PARIPEX - INDIAN JOURNAL OF RESEARCH | Volume - 11 | Issue - 07 | July - 2022 | PRINT ISSN No. 2250 - 1991 | DOI : 10.36106/paripex

# ORIGINAL RESEARCH PAPER

# **BIOCHEMICAL PARAMETERS IN PATIENTS** WITH POLYCYSTIC ORARIAN SYNDROME

**KEY WORDS:** PCOS, Lipid profile, Homa IR index, Obesity

**Biochemistry** 

P. A. Waghmare	Ph D student, Department of Biochemistry, Government Medical College, Miraj
K. N. Pujari*	Professor and HOD, Department of Biochemistry, Government Medical College, Miraj *Corresponding Author
S. P. Jadkar	Assistant professor, Department of Biochemistry, Government Medical College, Miraj.
Balaji B.R.	$PG\ student, Department\ of\ Biochemistry, Government\ Medical\ College, Miraj$

Polycystic ovarian syndrome (PCOS) is a most common endocrine condition affecting women of reproductive age group. It is one of the primary causes of infertility in women. It is characterized by ovarian dysfunction, anovulation andhyperanderogenism. Obesity and insulin resistance in PCOS increases the risk of cardiovascular disease and atheriosclerosis. In this study, we have estimated serum leptin and irisin levels in PCOS patients and its correlation with lipid profile and homa IR index. These parameters were estimated by enzymatic linked immuno assay, direct method, CHOD-POD, GPO trinder method. In this study, We found significant increase in serum leptin, irisin, fasting blood sugar, homa IR index, total cholesterol, LDL cholesterol and triglycerides levels in casescompared to controls, whereas significant decrease of HDL cholestrol level in cases as compared to controls.Significant negative correlation between serum leptin and HDL cholesterol was noted. We have concluded that assessment of serum leptin, irisin levels and lipid profile might help in early prediction of cardiovascular complications of PCOS and its management.

#### **INTRODUCTION:**

Polycystic ovarian syndrome (PCOS) is a heterogenous endocrine disorderlinked withanovulation, excess androgen activity and polycystic ovaries. It is associated with various conditions such as type 2 diabetes mellitus, obesity, cardiovascular diseases and endometrial cancer. Around 5 -10 % of females in reproductive age group are affected by PCOS<sup>1</sup>.

The complex pathophysiology of PCOS involves abnormal hypothalamic-pituitary-gonadal axis, neuroedndocrine alterations, genetic and epigenetic interactions and endocrine-metabolic modifiers. However, the exact etiology and pathology of the disease is unknown<sup>2</sup>.

Leptin is a peptide hormone secreted by adipose tissue. It regulates energy homeostasis, neuroendocrine function and metabolism. It is directly linked with obesity and insulin resistance<sup>3</sup>.

Irisin is a newly identified myokine which act like adipokines and is associated with the insulin resistance and metabolic syndrome. Irisin conducts many downstream events including osteoblast differentiation, nerve cell and b-cell regeneration and so on. Higher irisin levels are reported to be associated with BMI and adipose tissue mass<sup>4</sup>.

Dyslipidemiapattern is common in PCOS. It characterized by higher triglycerides, total cholesterol LDL cholestrol and lower HDL cholesterol levels. Dyslipidemia in PCOS has multifactorial causation and occurs independent of body mass index (BMI). However the deleterious effect of obesity and insulin resistance in PCOS has increased the risk of cardiovascular diseases<sup>§</sup>.

In this study, we have estimated serum leptin and irisin levels in PCOS patients and its correlation with lipid profile and homa IR index. It contributes to the knowledge of leptin and irisin in PCOS and its association with obesity and insulin resistance.

#### MATERIALS AND METHODS:

Present study was conducted in Department of Biochemsitry, Government Medical college Miraj and Patwardan's Endocrine Research Center, Miraj. Ethical committee www.worldwidejournals.com approval was obtained from GMC, Miraj. Total 270 subjects were included in this study. This includes 135 patients and 135 controls. In this study, we have estimated Serium Irisin and Leptin by Elisa method and Fasting Plasma glucose, Total Cholesterol, High density lipoprotein (HDL), Low density lipoprotein (LDL) and Triglycerides (TG) on XL-640 Fully automated Biochemistry Analyzer. Insulin resistance by homeostatic model assessment (HOMA-IR). All data were analysed by statistical software Epi and STATA. Significance of difference was assessed by Independent Sample T test and correlation was evaluated using Pearson's correlation coefficient.

#### DISCUSSION:

Polycystic ovary syndrome includes a spectrum of diseases that are associated wth polycystic ovaries, irregular mensturation, hyperandrogenism which leads to infertility. There is evidence that PCOS may be the result of metabolic disorders including insulin resistance and obesity. Risk of cardiovascular diseases is increasing in PCOS<sup>6</sup>.

The mean value of serum leptin and irsin in cases were  $1.13 \pm 0.4$  and  $1.44 \pm 0.26$  and in controls were  $0.28 \pm 0.06$  and  $0.31 \pm 0.07$  respectively. The mean value of fasting blood sugar and homa IR index in cases were  $93.11 \pm 18.43$  and  $6.20 \pm 0.98$  and in controls were  $78.39 \pm 6.83$  and  $2.82 \pm 0.50$  respectively.

Where as the mean serum level of total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides in cases were 232.89  $\pm$  19.65, 36.26  $\pm$  6.10, 130.66  $\pm$  5.58 and 126.67  $\pm$  12.81 and in controls were 161.76  $\pm$  20.45, 56.72  $\pm$  5.78, 96.96  $\pm$  9.74 and 85.77  $\pm$  6.1.

We found significant increase (p < 0.001) in serum leptin, irisin, fasting blood sugar, homa IR index, total cholesterol, LDL cholesterol and triglycerides and decreased level of HDL cholesterol in cases compared to controls.

Leptin, a product of OB gene, is secreted primarily in adipose tissue. It plays an important role in regulation of energy homeostasis. It decreases appetite and induces weight loss. It seems to be directly related to obesity<sup>6</sup>.

Jalilian et al  $\degree$  , Chakrabarti J et al  $^7$ , Obirikorang et al  $\degree$  in their studies observed Higher serum leptin in the PCOS group

## PARIPEX - INDIAN JOURNAL OF RESEARCH | Volume - 11 | Issue - 07 | July - 2022 | PRINT ISSN No. 2250 - 1991 | DOI : 10.36106/paripex

compared to controls. Thus, high serum leptin levels in PCOS might be possibly linked to obesity and leptin resistance.

Irisin, a newly discovered muscle-derived brown adiposedifferentiation factor. It also conducts many downstream events including osteoblast differentiation, nerve cell and bcell regeneration<sup>9</sup>.

Li et al<sup>9</sup>, Park et al<sup>10</sup> demonstrated that irisin levels were significantly higher in PCOS subjects than in controls. Irisin level in PCOS might be elevated due altered metabolic status which includes elevated LH, hyperandrogenidsm, inceased body weight, irisin resistance and insulin resistance.

Insulin resistance and the consequent development of hyperinsulinemia seem to be an important pathophy siological mechanism that links PCOS to its concurrent metabolic derangements. Increased Homa IR index, hyperinsulinemia with increased fasting glucose levels occurs in 70-95 % of people with obese PCOS. This occurrence is due to alterations in  $\beta$ -cell function which causes frank diabetes in women with PCOS<sup>11</sup>.

In our study, a significant negative correlation (r = - 0.22, p < 0.009) between serum leptin and HDL cholesterol was observed. Hui Zuo et al <sup>12</sup> demonstrated an inverse relationship between leptin and HDL cholesterol. This is because leptin promotes hepatic clearance of HDL by upregulating its scavenger receptors.

In my study due to polycysticovary and alternation in lipid metabolism total cholestol increased and there is increase in triglyceride due accumulation of triacylglycerol and decreased in clearnce. Increased in hyperandrogen which affect Lipid metabolism and due to induction of hepatic lipase enzyme catabolism activity of HDL dicreases.Due to insulin resistance more catabolism of HDL particles and formation of LDL particls seen in my study.

Results of studies by Dunaif et al <sup>13</sup> Robert et al <sup>14</sup>, Sonali S Patel <sup>15</sup>showed Higher serum lipids except HDL cholestrol (total cholesterol, LDL, triglycerides) in PCOS patients.Compared to healthy persons whereas the level of HDL was noted to be lower in PCOS than healthy persons. Increased secretion of apolipoprotein B100 secretion and VLDL particles by the liver results in elevated plasma triglycerides concentration <sup>16</sup>. Alterated lipid metabolism, increased lipogenesis, decreased fatty acid oxidation leads to increased levels of total cholesterol, LDL and triglycerides in patients with PCOS. It increases the risk of atherosclerosis leading to cardiova scular complications in PCOS<sup>17</sup>.

HDL cholesterol level may be decreased in PCOS due to hyperandrogenism. It induces hepatic lipase enzyme which has a role in catabolism of HDL <sup>18</sup>. Serum Amyloid A aproinflammatory molecule is associated with HDL lipoprotein and makes it dysfunctional. Insulin resistance also leads to the catabolism of HDL particles and formation of LDL particles. Cholesterol ester transfer protein may also contribute for this <sup>19</sup>.

Altered lipid profile, adiposity, insulin resistance may contribute to atherosclerosis and cardio-vascular diseases. Thus PCOS patients should be screened and monitored regularly, to prevent complications associated with cardiovascular diseases.

#### **CONCLUSION:**

The study concluse the women with pcosscreened for Lipid profils which ishelpful in assessing the risk of coronary artery disease.bycounslingand Dietatory modification reduce PCOS.

#### **OBSERVATIONS AND RESULTS:**

50

#### Table 1: Comparison of study parameters in subjects

Parameters	Cases (n=135) Mean±SD	Controls (n=135) Mean ±SD	p value				
Serum Leptin	$1.13 \pm 0.4$	$0.28 \pm 0.06$	0.0001				
(ng/mL)							
Serum Irisin (ng/mL)	$1.44 \pm 0.26$	$0.31 \pm 0.07$	0.0001				
Fasting Blood Sugar	93.11 ± 18.43	78.39 ± 6.83	0.0035				
(mg/dl)							
Homa IR index	$6.20 \pm 0.98$	$2.82 \pm 0.50$	0.0001				
Total Cholesterol	232.89 ± 19.65 161.76 ±		0.0001				
(mg/dl)		20.45					
HDL Cholesterol	36.26 ± 6.10	$56.72 \pm 5.78$	0.0001				
(mg/dl)							
LDL Cholesterol	130.66 ± 5.58	$96.96 \pm 9.74$	0.0001				
(mg/dl)							
Serum triglycerides	126.67 ± 12.81	$85.77 \pm 6.1$	0.0001				
(mg/dl)							
m < 0.001 Highly significant $m < 0.05$ Statistically							

p < 0.001 – Highly significant, p < 0.05 – Statistically significant

There is a significant increase (p < 0.001) in serum leptin, irisin, fasting blood sugar, homa IR index, total cholesterol, LDL cholesterol and triglycerides in cases as compared to controls whereas there is significant decrease(p < 0.001in HDL Cholesterol in cases as compared to controls.

#### Table 2: Correlation of Serum Irisin and Leptin with Biochemical parameters in Pcos

Parameters	Serum leptin (ng/mL)	Serum Irisin (ng/mL)		
	r value	p value	r value	p value
Fasting Blood Sugar	0.07	0.43	-0.11	0.20
Homa IR index	0.05	0.54	0.16	0.06
Total Cholesterol	-0.10	0.24	0.01	0.95
HDL Cholesterol	-0.22	0.009	0.07	0.39
LDL Cholesterol	0.06	0.49	-0.14	0.094
Serum triglycerides	0.10	0.25	-0.07	0.41

A significant negative correlation was found (r = - 0.22, p < 0.009) between serum leptin and HDL cholesterol .



(r = -0.22, p < 0.009) between serum leptin and HDL cholesterol was observed.

# Graph No 1: Correlation between S. Leptin and HDL cholesterol in Study group

#### **REFERENCES:**

- Richard S. Legro, Silva A. Arslanian, David A. Ehrmann, Kathleen M. Hoeger et al. Diagnosis and Treatment of Polycystic Ovary Syndrome: An Endocrine Society Clinical Practice Guideline 2013. J Clin Endocrinol Metab 98: 4565–4592.
- Witchel S.F., E Oberfield, S., Peria A.S. Polycystic Ovary Syndrome: Pathophysiology, Presentation, and Treatment With Emphasis on Adolescent Girls. J.Endocr Soc. 2019,3, 1545–1573.
- Mukhtiar Baig, RehanaRehman, Saba Tariq, and Syeda Sadia Fatima. Serum Leptin Levels in Polycystic Ovary Syndrome and Its Relationship with Metabolic and Hormonal Profile in Pakistani Females. International Journal of Endocrinology. 2014, 132908,5.
- Pontus Boström, Jun Wu, Mark P. Jedrychowski, Anisha Korde et al. A PGC1αdependent myokine that drives browning of white fat and thermogenesis

### PARIPEX - INDIAN JOURNAL OF RESEARCH | Volume - 11 | Issue - 07 | July - 2022 | PRINT ISSN No. 2250 - 1991 | DOI : 10.36106/paripex

#### Nature 2012 481, 463–468.

- Alexander CJ, Tangchitnob EP, Lepor NE. Polycystic ovary syndrome: a major unrecognized cardiovascular risk factor in women. Rev Obstet Gynecol. 2009;2(4):232-239.
- Jalilian N, Haghnazari L, Rasolinia S. Leptin and body mass index in polycystic ovary syndrome. Indian J Endocrinology Metab 2016;20:324-8
- Chakrabarti J. Serum Leptin Level in Women with Polycystic Ovary Syndrome: Correlation with Adiposity, Insulin, and Circulating Testosterone. Annals of Medical and Health Sciences Research. 2013;3.
- Obirikorang C. Assessing the variability and predictability of adipokines (adiponectin, leptin, resistin and their ratios) in non-obese and obese women with anovulatory polycystic ovary syndrome.BMCreaserch note 2019 :12(1),1-8.
- Li.M., Yang, M., Zhou, X., Fang, X. et al. Elevated circulatinglevels of irisin and the effect of metformin treatment in women withpolycystic ovary syndrome. J. Clin. Endocrinol. Metab. 2015. 100, 1485–1493.
- Park KH, Zaichenko L, Brinkoetter M. Circulating irisin in relation to insulin resistance and the metabolic syndrome. J ClinEndocrinolMetab 2013; 98: 4899-907.
- Corbould A, Kim YB, Youngren JF, Pender C et al. Insulin resistance in the skeletal muscle of women with PCOS involves intrinsic and acquired defects in insulin signaling. Am J Physiol Endocrinol Metab. 2005;288(5):E1047-54.
- Hui Zuo, Zumin Shi, Baojun Yuan, Yue Dai et al. Association between Serum Leptin Concentrations and Insulin Resistance: A Population-Based Study from China. Annuary. 2013:8, 1-54615.
- Dunaif. A.Insulin resistance and the polycystic ovary syndrome mechanism and implication for pathogenesis Endocrine rev. 1997;25(1):98–105.
- Robert A. Lipid in polycystic ovary syndrome :systematic review and meta analysis 2011;86:1206–11.
- Sonali S Patel, Uyen Truong, Martina King, Annie Ferland et al. Obese adolescents with polycystic ovarian syndrome have .elevated cardiovascular disease risk markers. Vascular Medicine 2017, Vol. 22.2.85–95.
- Orio A. Lipid profile in nonobese pregnant women with polycystic ovary syndrome :a prospective controlled clinical study.2014;steroid 88,36-43.
- Erel CT. Leptin level regulated by thyroid function, lipid metabolism and insulin resistance in polycystic ovary syndrome.Gynecological endocrinology 2003:17(3)223-229.
- Lambrinoudaki I, Christodoulakos G, Rizos D, Economou E et al. Endogenous sex hormones and risk factors for atherosclerosis in health Greek post menopausal women. Eur J. Endocrinol 2006; 154(6):907-16.
- Taskinen M. LDL-cholesterol, HDL-cholesterol or triglycerides: which is the culprit? Diabetes Res ClinPract 2003;61(1):19-26.