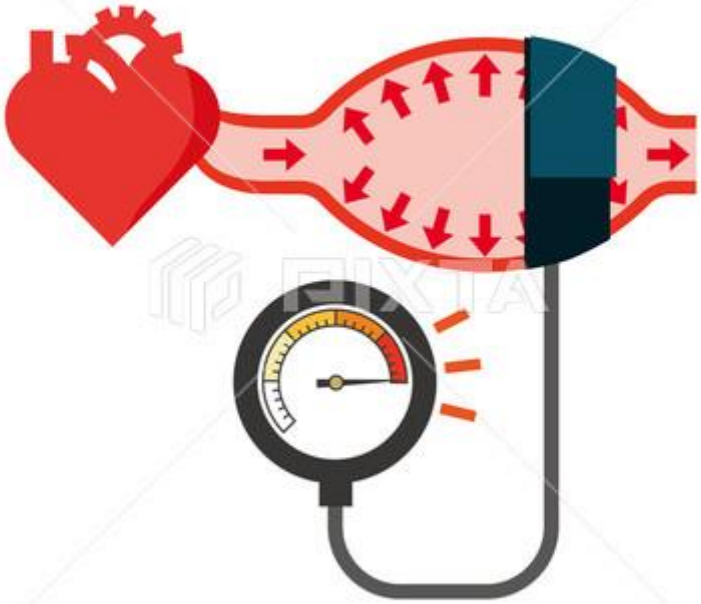

4. Pathophysiological Link

The relationship between PCOS, insulin resistance, and metabolic syndrome is bidirectional:

- Insulin resistance → hyperinsulinemia → ovarian androgen excess
- Androgen excess → visceral fat accumulation → worsened insulin resistance
- Chronic inflammation → endothelial dysfunction

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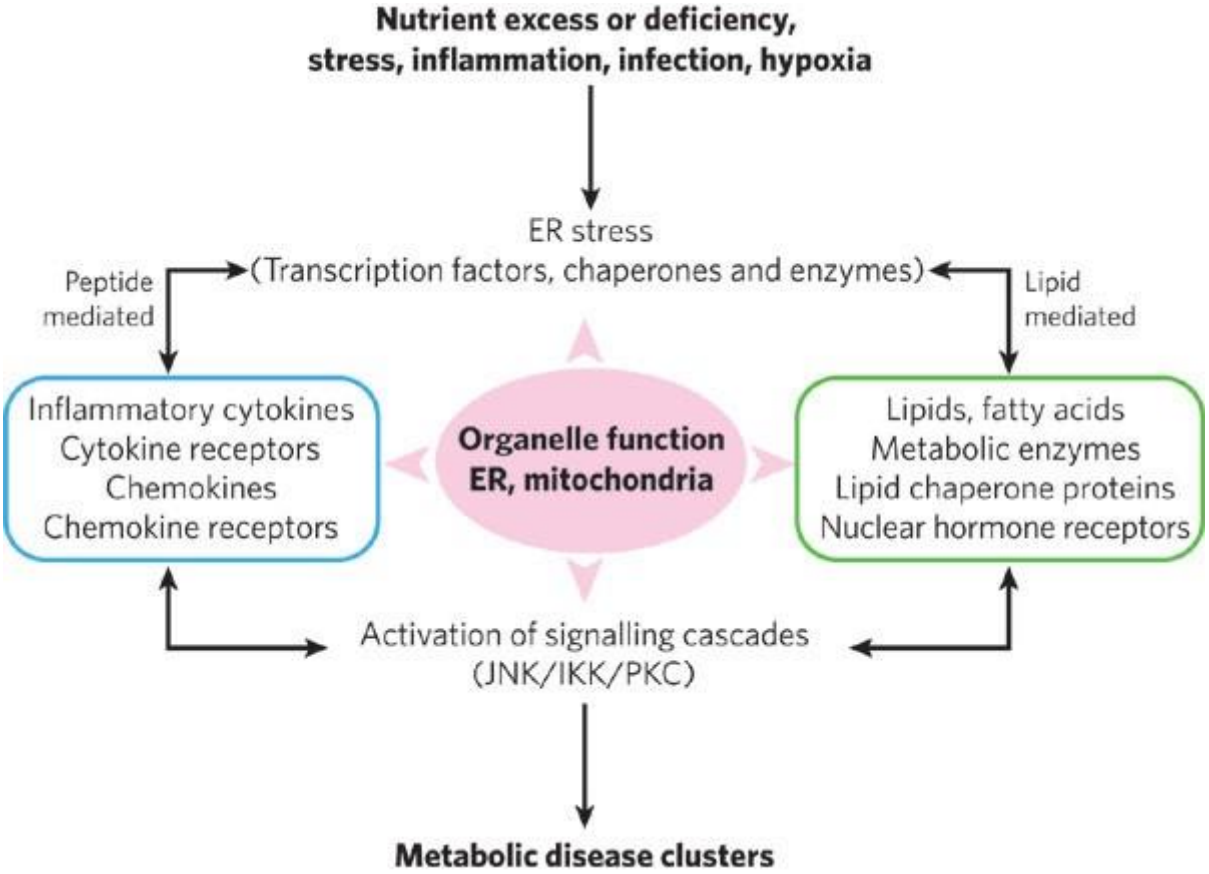

5. Clinical Manifestations

Reproductive:

- Irregular menstruation
- Infertility
- Polycystic ovaries

Metabolic:

- Obesity
- Acanthosis nigricans
- Impaired glucose tolerance

Long-term risks:

- Type 2 diabetes mellitus
- Cardiovascular disease
- Endometrial hyperplasia

DISCUSSION

The association between PCOS, insulin resistance, and metabolic syndrome represents a major clinical challenge. Insulin resistance is not only a metabolic abnormality but also a driver of reproductive dysfunction in PCOS.

Early screening is essential, especially in adolescents and young women. Diagnostic tools include:

- Oral glucose tolerance test (OGTT)
- Fasting insulin and glucose levels
- Lipid profile

Management strategies:

- Lifestyle modification (diet + physical activity)
- Insulin sensitizers (e.g., Metformin)

- Hormonal therapy (oral contraceptives)
- Weight reduction

Multidisciplinary care involving endocrinologists, gynecologists, and nutritionists is recommended.

CONCLUSION

PCOS is a multifactorial disorder strongly associated with insulin resistance and metabolic syndrome. These interrelated conditions significantly increase the risk of long-term metabolic and cardiovascular complications. Early diagnosis, lifestyle interventions, and targeted pharmacological treatment are essential for improving patient outcomes.

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