

Insulin Resistance with Dysfunction of β -cell in adolescent with Polycystic Ovary Syndrome: An increased risk of type 2 diabetes

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ABSTRACT

Background: Polycystic ovary syndrome is related with insulin resistance, compensatory high level of insulin along with β cell dysfunction and consequently may increased the risk of type 2 diabetes.

Aim: To estimate the role of insulin resistance with dysfunction of β - cell in adolescent with Polycystic Ovary Syndrome: An increased threat of type 2 diabetes.

Methods: This cross sectional study was included 50 PCOS of Polycystic ovary syndrome in adolescents with age range 18-24 year. Polycystic ovary syndrome was confirmed by Rotterdam's criteria. Level of serum insulin and fasting blood glucose was estimated by ELISA and glucose oxidase method respectively. Insulin resistance and beta cell function was calculated by formula. BMI was calculated. Twenty control subjects with regular menstruation cycle,

Results: Percentages of demographic characteristics of PCOS patients showed 60-80% adolescent have irregular menstrual history, body/facial hairs, acne, pelvic pain, mood disorder and sedentary life style. Among these adolescents 44% have family history of PCOS. Mean age of adolescent was 20 year with non-significantly increased BMI. Level of blood glucose fasting, serum insulin and insulin resistance was markedly increased. Percentages of β cell function were high in patients as compared to normal controls.

Conclusion: Signs of PCOS along with insulin resistance and dysfunction of β cell may give clues of the risk of type 2 DM. Our results emphasize that more studies are needed to find out the exact mechanism by which insulin resistance interrelates with the function of β -cells to increase the jeopardy of diabetes in adolescents with PCOS.

Keywords: PCOS, Insulin resistance, β cell dysfunction

INTRODUCTION

Polycystic Ovarian syndrome (PCOS) is a combination of environmental & genetic factors and seen in reproductive age belong to different nationalities and races. Its prevalence rate worldwide is 4% to 16.5% with characteristic of hyperandrogenism and anovulation¹. In Pakistan, its prevalence rate is 20.7%².

Factors associated with increased risk of PCOS include lack of physical activity, obesity, epigenetic, endocrine disruptors due to industries and a family history of PCOS. This may affects the value of life of women due to its multiform signs and symptoms. Furthermore, many women shows impaired glucose tolerance and are risk of developing T2D or diabetes mellitus³. Indeed, many PCOS women are insulin resistant, partly due to genetic tendency and partly due to obesity^{4,5} 2016).

Insulin resistance escorted by compensatory high concentration of insulin and it is thought that hyper-insulinemia have a significant role in progress of PCOS. It is proposed that Insulin subsidizes the hyperandrogenism of by motivating synthesis of androgen in ovary and reducing the values of sex hormone binding globulin in serum. High values of insulin may have a direct effect on folliculogenesis⁶.

In women with PCOS, oxidative stress is link with malfunctioning of β -cell. Increased mass of β -cell is a result of insulin resistance that enhance the release of insulin for marinating the normal level of glucose in blood⁷. High level of serum androgen also help in dysfunction of pancreatic cells via the initiation of inflammation and oxidative stress from mononuclear cells that eventually promote failure of β -cell

function in PCOS women⁸. Though, studies of dysfunction of β -cell PCOS adolescent and women have given contentious results⁹.

Increased level of insulin along with insulin resistance is associated with the sign and symptoms of PCOS like acne, hirsutism, and disruption of metabolic pathways related with reproduction⁹. Its links with menstrual abnormalities and infertility; common feature of many PCOS women¹⁰.

Study was planned cross sectionally to estimate the function of insulin resistance with dysfunction of β -cell function in adolescent with PCOS, which may increase the risk of developing type 2 diabetes

MATERIAL AND METHODS

This study was included 50 PCOS adolescents with age between 18- 24 year visiting obstetric and Gynecology Department of Sir Ganga Ram Hospital Lahore. PCOS was confirmed by Rotterdam's criteria. Women who have other disorders related with endocrines like hypo and hyperthyroidism, hyperprolactinaemia etc were excluded from the study. Level of serum insulin and fasting blood glucose was estimated by ELISA and glucose oxidase method respectively. Insulin resistance and beta cell function was calculated by formula. BMI was calculated¹¹. Twenty control subjects with regular menstruation cycle, and the level of serum progesterone dependable with ovulation (>6ng/ml) were included in the study. All of the Control subjects showed normal level of serum androgen. Letter of consent was taken from both PCOS patients and controls. Study was approved by Ethical committee of Post Graduate Medical Institute Lahore. Data was entered in SPSS 20. Variables were expressed as mean \pm SD. Student 't' test was used to compared the variables. P< 0.05 was taken as significant.

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RESULTS

Demographic Characteristics of PCOS women in Percentages showed 60-80% adolescent have irregular menstrual history, body hairs/ facial hairs, pelvic pain, acne, mood disorder and sedentary life style. Among these adolescents 44% have family history of PCOS (Table 1). Mean age of adolescent was 20 year with non-significantly increased BMI. Level of blood glucose fasting, values of insulin in serum and insulin resistance was increased with p value 0.05 and 0.001. Percentages of β cell function were high in patients compared to control subjects (Table 2).

Table 1: Demographic characteristics of PCOS women in %ges

Variables	Patients
Irregular menstrual history	62.5 %
Body / facial hairs	80 %
Acne	81.25%
Pelvic pain	75%
Mood Disorder (Anxiety + depression)	81.25%
Life style Active	37.5%
Life style Sedentary	62.5%
Family history of PCOS	43.75 %

Table 2: Mean age, BMI & Biochemical parameters of adolescents.

Variables	PCOS patients (50)	Control subjects(n=20)
Age (years)	20.31±2.75	18.6±1.12
BMI (Kg m ²)	26.55 ± 0.86	23.60 ± 1.94
Fasting Glucose (mg/dl)	98.75 ±20.28*	80.0 ± 8.5
Fasting level of Insulin (IU / ml)	9.31 ± 0.34**	3.3 ± 2.6
HOMA-IR (insulin resistance)	1.23 ± 0.12**	0.43±0.06
Homa-Beta cell %	91. 25	68. 60

*P < 0.05= Significant **P < 0.001= Highly Significant

DISCUSSION

PCOS is typified by hyperinsulinaemia, hyperandrogenaemia as well as by deranged secretion of adipokines from the adipose tissue. In addition to the insulin resistance, PCOS patients also show malfunctioning of β -cell. Low weight at birth and exposure of fetus to androgens may help in the progress of the polycystic ovary syndrome phenotype in life¹².

We observed that percentages of demographic characteristics of PCOS patients showed 60-80% adolescent have irregular menstrual history, body/facial hairs, acne, pelvic pain, mood disorder and sedentary life style.

Our study is agreed with number of studies who observed that history adolescent of irregular menstrual cycles may be the indicator of PCOS. Irregular menstruation may also a factor of endometrial hyperplasia^{13,14}. Increased BMI in the age of adolescent may be related with acne, male-pattern baldness etc. Depression along with multiform of system may be due to enhanced level of androgen¹⁵. According to a study BMI is a forecaster of oligomenorrhea into adolescence and apparently the progress of PCOS¹⁶.

Level of blood glucose fasting, values of serum insulin and insulin resistance was increased significantly. Percentages of β cell function were high in patients compared to control subjects. A study proposed that the glucose-regulatory reaction to resistance of insulin is a mutual increase of insulin secretion by β -cell of pancreas that keeps normoglycemia. However in the problem of PCOS this serving to compensate hyperinsulinemia is linked to increased level of androgens¹⁷. It is stated that approximately 50.0% of adolescent with polycystic ovarian syndrome develop type 2 diabetes 35-40 years of age¹⁸.

CONCLUSION

Our results emphasize that more studies are needed to find out the exact mechanism by which insulin resistance interrelates with the function of β -cells to surge jeopardy of diabetes in adolescents with PCOS.

Limitation of study: Our study has some limitations that may have an effect on our explanation. It is doubtful that high blood glucose level is primary factor of malfunctioning of β cell dysfunction as PCOS is also observed in lean PCOS adolescent.

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