

A Study on Clinico: Biochemical Correlation Between Polycystic Ovarian Syndrome, Dyslipidemia and Insulin Resistance

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ABSTRACT:

Polycystic Ovary Syndrome (PCOS) has been recognized as an endocrine disease with reproductive and metabolic disturbances and present in 5 to 10% of reproductive age women. PCOS are multifactorial and polygenic. Hyperinsulinemia or Insulin resistance is key pathogenic factors in PCOS women and leads to hyperglycemia that characterized by metabolic disorders involves lipids, carbohydrates, proteins metabolism and reproductive abnormalities. Insulin resistance, hyperglycemia and dyslipidemia are markers of abnormal vascular function which causes increased risk of diabetes and cardiovascular disease in PCOS women. The purpose of this study was to estimate insulin level and its impact on fasting glucose level, lipid profile in PCOS and PCOS related complications.

Study was carried out in M.G.M. Medical college, Govt. Holkar Science college and K.R.G's Blessed Mom Centre from December -2016 to December -2017. The study population consisted of total 60 women subject among them 30 women cases suffering from PCOS aged between 30 to 40 year taken as case group and 30 age matched healthy women taken as control group. Fasting blood sample was collected from each subject and analyzed for insulin level, fasting glucose level and Lipid profile.

Results Revealed that significant increased serum Insulin, fasting glucose level, Cholesterol, triglycerides, LDL, VLDL levels and decreased HDL levels were observed in PCOS cases when compared to control subjects .

Study concluded increase insulin level leads to increased risk of Polycystic Ovarian Syndrome and PCOS associated complications.

Keyword: Polycystic Ovarian Syndrome(PCOS), Lipid profile, Insulin resistance, Metabolic syndrome etc.

INTRODUCTION

Polycystic Ovary Syndrome (PCOS) has been recognized as an endocrine disease with reproductive and metabolic disturbances such as infertility, menstrual dysfunction, hyperandrogenism, hyperinsulinemia, Insulin Resistance, dyslipidemia, hypertension and cardiovascular disease.¹Prevalence of PCOS is around 5 to 10% of reproductive age female.²Etiology and pathophysiology of PCOS are multifactorial and polygenic.^{3,4}Main clinical features of PCOS are chronic anovulation ,hyperandrogenism, polycystic ovaries, hyperinsulinemia,obesity.⁵hyperinsulinaemia and insulin resistance are key pathogenic factors

and major abnormality associated with PCOS .⁶and it is present in 65-80% of both obese and non-obese PCOS patients.⁷

Insulin, a polypeptide hormone secreted by the B-Cells of the pancreas, plays a dominant role in maintaining glucose homeostasis and wide range of physiological processes.⁸Insulin resistance defined as a metabolic state characterized by a decrease in the cellular ability to respond to insulin signaling, this result increase insulin secretion by the pancreas.⁹and this increase insulin level affects Reproductive and metabolic dysfunction in PCOS women.¹⁰ Increase insulin act directly on pituitary gland and leads to increased frequency of hypothalamic gonadotropin-releasing hormone (GnRH) pulses, increase Luteinizing Hormone (LH) and may act synergistically with luteinizing hormone (LH) to enhance androgen production from the theca cells of polycystic ovaries.^{11,12}and on the other hand, insulin reinforces adrenal glands and increased androgen secretion parallel to ovaries.¹³Insulin also decrease sex hormone binding globulin (SHBG) the hormone that bind testosterone in circulation, increase free testosterone (androgen) and resulting in hyperandrogenism which causes polycystic ovary syndrome.¹⁴

Insulin resistance may play significant pathophysiological roles in carbohydrates and lipid metabolism in PCOS patient.¹⁵The present study was undertaken to estimate serum insulin level and its impact on fasting blood sugar level, lipid profile in PCOS women and PCOS associate complications and its comparison with age matched healthy subject.

MATERIAL AND METHODS:

Present study was carried out in the M.G.M. Medical college, Government Holkar Science College and K. R. G's Blessed Mom Centre, Indore(M.P.), during June 2016 to June 2017. Study comprised total 60 Subjects divided into two groups control & cases. 30 Healthy women aged between 30 to 40 year taken as control and 30 PCOS patients aged between 30 to 40 year taken as cases. Fasting blood samples from each cases and control subject were collected and analyze for Insulin, Fasting blood sugar (FBS), Cholesterol, Triglycerides, HDL, LDL, VLDL levels. Serum Insulin level was measured using Chemiluminescent Microparticle Immunoassay (CMIA). FBS, Cholesterol, triglycerides, HDL, LDL, VLDL, were measured by enzymatic method of fully automated biochemistry analyzer. Data were analyzed by using Statistical Program for Social Sciences Version (SPSS) software and data were expressed as mean and standard deviation. (Mean + SD) Comparison done by using student t-test and p-value. P-value <0.05 taken as significant and p value < 0.001 taken as highly significant.

OBSERVATION

Table 1 : Comparison of Serum Insulin level between cases and control.

Parameters	Control (n=30)	PCOS (n=30)	p-value
Insulin (µ/ml)	5.58 ± 3.17	16.25 ± 7.38	<0.001

Table 2: Comparison of FBS and lipid profile levels in cases and control

Parameter	Control Mean±SD	Cases Mean±SD	P value
FBS(mg/dl)	75+9.20	134+18.25	<0.001
CHO (mg/dl)	179+19.03	223+15.30	<0.05

TG (mg/dl)	107+32	169+19.71	<0.001
HDL (mg/dl)	50+13	35+5.15	<0.001
LDL (mg/dl)	82+33	121+20	<0.001
VLDL(mg/dl)	22+7.3	31+4.31	<0.001

RESULTS

Result shown in table 1 revealed that the mean serum Insulin level in cases was 16.25 ± 7.38 ($\mu\text{U/mL}$) and control subjects was 5.58 ± 3.17 ($\mu\text{U/mL}$). Result showed highly Significant (0.001) increase in serum insulin level in cases when compared to control group.

Results shown in table 2 revealed that there was statistically significant (0.001) increased levels of total FBS, Triglyceride, LDL, VLDL in PCOS group when compared to the control group and Cholesterol level was significant (0.05) high in cases when compared to control with significant decreased HDL level in PCOS group when compared to control group.

DISCUSSION

Study shows increased insulin level in PCOS patients in comparison to control. Hyperinsulinemia or Insulin resistance is a characteristic feature of PCOS¹⁶ and play a core role in pathogenesis of PCOS and amplifies and positively correlate with other pathogenic factors such as androgen, AMH, obesity and leads to increase the severity of PCOS and PCOS associated reproductive and metabolic disorders.¹⁴ Mechanisms involved in insulin resistance in PCOS are likely to be complex with contribution of genetic and environmental factors.¹⁷

In women with PCOS decrease in insulin sensitivity along with significant decrease in maximal rates of Insulin-Stimulated glucose transport secondary to a decrease in the abundance of GLUT-4 glucose transporters.¹⁸ Insulin itself leads to a insulin resistance, every time a cell is exposed to insulin, the production of type 4 glucose transporters (GLUT4) on the cell membrane decrease.¹⁹ In women PCOS decreases in insulin receptor binding or autophosphorylation in the insulin receptors gene and later on extreme insulin resistance.²⁰

The result of our study showed high fasting glucose levels in PCOS women when compared to age matched healthy women. Hyperinsulinemia leading to hyperglycemia in PCOS women that characterized by metabolic disorders of lipid, carbohydrates and protein^{21,22} and hyperlipidemia also elevated fasting glucose levels in PCOS women.²³

The Result of our study showed high cholesterol, triglycerides, VLDL, LDL and lower HDL levels present in PCOS women when compared to age matched healthy women. Lipid abnormalities were closely related to Insulin Resistance and it is considered to play a role in defected lipid profile²⁴, abnormal lipid metabolism and elevated plasma glucose level in PCOS women.²⁵ Dyslipidemia is most common abnormality in PCOS²³ with elevated total cholesterol, Triglycerides, low density lipoprotein (LDL) and Very Low Density lipoprotein (VLDL) and low levels of high density lipoproteins (HDL).^{26,27} About 70% of women with PCOS have at least one abnormal lipid constituent. Insulin Resistance and dyslipidemia in PCOS women associated with susceptibility to coronary heart disease, markers of abnormal vascular function, hyperglycemia²³ which causes increased lifetime risk of both diabetes and cardiovascular disease.¹

CONCLUSION:

PCOS patients had significant increased levels of serum insulin, FBS and altered lipid profile which may feature Insulin resistance, Glucose intolerance and dyslipidemia. Insulin resistance plays a pivotal role in pathogenesis of PCOS and PCOS associate reproductive and metabolic disorders such as hyperandrogenism, infertility, hypertension, dyslipidemia, glucose intolerance, obesity, cardiovascular disease and longterm complications like endometrial cancers, non-alcoholic fatty liver disease. In PCOS women early screening for insulin resistance, fasting glucose level, Lipid profile help to identify this syndrome and prevent further cardio-metabolic complication and PCOS associated complications.

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