

# To Study the Levels of Insulin Resistance in Polycystic Ovary Syndrome

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**Abstract:** *The aim of study was to measure level of HOMA-IR in Polycystic ovary syndrome (PCOS) and compare with healthy control subjects. In this study 85 PCOS and 85 healthy subjects (age and gender matched) were enrolled. BMI and HOMA-IR were assessed. HOMA-IR levels were higher in PCOS subjects compared with healthy controls ( $3.0 \pm 0.8$  vs  $1.7 \pm 0.7$ , respectively,  $P < 0.0001$ ). Increased HOMA-IR levels in PCOS other than healthy subject.*

**Keywords:** HOMA-IR, PCOS

## 1. Introduction

Polycystic ovary syndrome (PCOS) is a common endocrine disorder in females, especially in women of reproductive age. PCOS could be diagnosed by infertility, acne, amenorrhea or oligomenorrhea, hirsutism, insulin resistance, obesity, hyperandrogenism, and polycystic ovaries by ultrasonography. Association of PCOS with infertility is well studied and is thought to be responsible for 40% of female infertility [Muhammad Jaseem Khan et al. 2019]. Excess luteinizing hormone (LH) and low follicle stimulating hormone (FSH) are also common in PCOS. Irregular or absence of menstrual cycle, increased levels of male hormones.

Insulin resistance means the body's tissues are resistant to the effects of insulin i.e. to move glucose from blood to cells, where it is broken down to produce energy. Therefore the body has to produce extra insulin to persuade fat and muscle cells to take up glucose and the liver to continue to store it. Many studies have proved that insulin directly stimulates ovarian steroidogenesis at the level of theca cells, along with LH. This co-gonadotropic effect contributes to the PCOS hyperandrogenism. Furthermore insulin decreases the sex hormone binding globulin (SHBG) levels by decreasing the liver synthesis, raising the level of free testosterone, which interferes with development of follicles and prevent normal ovulation. Insulin resistance can also lead to weight gain, which can make PCOS symptoms worse, as having excess fat causes the body to produce even more insulin.

The most evident neuroendocrine feature regulating abnormal ovarian follicle development in PCOS is increased luteinizing hormone (LH) pulsatility regarding both frequency and amplitude, with relatively low FSH secretion [R. Reber et al. 1976, A. P. Cheung et al. 1997]. Increased

LH pulse frequency increases theca cell production of androgens, while the lower FSH level impairs follicle maturation and consequently ovulation [C.M. Burt et al. 2012]. The cause of LH hypersecretion in PCOS is probably due to enhanced pituitary sensitivity to gonadotropin releasing hormone (GnRH) or to changes in GnRH secretion patterns rather than increased GnRH secretion [K. Patel et al. 2004].

Although there are many evidences linking insulin resistance and PCOS. Data about insulin resistance concentration in PCOS is limited. Therefore, present study was undertaken to evaluate insulin resistance levels in patients with PCOS and to compare it with healthy controls.

## 2. Materials & Methods

The present study has been conducted on 85 diagnosed PCOS patients (According to Rotterdam PCOS Consensus Criteria) admitted or attending out-patient department of Janana Hospital, Ajmer. 85 healthy subjects of similar age group and BMI has been included in the study as control group. Anthropometric parameters and other variables i.e. Age, Weight, Height, Body mass index (BMI), Serum Glucose, Serum Insulin and HOMA-IR were measured. Venous blood sample was collected by aseptic technique and serum samples were separated into labelled tubes. Serum samples were kept frozen until assayed. Blood samples were obtained during the early follicular phase of menstrual cycle after at least 10 hours of fasting.

## 3. Results and Observation

In this study, 85 cases of PCOS were compared with 85 healthy controls.

**Table 1:** Anthropometric parameters of PCOS subjects & Healthy controls

Parameters	PCOS Cases (Mean ± SD)	Healthy Controls (Mean ± SD)
AGE (yrs)	31.60 ± 6.4	30.4 ± 5.2
WEIGHT (kg)	69 ± 19	71 ± 17
HEIGHT (cm)	160 ± 1.7	170 ± 1.6
BMI (kg/m <sup>2</sup> )	26.7 ± 6.6	24.4 ± 6.6

**Table 2:** Biochemical parameters of PCOS subjects & Healthy subjects

Parameters	PCOS Cases (Mean ± SD)	Healthy Controls (Mean ± SD)	P-Value
Fasting serum Glucose (mg/dl)	91.3 ± 7.5	83.5 ± 6.4	<0.0001 (HS)
Serum Insulin(μU/ml)	13.1 ± 3.6	8.2 ± 2.2	<0.0001 (HS)
HOMA-IR(n)	3.0 ± 0.8	1.7 ± 0.7	<0.0001 (HS)

P value <0.0001 is considered highly significant while p<0.01 is considered significant

Basic anthropometric parameters of PCOS subjects and healthy subjects are summarized in table-1. There was no significant difference between PCOS subjects and healthy subjects regarding mean age (31.60 ± 6.4 vs 30.4 ± 5.2 yrs). BMI mean ± SD in kg/m<sup>2</sup> in PCOS and healthy subjects was (26.7 ± 6.6 vs. 24.4 ± 6.6) and it was highly significant. Biochemical parameters of PCOS subjects and healthy subjects are presented in table-2. PCOS subjects had higher levels of HOMA-IR compared to healthy subjects (3.0 ± 0.8 vs 1.7 ± 0.7, P<0.0001).

#### 4. Discussion

In the present study, PCOS subjects have significantly higher levels of HOMA-IR as compared to healthy control subjects. A number of articles have reported increased levels of HOMA-IR in PCOS but PCOS subjects have not been studied extensively to know whether the increase in the HOMA-IR levels begin before the onset of PCOS. Our result was consistent with previous research which claimed the tendency of increasing level of HOMA-IR levels in PCOS women. Study done by Amar Nagesh Kumar et al. 2015 found that serum insulin and HOMA IR in PCOS patients is increased when compared with controls and is highly significant (p < 0.0001) and this is in accordance with the studies of Naidu J N et al. 2013, Dunaif et al. 1989. Insulin increases intra ovarian androgens, disrupts normal follicular genesis, resulting in the development of multiple ovarian cysts and ovarian enlargement. Results of this study suggest that HOMA-IR are increased in patients with PCOS.

#### 5. Limitations of Study

Our sample size was relatively small.

#### 6. Acknowledgements

NIL

#### 7. Conflicts of Interest

We have no competing interests.

#### 8. Funding

NIL

#### 9. Conclusion

From the present study it is concluded that HOMA-IR levels gets increased prior to onset of PCOS. Moreover the relation between the Insulin Resistance and both metabolic and hormonal changes may act as a major player in the link between the metabolic syndrome and the PCOS. It could be considered among therapeutic agents used in the prevention of PCOS and in the prevention or reduction of its critical complications.

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