

# Correlation Of Visceral Adiposity Index (Vai) & Hirsutism As A Predictor Of Metabolic Consequences In Poly Cystic Ovarian Syndrome

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## Abstract

Poly Cystic Ovarian Syndrome (PCOS) is one of the most common reproductive and metabolic disorders among women of reproductive age. Women suffering from PCOS present with an array of symptoms connected with menstrual dysfunction and androgen excess, which significantly impacts their health well being. PCOS women are likely to be at increased risk of multiple co-morbidities, including insulin resistance, obesity and cardiovascular disease (CVD), type II diabetes mellitus, infertility and psychological illness. The most commonly exhibited problems noticed in PCOS is menstrual cycle disturbances (oligo/amenorrhea), hirsutism, infertility, dyslipidemia and metabolic disturbances due to insulin resistance (IR). Obesity, in particular visceral obesity, is associated with an increased risk of metabolic diseases, such as cardiovascular disease, pre-diabetes and type 2 diabetes (dysglycemia), hypertension and dyslipidemia. Cardio-metabolic diseases are the global leading causes of death and represent a significant economic burden on health systems. The pressure to search for and use new effective preventive tools increases and given the current epidemiological situation, as these diseases are to a large extent preventable. This review is an attempt to correlate the visceral adiposity index (VAI) & hirsutism in predicting metabolic consequences in PCOS.

## INTRODUCTION:

Polycystic ovarian syndrome (PCOS) was first described in the year 1935 by Stein and Leventhal in the form of a report named "Amenorrhoea associated with polycystic ovaries," which from then on, has led to a surfeit of research in the field of medicine (1). Polycystic ovarian syndrome (PCOS) is one of the most common endocrine disorder affecting females of reproductive age in today's world. Globally, the prevalence of PCOS is estimated to be between 5.5% and 12.6% in women in the age group of 17–45 years (2). In India, the prevalence estimates are between 8.2% and 22.5% depending on the diagnostic criteria used (3).

## DIAGNOSTIC CRITERIA FOR PCOS (4)

| <u>1990 NIH CRITERIA</u> | <u>REVISED/ROTTERDAM 2003 CRITERIA</u> | <u>ANDROGEN EXCESS-PCOS CRITERIA</u>                  |
|--------------------------|--|---|
| Chronic anovulation      | Oligo/anovulation                      | Clinical and/or biochemical signs of hyperandrogenism |

|   |   |   |
|---|---|---|
| Clinical and/or biochemical signs of hyperandrogenism                                       | Clinical and/or biochemical signs of hyperandrogenism<br><br>Polycystic ovarian morphology in the absence of a dominant follicle > 20mm | Ovarian dysfunction (defined by Oligo/anovulation or polycystic morphology or both) |
| Both criteria needed  | 2 of 3 criteria needed  | Both criteria needed  |
| <b>Note:</b> All three require the exclusion of other endocrinopathies.                     |   |   |
| <b>Abbreviations:</b> PCOS: Polycystic ovarian syndrome; NIH: National Institutes of Health |   |   |

## PATHOPHYSIOLOGY OF PCOS:

PCOS is complex disease with a largely unknown pathophysiology. Environmental and genetic contributors to hormonal disturbances combine with other factors including ovarian dysfunction, obesity and hypothalamic pituitary abnormalities to contribute to the etiology of PCOS. In spite of the fact that the etiology of PCOS is unclear, evidence suggests that insulin resistance (IR), with or without compensatory hyperinsulinemia, contributes to inhibit liver sex hormone-binding globulin (SHBG) production and to stimulate ovarian/adrenal androgen secretion (7,8). There has been much attention paid to PCOS dysmetabolic aspect in recent years. Several features of metabolic disturbances, particularly insulin resistance and hyperinsulinemia, have been observed in most women with PCOS. Therefore, overweight and/or obesity (specifically, enlarged visceral fat) are very common in PCOS women, thus indicating that some PCOS and metabolic syndrome (MS) female phenotypes share common characteristics (9, 10). In around 60% to 80% of PCOS cases, hyperandrogenism & insulin resistance is well established contributor to PCOS etiology (11).

## METABOLIC FEATURES OF PCOS:

In PCOS specific abnormalities of insulin metabolism identified includes reductions in secretion [12,13], reduced hepatic extraction [13], impaired suppression of hepatic gluconeogenesis [14] and abnormalities in insulin receptor signaling [15]. There's a paradoxical expression of insulin resistance in PCOS whereby insulin-stimulated androgen production persists while its role in glucose metabolism is impaired [15]. As a result, insulin resistance in PCOS leads to hyperinsulinaemia, which affects lipid metabolism, protein synthesis and modulation of androgen production in diverse ways. In comparison with weight-matched controls, lean women with PCOS often, but not always, have abnormal insulin secretion and action. Where a lady with PCOS is overweight, can also demonstrate extrinsic insulin resistance associated with adiposity, which is potentially mechanistically distinct from the insulin resistance present in lean women with PCOS [14].

## VISCERAL ADIPOSITY INDEX (VAI):

Obesity, particularly visceral obesity, is related to an increased risk of metabolic diseases, like pre-diabetes, type 2 diabetes dyslipidemia, hypertension, and cardiovascular diseases (16). Metabolic syndrome (MetS) may be a cluster of clinical, metabolic, and biochemical abnormalities, like central adiposity, hypertension, hyperglycemia, and dyslipidemias (17, 18). Several studies have proved that ladies with PCOS have an increased tendency of developing obesity, especially visceral obesity and lipid abnormalities during reproductive age (19, 20, 21). Adiposity features a significant role in maintaining and generating PCOS (22). Body mass index (BMI) assesses the entire obesity of PCOS patients, but BMI cannot estimate abdominal fat distribution (23). Visceral fat (VAT), plays a critical role within the pathogenesis of MetS. Anthropometric indices like body mass index (BMI), waist-to-height ratio (WHtR), and waist circumference (WC) are used to quantify VAT. indices which combined anthropometric also as biochemical indices

(i.e., TG, HDL-C) showed better predictive accuracy compared to single parameters like laboratory tests, BMI, WHtR, and WC. Visceral adiposity index (VAI) is introduced as a combined, simple, and novel sex-specific indicator of VAT that's calculated using anthropometric (BMI and WC) and laboratory (TG and HDL-C) measures. VAI is related to insulin resistance, type 2 DM, cardiovascular diseases, and MetS (24, 25, 26). VAI increases significantly with a growing number of present MetS components; thus, demonstrating the power of VAI to reflect a level of the metabolic disorder connected with MetS (26).

## HIRSUTISM:

Hirsutism in women is defined as excessive hair growth in androgen-dependent areas (27). Hirsutism results from an interaction between androgen and hair follicle sensitivity to this sex hormone (28). Idiopathic hirsutism is the most common form, but the condition can be associated with PCOS or medication (28, 29). Hirsutism is associated with IR and increased prevalence of impaired glucose tolerance in obese patients & may be associated with the elevated risk of IR, cardiovascular diseases, and subsequent potentiality of metabolic disorders (29). Few studies have shown that insulin/IGF plays a role in stimulating hair follicle growth acting together with androgens. Insulin/IGF system in IH has a mitogenic effect on hair follicles, resulting in cell growth in the pilosebaceous unit (PSU) in response to high insulin levels; increased 5 $\alpha$  reductase activity, promoting conversion of testosterone to dihydrotestosterone in hair follicles; and androgen receptor gene polymorphism, with increased sensitivity of PSU to the circulating androgens (30, 31).

## CONCLUSION:

In women with PCOS, there is a high prevalence of MetS, and metabolic surveillance should be considered to reduce potential complications. From the above discussion it is observed that PCOS women with visceral obesity & hirsutism, is associated with an increased risk of metabolic diseases, such as pre-diabetes, type 2 diabetes dyslipidemia, hypertension, and cardiovascular diseases as it associated with IR and increased prevalence of impaired glucose tolerance. In women with PCOS, VAI & pattern of hirsutism can serve as simple and effective tools for assessing metabolic risks, but further studies are required to extrapolate the index's use in clinical management.

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