Original Article

Relationship Between Body Mass Index and Insulin Resistance in Patients of Polycystic Ovarian Syndrome

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ABSTRACT

Objective: To determine the frequency of insulin resistance among patients with PCOS. To determine association between BMI and insulin resistance among patients with PCOS.

Study Design: Cross sectional study.

Place and Duration of Study: This study was conducted at the Obstetrics and Gynaecology Unit 3, Civil Hospital, Karachi from 22 February 2021 to 22 August 2021.

Materials and Methods: A total of 168 diagnosed cases of PCOS were included in this study. All patients was assessed for Insulin resistance asper operational definition. All data such as age parity BMI, place of residence, socioeconomic status, marital status, duration of all co morbidwas recorded on predesigned Performa.

Results: The average age of the patients was 27.59±5.15 years. Frequency of insulin resistance among patients with PCOS was 54.17%(91/168). Association of insulin resistance and body mass index was significantly high. Rate of insulin resistance was significantly high with overweight and also obese cases (p=0.0005).

Conclusion: In conclusion majority of the overweight/obese PCOS patients showed higher insulin resistance& lower insulin sensitivity vs. their normal weight counterparts. PCOs women are more prone to adiposity and excess body mass index was associated with Insulin Resistance. Consequently, Insulin Resistance disorders androgen profile and threatens metabolic and reproductive health across life span, accordingly, health strategy needs to be screened for the diagnosis of Insulin Resistance in all young PCOs overweight/obese women.

Key Words: Polycystic ovary syndrome, obesity, insulin resistance

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INTRODUCTION

Polycystic ovary syndrome (PCOS) is the most common cause of infertility due to anovulation.[1] It is considered to be most prevalent endocrine disorder of all that women face.[2] It is a heterogeneous disorder characterized by ovulatory dysfunction, clinical and biochemical hyperandrogenemia and polycystic ovaries and is associated with various metabolic abnormalities, including obesity, insulin resistance, metabolic syndrome, type 2 diabetes mellitus and dyslipidemia, thus increasing the lifelong risk for cardiovascular disease.[3]

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Clinical manifestations of PCOS include menstrual irregularities, signs of androgen excess, obesity, and sometimes hirsutism.[4] The Rotterdam guideline accepts any two out of three criteria consisting of menstrual irregularity, androgen excess, and polycystic ovary morphology (PCOM) on ultrasound to diagnose polycystic ovarian syndrome.[5] The most common cause of medically treatable infertility is also PCOS.[6]

Insulin resistance is a key feature of both obese and lean PCOS in western world. It occurs in 70-95% of people with obese PCOS and 30-75% of people with lean PCOS in western world.[7,8] The role of insulinin the pathogenesis of PCOS is far more than what health practitioners ever believed. Almost 15% of the patients with PCOS are diabetic. One study done in Pakistani population showed that 137 (69%) out of 200 patients with PCOS had an insulin resistance [9]. In another study with a larger sample size of 270 patients with PCOS, 174 (64.4%) were found to have insulin resistance In an observational study with a sample size of 200 women at the Department of Chemical Pathology and Endocrinology, CMH Lahore, Pakistan**,** 78.4% women with a body mass index (BMI) > 25 and with PCOS had insulin resistance whereas only 58% of women PCOS and BMI < 25 had insulin resistance.[9]

In this study, we will find the frequency of insulin resistance in patients with PCOS and will also evaluate an association between BMI and insulin resistance in these patients.Rationale is hyperinsulinemia is a feature of PCOS that has a very strong connection with BMI. The presence of polycystic ovaries appears to have a stronger influence than obesity on insulin resistance.[11] There are little studies showing how high BMI causes hyperinsulinemia in Pakistan leading to hyper androgenism, infertility, diabetes and a lot of metabolic disorders. Studies have shown that 5% reduction of weight can result in pregnancy and can reduce hyperandrogenism and insulin levels. This study will help to guide patients to reduce weight with better lifestyle modification and exercise in order to prevent insulin resistance and diabetes and it will also help using delineating further ways of managing PCOS patients.

MATERIALS AND METHODS

Cross sectional study in Department of Obstetrics and Gynaecology unit 3 in civil hospital, Karachi, six months from 22 February 2021 to 22August 2021 Sample size was calculated by using WHO sample size calculator using 69% prevalence of insulin resistance in PCOS from previous studies, margin of error 7% and confidence interval 95%. The total sample size required for the study is 168. Non-probability consecutive sampling technique. All diagnosed PCOS since 6 months patient according to the Rotterdam criteria were included .Patients included were between 13 to 40,BMI ranging between 18 to 39.9.Patients excluded were regular high intensity endurance or strength training (two or more times per week of vigorous exercise), Concurrent treatments (insulin sensitizers or drugs known toaffect gonadotropin or ovulation, with a wash out period of 1 months prior to inclusion) Ongoing pregnancy, Pre-excisting diabetes, excluded on the basis of report of HbA1C(more than 6.5%) and history, pre-existing hypertension , hyperlipidemia were excluded.

The data collection was started after an approval from the CPSP. After taking ethical committee approval and explaining the procedure informed constant was taken. Patients was enrolled from the OPD of department of gynecology and obstetrics, Civil Hospital Karachi. All patients presented in infertility OPD was enrolled on the basis of inclusion and exclusion criteria. Informed consent was taken from each patient. All patients was assessed for Insulin resistance as per operational definition. All data such as age parity BMI, place of residence, socioeconomic status, marital status, duration of all co morbids was recorded on predesigned performa.

Data was analyzed using software of Statistical package of Social Sciences (SPSS version 21). Quantitative variables such as age, height, weight, BMI, duration of PCOS, parity were reported as Mean + SD for normality distribution data and median (IQR) for non-normally distributed data. Normality was assessed by using Shapiro Walks test. Frequency and percentages was calculated for place residence, socioeconomic status, marital status and insulin resistance. Association of insulin resistance and BMI was assessed by chi-square test. Effect modifiers such as age, place of residence, socioeconomic status and duration of PCOS was controlled through stratification. Post stratification Chi- square test was used taking P value of <0.05 as significant.

RESULTS

A total of 168 diagnosed cases of PCOS were included in this study. The average age of the patients was 27.59±5.15 years. There were 48.21% patients had normal BMI, 33.33% overweight and 18.45% had obese (figure 1). 97.62% of the patients were married. Almost 81% of the patients were between getting monthly income 25K to 100K and residential status of 94% patients had urban .

Table No. 1: Association Between Bmi and Insulin ResistanceAmong Patients with Pcos

BMI	Insulin Resistance		Total	P-value
	Yes	No		
Normal	32(40%)	48(60%)	80	.0005
Overweight	30(52.6%)	27(47.4%)	57	
Obese	29(93.5%)	2(6.5%)	31	

Chi-square = 25.88

Table No. 2: Frequency of Insulin Resistance Among Patients with Pcos By Effect Modifiers n=168

Effect Modifiers		INSULIN RESISTANCE				Total	P-Value
		Yes		No			
		Count	%	Count	%		
Age Groups	≤25	43	47.3%	30	39.0%	73	0.556
	26 to 30	24	26.4%	28	36.4%	52	
	31 to 35	12	13.2%	10	13.0%	22	
	>35	12	13.2%	9	11.7%	21	
Duration of PCOS	<10	70	76.9%	62	80.5%	132	0.571
	≥10	21	23.1%	15	19.5%	36	
Marital	Yes	89	54.3%	75	45.7%	164	0.866

status	No	2	50%	2	50%	4	
Socioeconomic status	<25000	8	8.8%	8	10.4%	16	0.853
	25000 to 100000	74	81.3%	63	81.8%	137	
	>100000	9	9.9%	6	7.8%	15	
place residence	Rural	10	11.0%	0	.0%	10	0.003
	Urban	81	89.0%	77	100.0%	158	

Table No. 3: Association Between Bmi And Insulin Resistance Among Patients With Pcos Controlling The Effect Of Duration Of Pcos

Durationof PCOS (months)	BMI	Insulin Resistance		Total	p-Value
		Yes	No		
<10	Normal	21(34.4%)	40(65.6%)	61	0.0005
	Overweight	25(55.6%)	20(44.4%)	45	
	Obese	24(92.3%)	2(7.7%)	26	
	Total	70	62	132	
≥10	Normal	11(57.9%)	8(42.1%)	19	0.084
	Overweight	5(41.7%)	7(58.3%)	12	
	Obese	5(100%)	0(0%)	5	
	Total	21	15	36	

Frequency of insulin resistance among patients with PCOS was 54.17% (91/168). Association of insulin resistance and body mass index was significantly high. Rate of insulin resistance was significantly high with overweight and also obese cases (p=0.0005) as shown in Table 1.

Stratification analysis was performed and frequency of insulin resistance among patients with PCOS was not significant in age groups, duration of PCOS, marital status and socio economic status while rate of insulin resistance was significant in urban cases as compare to rural (p=0.003)

DISCUSSION

PCOS is the most common female endocrine disorder in the developed world, Pakistan being no exception to it. It is a multifactorial and most debatable reproductive endocrinal disorder in the young females with highly controversial pathophysiology.[12] Data on the prevalence of PCOS is variable mainly due to the different sets of criteria for diagnosis. Studies in which polycystic ovaries were detected using ultrasonography report a prevalence of 21-22%, which does not give us an accurate estimate as many women with polycystic ovaries are endocrinologically normal. Data from a cross-sectional study in Greece indicate 9% prevalence while defining PCOS as having oligomenorrhea and hyper-androgenism. Another study by Knochenhauer and coworkers. assessed menstrual cycle characteristics and clinical androgen excess among 277 women undergoing a routine pre-employment history and physical examination in Alabama. The estimated prevalence was 4.6% with a possible range of 3.5-11.2%. PCOS is being strongly associated with future development of type-2 Diabetes mellitus and hyperinsulinaemia.[13] However, controversy remains over the importance of obesity within this relationship. A number of studies have found that subjects with polycystic ovaries. Whereas other groups have found insulin resistance in individuals with lean polycystic ovaries. To determine the relationship of body mass index and insulin resistance in patients of poly cystic ovarian syndrome, A total of 168 diagnosed cases of PCOS were included in this study. The endocrine society, however, recommended that PCOS can be diagnosed if the adult women presents with two of the following features i.e., excess production of androgens, anovulation and pearl- sized cysts found in the ovaries.[14] In our study we used the same criteria for diagnosis. In our study out of 168 females, 48.21% had normal BMI, 33.33% overweight and 18.45% were obese. We observe that 97.62% of the patients were married. These observations were supported by a study done by Sidra et al. which reported out of 440 patients with PCOS were studied Weight measurements revealed that a large proportion (74.5%) of the patients were normal to nearly obese; approximately, a quarter (24.5%) of the patients were morbidly obese, whereas only a few (0.9%) were underweight. Among the study patients, 364 (82.7%) were married and 76 (17.3%) were unmarried.[15] In our study, the proportion of participants diagnosed with PCOS was higher among urban participants (94%) in comparison to rural participants. This is supported by another study in the region.[16]

In our study 91 out of 168 (54.17%) patients were found to be insulin resistant. Majida Farooq et al in their study reported that 137 out of 200 (69%) patients were found to be insulin resistant.[9] A study from Karachi used QUICKI value in patients of PCOS to detect IR which was found to be 88%.[17] Moghetti P in 2016 estimated 70% of PCOS patients to be insulin resistant.[18] Stratification analysis was performed and frequency of insulin resistance among patients with

PCOS was significant in urban cases as compare to rural (p=0.003) which is supported by Swetha Balaji et al.[16] In our study we found that the association of insulin resistance and body mass index was significantly high. Rate of insulin resistance was significantly high with overweight and also obese cases (p=0.0005). In a study, 57% of overweight/obese women with PCOs are insulin resistant, while the prevalence was 9.3 % in the lean counterparts. In addition, insulin sensitivity (IS) was reduced 50% in obese PCOs from that in lean controls.[19] Even augmenting BMI by 1 kg/m^2 reduces IS indexed further in PCOs patients versus in controls.[20] Recent evidence has suggested that adiposity contributesas an additional component to IR in obese PCOs.[21,22] however, not a defining criterion for PCOs.[20] Hence, weight loss through lifestyle. Modification improves IR and reduces and detracts PCOS clinical manifestation intensity.[23]

CONCLUSION

In conclusion majority of the overweight/obese PCOS patients showed higher insulin resistance& lower insulin sensitivity vs. their normal weight counterparts. PCOs women are more prone to adiposity and excess body mass index was associated with Insulin Resistance. Consequently, Insulin Resistance disorders androgen profile and threatens metabolic and reproductive health across life span, accordingly, health strategy needs to be screened for the diagnosis of Insulin Resistance in all young PCOs overweight/obese women.

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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