Role of Glucose to Insulin Ratio (G/R) in Obese and Non-Obese Patients with Poly Cystic Ovarian Syndrome (PCOS)

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ABSTRACT

Polycystic ovarian syndrome is a common endocrine disorder in females of reproductive age group. This syndrome has familial predisposition. The basic problem is in hypothalamic pituitary axis leading to increased LH/FSH ratio. Insulin resistance & resultant hyperinsulinemia is a common finding which leads to altered steroid hormone metabolism and other manifestations of the syndrome. This study was carried on sixty females of PCOS half obese and half non-obese taken from gynaecology and obstetrics OPD of Services Hospital, Lahore. They were diagnosed on the basis of History, clinical examination raised LH/FSH ratio. Forty females half obese and half non obese were taken as control. Fasting glucose and insulin levels were determined and ratio (GIR) was calculated. Both cases and control were given 75gm glucose in 200ml of water. Two hours after glucose load again glucose and insulin levels were measured and glucose to insulin ratio was calculated. Fating glucose was not significantly high in both obese and non-obese groups. But significant higher insulin levels were observed especially in obese group. So GIR ratio was decreased in (cut of value was taken 4.5) 33% of non-obese and 60% of obese cases. After glucose load. Glucose levels were not significantly raised but marked hyperinsulinemia was observed in obese cases. GIR was decreased & was below cut off value of 4.5 in 80% non obese & 86.6 % of obese cases. These are the patients who need insulin sensitizing drugs.
Key words: Obese, Poly Cystic Ovarian Syndrome, hypothalamic pituitary axis

INTRODUCTION

Polycystic ovarian syndrome (PCOS) is one of the most common female endocrine disorders affecting approximately 5 – 10% of women of reproductive age (12-45 years old) and is one of the leading causes of infertility[1]. In 2003 a consensus workshop in Rotterdam indicated PCOS to be present if 2 out of 3 criteria are met. Oligo ovulation and/or anovulation. Excess androgen activity. Polycystic ovaries (by gynecologic ultrasound) and other endocrine disorders are excluded[2]. About 50% of PCOS women are overweight or obese and most of them have abdominal phenotype[3] Serum (blood) levels of androgens (male hormone) including androstenedione, testosterone and dehydroepiendosterone sulphate may be elevated[4] Mild symptoms of hyperandrogenism such as acne or hyperseborrhea are frequent in adolescent girls and are often associated with irregular menstrual cycle. In most instances due to immaturity of hypothalamic pituitary ovarian axis[5]. PCOS may be associated with chronic inflammation, with several investigators correlating inflammatory mediators with anovulation and other PCOS symptoms[6]. Oberity which is frequently associated with PCOS seems to amplify the degree of insulin resistance[7]. Adiponectin a recently discovered adipose specific adipokine, has been said to be involved in obesity and diabetes[8]. A majority of patients with PCOS have insulin resistance and/or are obese. Their elevated insulin levels contribute to or cause the abnormalities seen in the hypothalamic pituitary ovarian axis that leeds to PCOS. Abnormalities in insulin action are poorly detected by simple determination of either glucose or insulin level[9]. The ratio of fasting insulin (µIU/L) to fasting glucose (mmol/L) has been found to be a simple and accurate indicator of insulin resistance at values above 4 mu/mmol/L[10]. Measurement of abnormal glucose tolerance often indicates abnormality in the fasting and 2 hour blood sugar, post 75gm glucose challenge or the fasting glucose/ insulin ratio[11].

MATERIALS AND METHOD

This study included sixty female patients from obstetrics and gynaecology OPD Services Hospital Lahore. They were in reproductive age group already diagnosed and documented as polycystic ovarian syndrome on the basis of history & thorough physical examination, blood tests (LH/FSH) ratio and pelvic ultrasound

findings. Half of them were obese with bodymass index (BMI) 30 and more than 30 and other half non-obese with BMI < 29.9. Forty healthy female half obese and half non-obese were taken as controls. Both patients and controls were with 10-12 hours fast. Baseline blood work was obtained including insulin & glucose levels. The patients as well as the control subjects then drank 75 grams of glucose in 200ml water. Two hours later insulin and glucose levels were repeated and by examining the baseline and stimulated insulin and glucose levels, the ratio was calculated and diagnosis was made 5ml of venous blood was taken from anticubital vein. 1.5 ml placed in sodium fluoride and EDTA tube for glucose estimation. Rest was allowed to clot in a plastic tube. Clear serum was taken after centrifugation and stored in plastic cups at -20 degree centigrade for insulin estimation. Glucose estimation was done by enzymatic oxidation in the presence of glucose oxidase by using Randox glucose kit. Insulin assay was done on stored serum by enzyme immunoassay (EIA).

RESULTS

Mean fasting glucose level in obese group was 79.50 mg/dl while in non obese it was 72.8 mg/dl. Similarly fasting insulin level was 16.86 µIU/L in obese and 12.4 µIU/L in non obese group when average ratio was calculated it was 4.72 µIU/L in obese and 5.8 µIU/L in non obese group. The mean fating levels of blood glucose in normal (control) obese subjects was 78 mg/dl, while in non obese normal subjects was 81.0 mg/dl. The mean level of fasting insulin in normal obese subjects was 7.14 µIU/L and in non obese normal subjects was 6.3 µIU/L.GIR in obese control was 10.9 µIU/L and non- obese control 12.8. Two hours after glucose load, the mean glucose level in obese group was 128.6 mg/dl and in non obese cases it was 118.2mg/dl. Similarly insulin level in obese group was 74.1 µu/L and in non obese it was 54.8 µu/L. when glucose to insulin (GIR) ratio was calculated in obese group it was 2.6 and in non obese it was 3.1.Where as in controls Obese group glucose was 125.7 mg/dl. Insulin level was 19.5 and GIR was 6.9. In non obese group blood glucose was 117 mg/dl. Insulin level was 14.4 µIU/L and GIR was 8.3.

Fasting Levels of Glucose, Insulin and Glucose/ Insulin ratio(Non-Obese & Obese Group)

Fasting Levels		N	Non-Obese	Obese
			Mean	Mean
Glucose	Cases	30	72.8	79.50
	Control	20	81.0	78.00
Insulin	Cases	30	12.4	16.86
	Control	20	6.3	7.14
Glucose insulin ratio	Cases	30	5.8	4.72
	Control	20	12.8	10.9

Two Hours Levels of Glucose, Insulin and Glucose/Insulin ratio (None-Obese & Obese Group)

		N	Non-Obese	Obese
			Mean	Mean
Glucose	Cases	30	118.2	128.6
	Control	20	117.0	125.7
Insulin	Cases	30	54.8	74.1
	Control	20	14.4	19.5
Glucose insulin ratio	Cases	30	3.1	2.6
	Control	20	8.3	6.9

DISCUSSION

In this study findings of glucose and insulin in both obese and non obese PCOS (values given in results) are comparable with a similar study done by legro et all in 1998 in which fasting glucose did not differ but PCOS women has significantly higher fasting insulin levels than control women (P 0.001)[12]. It was observed that obese families with low GIR than cut off value (<4.5) are more insulin resistant than non obese PCOS. When their mean values were calculated 86.6% obese (26 of 30) while 80% (24 of 30) non obese were insulin resistant. Falcone et al reported that 63% of their non obese subjects were insulin resistant[13]. Glucose sitmulated hyper-insulinemia, reduced GIR was more marked in obese (86.6%) than non-obese (80%). In study conducted on 83 women by Robert Kauf man et al (2002)and pre valence of insulin resistance in 54.5% of their PCOS population in general broken down by ethnicity insulin resistance was demonstrated in 43.8% of white and 73.1 of Mexican American women with PCOS[14]..

CONCLUSION

Fasting insulin and GIR are sensitive measure of insulin resistance. 60% of obese and 33% of non obese PCOS were insulin resistant (GIR <4.5). After glucose load 86.6% of obese and 80% of non obese PCOS were insulin resistant. (GIR < 4.5) which may be picked and selected for use of insulin lowering agents in addition to traditional ovulation induction and hormone therapy.

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