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Research Article

**RATE OF OCCURRENCE OF INSULIN RESISTANCE
AMONG PATIENTS SUFFERING FROM POLYCYSTIC
OVARIAN SYNDROME**¹Dr Ibtisam Ashraf, ¹Dr Amna Zaree, ²Dr Bilal Arif¹Shalamar Hospital Lahore²Medical Officer, THQ Khushab**Article Received:** February 2020**Accepted:** March 2020**Published:** April 2020**Abstract:**

Objective: This research work carried out to evaluate the rate of occurrence of IR (Insulin Resistance) in the patients suffering from PCOS (Polycystic Ovarian Syndrome) with the utilization of simple indices of IR and to find out the relationship of PCOS's clinical manifestations with indices of IR.

Methodology: This research work carried out in Shalamar Hospital Lahore during July 2018-july 2019. We included total 100 patients who fulfilled the revised 2003 Rotterdam standard of diagnosis for PCOS. Averages, standard deviations and frequencies were in use for the calculation of the descriptive statistics. The calculation of the IR carried out with the use of level of fasting insulin (> 10.0 IU/ml), fasting insulin: glucose ratio (> 4.50). The calculation of various surrogate marker of insulin resistance as HOMA-IR (> 2.60), QUICK-1 (< 0.3570) & McAuley (< 5.80) carried out.

Results: The values for the HOMA-IR, QUICK-1 & McAuley among PCOS patients were 65.0%, 88.0% and 51.20% correspondingly. Patients present with the level of fasting insulin (> 10.0 IU/ml) were 75.320%. Irregularities in menstruation period were the most common presentation followed by infertility, obesity and hirsutism. There was a positive relationship of body mass index (BMI) with different irregularities in menstruation, IR and hyperinsulinemia.

Conclusion: There was a significant high frequency of hyperinsulinemia and IR in the patients suffering from PCOS. Most of the clinical manifestation were present to have association with the indices of insulin resistance.

Keywords: Presentation, BMI, infertility, insulin, menstruation, PCOS, obesity, frequency, manifestation, fasting, surrogate.

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INTRODUCTION:

One of the most frequent issue of endocrine is PCOS (Polycystic Ovary Syndrome) which affects 5.0% to 10.0% females in their age of reproduction [1-3]. The diagnosis is considered with the availability of two or greater than two of following features; anovulation, polycystic ovaries and androgen excess on examination though ultrasonography [4]. The most frequent clinical manifestations comprise different irregularities of menstruation, obesity, infertility, and symptoms of androgen excess like acne and hirsutism [1]. PCOS has association with different abnormalities of metabolism and patients of this complication are present with high risk of development of HTN (Hypertension), impaired tolerance to glucose or type-2 DM and dyslipidemia [5-7]. There is not fully understanding of the pathophysiology of polycystic ovaries syndrome regardless of the advancement of the research.

Complex relations between actions of insulin, ovaries and gonadotropins are accountable for different PCOS manifestations [8, 9]. There are many methods which are being used to evaluate the resistance and sensitivity of insulin. These methods include hyperinsulinemia euglycemic glucose clamp method [10], minimal modal analysis of an FSIVGTT (Frequently Sampled Intravascular Glucose Tolerance Technique) [11] and different indices derived from an oral GTT [12] or fasting glucose. The most precise test available for the calculation of the insulin action is glucose clamp technique but it is a complicate method. Faster and less invasive method is surrogate approach for measuring the glucose and insulin. This research work carried out to find out the rate of occurrence of IR in patients suffering from PCOS with the utilization of the simple IR indices and to determine the relationship between PCOS manifestation with various indices of IR.

METHODOLOGY:

This research work carried out at Shalamar Hospital Lahore for a period of July 2018-july 2019. All the patients who visited the OPD of the department and fulfilled the diagnosis standard of the PCOS in accordance with the consensus workshop of Rotterdam 2003 were the participants of this research work [4]. We collected the detailed history

of the patients on a well-organized Performa. Physical examination of the patients including weight, height, and body mass index, circumference of waist and measurement of blood pressure carried out. The assessment of hirsutism carried out in accordance with the Ferriman & Gallwey chart and we recorded the attained score. Evaluation of biochemical hormones including total serum testosterone, LH, FSH, level of fasting plasma glucose (FPG), level of fasting plasma insulin (FPI) and profile of lipid, DHEAS, TSH, OGTT and Estradiol [17], prolactin and OH progesterone were also carried out. Every patient underwent ultrasonography for ovaries.

The assessment of the IR carried out with the calculation of various surrogate markers as FPG to FPI ratio, HOMA-IR (Homeostatic Model Assessment) and QUICK-1 (Qualitative Insulin Sensitivity Check Index-1) and McAuley indices as mentioned below;

HOMA-IR= $\text{Insulin (IU/ml)} \times \text{glucose (mmol/l)} / 22.50$, cutoff value of greater than 2.6110,

QUICKI= $1.0 / [\log (\text{fasting insulin}) + \log (\text{fasting glucose})]$, cutoff value of less than 0.357120,

McAuley Index= $\text{Exp} [2.630-0.0280 \ln (\text{Insulin in } \mu\text{mol/l}) - 0.310 \ln (\text{triglyceride in mmol/l})]$, cutoff value of less than 5.8130,

Fasting FPG: FPI ratio= $\text{Fasting plasma glucose (mg/dl)} / \text{fasting plasma insulin (IU/ml)}$, cutoff value of less than 4.51.

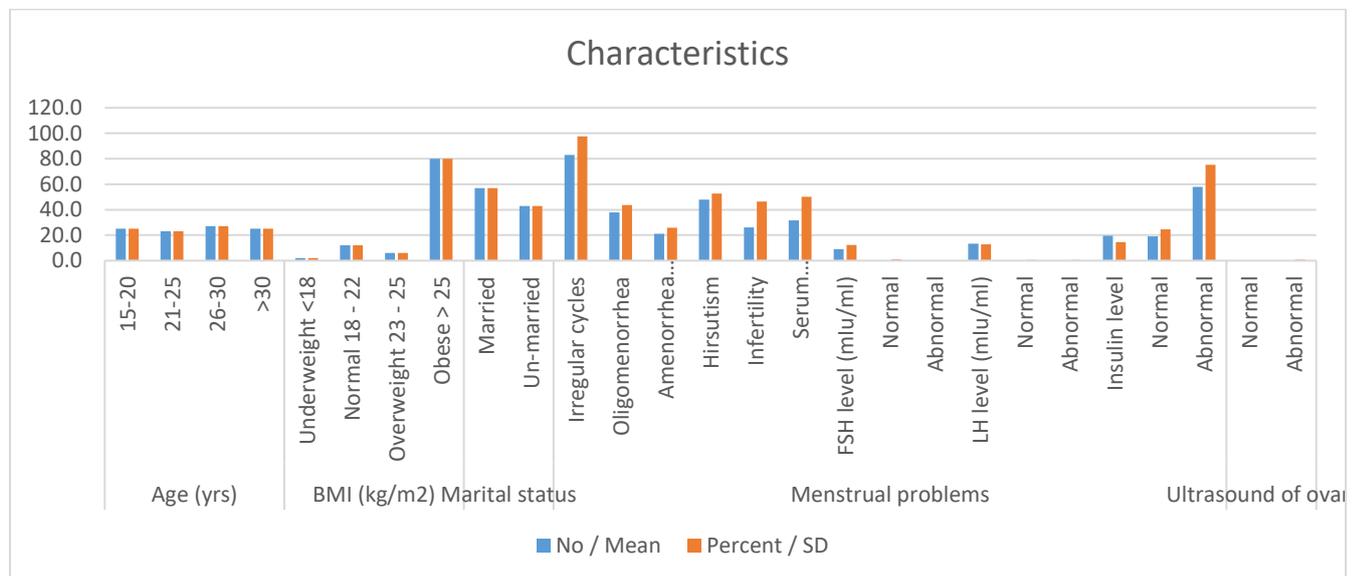
Ethical committee of the institute gave the permission to conduct this research work. We took written consent from every patients after explaining them the main objective of this research work.

RESULTS:

The study population of this research work comprised females of reproductive age. The average age of the females of this research work was 26.410 ± 7.740 years. Table-1 elaborates the distribution of percentage for normal and irregular clinical, biochemical and features of ultrasonography of recruited patients.

Table-I: Percentage distribution of different characteristics.

Features	No / Mean	Percent / SD
Age (yrs.)	15-20	25.0
	21-25	23.0
	26-30	27.0
	>30	25.0
BMI (kg/m ²)	Underweight <18	2.0
	Normal 18 - 22	12.0
	Overweight 23 - 25	6.0
	Obese > 25	80.0
Marital status	Married	57.0
	Un-married	43.0
Menstrual problems	Irregular cycles	83.0
	Oligo menorrhoea	38.0
	Amenorrhoea (secondary)	21.0
	Hirsutism	48.0
	Infertility	26.0
	Serum Testosterone (ng/dl)	31.5
	FSH level (IU/ml)	9.1
	Normal	-
	Abnormal	-
	LH level (IU/ml)	13.2
	Normal	-
	Abnormal	-
	Insulin level	19.6
	Normal	19.0
Abnormal	58.0	
Ultrasound of ovaries	Normal	-
	Abnormal	-



Out of total 100 patients, obesity was common in 80.0% (Body mass index > 25.0 kg/m²) whereas 51.610% patients were present with varying degrees of hirsutism, irregularities in menstruation were present in 86.0% patients and among them 43.680% and 25.880% patients were present with the oligo menorrhoea & secondary amenorrhoea correspondingly. Total 46.420% married females were suffering from infertility. There were normal hormonal assays for the FSH & LH in 93.30% and 59.20% correspondingly. Abnormal GTT was available in 32.0% patients whereas 12.90% patients were available with the confirmed diagnosis of Type-2 diabetes mellitus.

Table-II: Insulin Resistance in patients with PCOS.

Insulin Resistance	No	Percent
Fasting Insulin level (> 10)	61.0	75.30
HOMA-IR (> 2.6)	46.0	67.60
QUICKI (< 0.357)	60.0	88.20
McAuley (< 5.8)	21.0	48.80
Fasting G : I ratio (< 4.5)	21.0	31.00

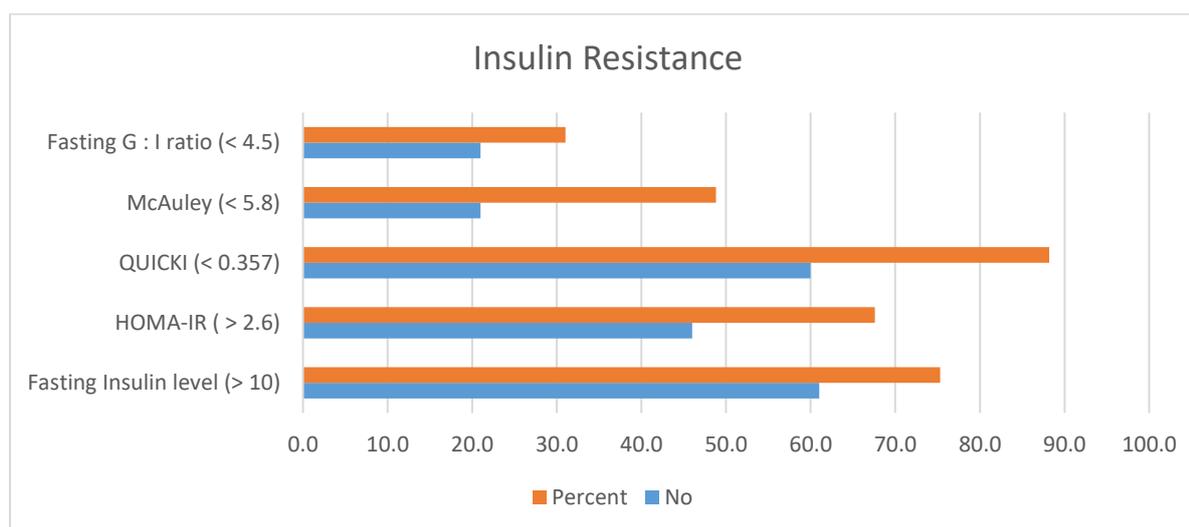
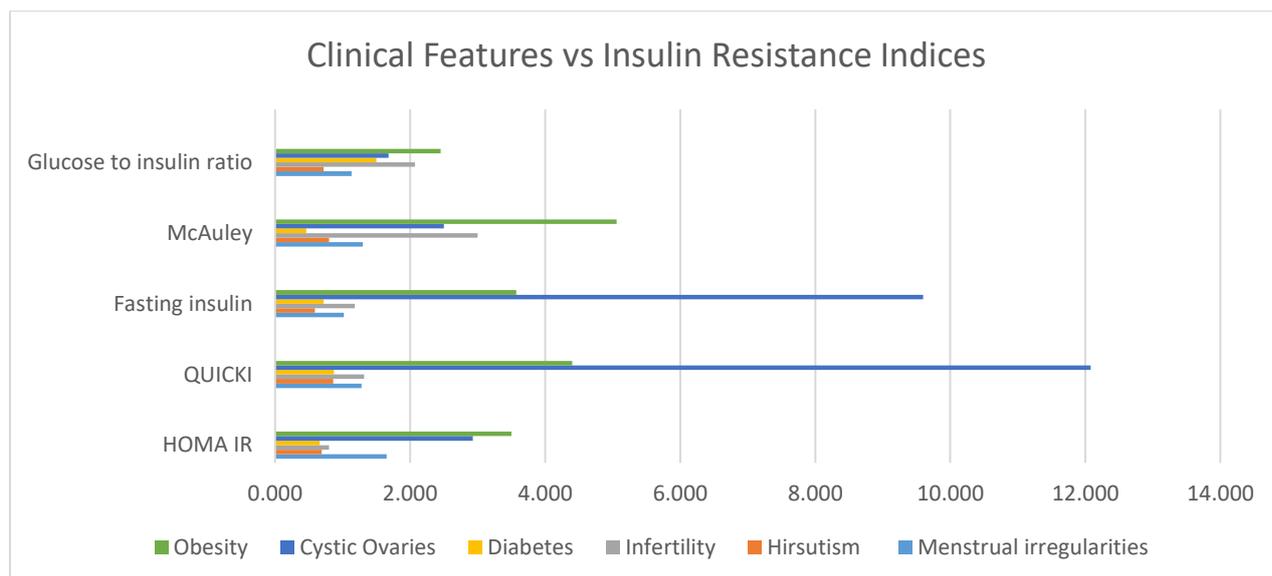


Table-2 displays the rate of occurrence of IR with the utilization of various indices for its calculation. Values for HOMA-IR, QUICK-1 and McAuley were 67.60%, 88.20% and 48.80% correspondingly. Approximately 75.30% patients were present with the level of fasting insulin greater than 10.0 IU/ml. Ultra sonographic appearance of PCO as elaborated in the 2003 Rotterdam workshop [4] was present in total 76.70% patients. There was a positive relationship of body mass index with the different irregularities in menstruation, IR and hyperinsulinemia. Most of the clinical manifestation were present to have association with the indices of IR (Table-3).

Table-III: Association of clinical features of PCO patients with insulin resistance indices.

Clinical Features / Insulin Resistance	Menstrual irregularities	Hirsutism	Infertility	Diabetes	Cystic Ovaries	Obesity	
HOMA IR	Value	1.650	0.690	0.800	0.660	2.930	3.500
	Range	(0.33-8.15)	(0.24-2.05)	(0.18-3.42)	(0.55-0.79)	(0.71-12.1)	(0.91-13.44)
QUICKI	Value	1.280	0.860	1.320	0.870	12.080	4.400
	Range	(0.13-12.3)	(0.17-4.22)	(0.194-9.02)	(0.79-0.96)	(1.88-77.66)	(0.82-23.5)
Fasting insulin	Value	1.020	0.590	1.180	0.720	9.600	3.570
	Range	(0.12-3.2)	(0.2-1.75)	(0.23-6.11)	(0.62-0.83)	(2.22-41.52)	(1.01-12.58)
McAuley	Value	1.300	0.800	3.000	0.460	2.500	5.060
	Range	(0.26-6.82)	(0.22-2.9)	(0.35-25.86)	(0.33-0.64)	(0.48-12.88)	(0.511-50.2)
Glucose to insulin ratio	Value	1.130	0.720	2.070	1.500	1.680	2.450
	Range	(0.20-6.36)	(0.25-2.09)	(0.53-7.99)	(0.23- 9.77)	(0.37-7.63)	(0.47-12.6)



DISCUSSION:

The current research work records the rate of occurrence of IR in the patients suffering from PCOS with the utilization of the simple IR indices, along with features of ultrasonography, biochemical features and clinical presentation. The widespread variation in appearing PCOS features is the cause of the difficulty in the analysis of the patients suffering from PCOS and providing the comparison of the data with other research work conducted locally or on international level. The results of this research work discovered that there is high rate of occurrence of hyperinsulinemia (level of fasting insulin greater than 10) and IR in comparison with the other research work conducted in white Caucasian patients of PCOS. Research works have stated that 40.0% females suffering from PCOS were present with high levels of fasting insulin [14-15] but this current research work discovered a very rate of occurrence of hyperinsulinemia and IR i.e. 60.0% to 80% which is consistent with many local research works [15, 16].

The findings of this research work about hyperinsulinemia are much comparable with the findings of one other research work carried out on immigrant Indians & Sri Lankans residing in United Kingdom which stated the prevalence of 55.0% to 60.0% [17]. There is more prominence of IR in an ovular females suffering from PCOS as compared to hyper-androgenic females with regular periods of menstruation [18]. This outcome is much similar with the results of this current research work as most of the patients with IR were present with irregularities in menstruation. Varying hirsutism degrees were present in 47.360% patients, but it was not present with the association of their level of serum testosterone showing that hirsutism present in the study population may not always be cause of pathology. Research works have displayed that

ethnic variations in hair growth rate should be under consideration in all hirsutism patients.

In this current research work, 80% patients were present with obesity with body mass index of twenty five or above. Obesity was common in 40.0% to 70.0% patients of PCOS in various research works [19-21]. There is redefinition of cutoff values for obesity by WHO for the females of South Asia; a body mass index of greater than 25 is considered as class-1 obesity which is equivalent to body mass index of greater than thirty for Caucasian females [22]. Association of IR with PCOS in the patients of this research work suffering from PCOS put emphasis on the significance of the identification of IR in these patients as this is a long term complication of metabolism. There is a need of further multi-center research works on large sample size to evaluate the degree of IR in affected patients of our region so that there should be an effective implementation of the treatments targeting insulin resistance.

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