

## ORIGINAL ARTICLE

**Frequency of Insulin Resistance and Their Association with BMI in Polycyclic Ovarian Syndrome**SEHER OBAID<sup>1</sup>, SHAIR ZAMAN KHAN<sup>2</sup>, IFTIKHAR ALI KAKAR<sup>3</sup>, SUSAN KAKAKHEL<sup>4</sup><sup>1</sup>Assistant professor, Physiology department, Northwest School of Medicine<sup>2</sup>Endocrinologist, Endocrinology Department, Bolan medical complex hospital Quetta<sup>3</sup>Pulmonologist, Senior Lecturer, Director Department of Medical Education, Bolan Medical College College Quetta<sup>4</sup>Assistant professor, Physiology, Northwest school of medicineCorresponding author: Susan kakakhel, Email: [Susankakakhel@gmail.com](mailto:Susankakakhel@gmail.com)**ABSTRACT****Background:** Polycystic Ovary Syndrome (PCOS) is among the most prevalent endocrine conditions that affects women of reproductive age. Genetics, obesity, birth weight and insulin resistance are some of the inherited and environmental variables that have been associated to the etiology of PCOS.**Objective:** To study the frequency of insulin resistance and their association with BMI in polycyclic ovarian syndrome**Methods:** This study was cross-sectional, carried out at the physiology department Northwest School of Medicine Peshawar. The study duration was six months from January 2022 to June 2022. After an overnight fast (12–14 hours), 2.5ml of venous blood was drawn into a sodium fluoride and EDTA tube. This blood was used to measure the fasting plasma glucose (FPG). Insulin levels were determined by concurrently drawing 2.5 ml of venous blood. A separate proforma was used to input all the data. On SPSS 23, all data were entered and examined.**Results:** In our study, totally 180 patients participated. The mean age with  $\pm$ SD was  $26\pm 4.23$  years. The overall frequency of insulin resistance observed in our study was 117 (65%). A statistical significant association was observed between BMI of  $\geq 25$  and insulin resistance ( $p=0.021$ ).**Conclusions:** Our study concludes that the frequency of insulin resistance in polycyclic ovarian syndrome is high. A statistical significant association was observed between BMI of  $\geq 25$  and insulin resistance in our study.**Keywords:** Insulin resistance; BMI, polycyclic ovarian syndrome**INTRODUCTION**

Polycystic Ovary Syndrome (PCOS) is among the most prevalent endocrine conditions that affects women of reproductive age<sup>1</sup>. PCOS is shown to be prevalent in 16.6% of women, with incidence considerably increasing with age. It ranges from 33.3% in females under 30 years to 10.2% in females of age over 35 years<sup>2</sup>. It is a diverse condition, and medical professionals identify it in eighty percent of infertile women who have anovulatory infertility<sup>3</sup>. Menstrual abnormalities, polycystic ovaries and clinical/biochemical hyperandrogenism are all symptoms of PCOS, which was originally identified in 1935<sup>4,5</sup>. The biochemical term for this condition is hyperandrogenemia, which is indicated by a high ( $>4.5$ ) free androgen index. An ovarian volume exceeding 10 ml and/or 12 or more follicles (measured 2-9 mm)/ovary were both considered indicators of polycystic ovaries<sup>6</sup>. There are a number of short-term and long-term health concerns that are connected with PCOS. The most significant of these include obesity, cardiovascular disease, type 2 diabetes mellitus, reduced fertility, obstructive sleep apnea, high risk of endometrial cancer and difficulties during pregnancy<sup>7</sup>. Genetics, obesity, birth weight and insulin resistance are some of the inherited and environmental variables that have been associated to the etiology of PCOS<sup>8</sup>. Insulin resistance is characterized by less sensitivity or reactivity to the metabolic effects of insulin, like insulin-mediated glucose elimination and suppression of hepatic glucose synthesis<sup>9</sup>. As a consequence of IR, compensating hyperinsulinemia stimulates the ovaries and raises free androgen by inhibiting the liver's ability to produce Sex Hormone Binding Globulin (SHBG)<sup>10</sup>. The high insulin levels are another factor contributing to or causing the abnormalities in the hypothalamus pituitary ovarian axis found in PCOS. Obesity, which is usually linked to PCOS, increases the level of insulin resistance<sup>11</sup>. Adults and the elderly may develop metabolic syndrome, cardiovascular disease and type 2 diabetes as a result of insulin resistance and the metabolic abnormalities linked with it<sup>9</sup>. There are several ways to determine whether a person is insulin sensitive or resistant. The Homeostasis Model Assessment for Insulin Resistance (HOMA-IR) is one of the most used indexes<sup>12</sup>. This calculated indicator is thought to be more effective at detecting IR in patients than clinical parameters<sup>13</sup>. In order to provide appropriate criteria for early detection and

treatment of IR and avoid its consequences in PCOS, the objective of the current study was to determine the true burden of the issue.

**MATERIALS AND METHODS**

This study was cross-sectional, carried out at the physiology department Northwest School of Medicine Peshawar. The study duration was six months from January 2022 to June 2022. By using the WHO sample size calculator, the overall sample size was 180.

**Inclusion criteria**

- Females of age range 15-35 years
- Diagnosed as PCOS
- Females willing to take part in our study

**Exclusion criteria**

- Pregnant females
- Abortion
- History of childbirth  $<3$  months back
- Diabetic patients
- Adrenal or thyroid dysfunction patients
- Patient taken insulin sensitizing agent within last three months

An informed consent in written was taken from the hospital committee of research and ethics. Before taking blood samples, physical examination and medical history was taken. After an overnight fast (12–14 hours), 2.5ml of venous blood was drawn into a sodium fluoride and EDTA tube. This blood was used to measure the fasting plasma glucose (FPG). It was examined in two hours. Serum Insulin levels were determined by concurrently drawing 2.5 ml of venous blood. A separate proforma was used to input all the data. On SPSS 23, all data were entered and examined. For numerical data like age, means and SDs were determined. For qualitative variables like insulin resistance, frequency and percentage calculations were used.

**RESULTS**

In our study, totally 180 patients participated. The mean age with  $\pm$ SD was  $26\pm 4.23$  years. Based on distribution of age, 86 (47.78%) patients were  $>25$  years while 94 (52.22%) patients were  $<25$  years of age. (Figure 1) Based on family diabetic history, 63 (35%) patients were observed with family history of diabetes mellitus, 63 (35%) patients were not observed with family history of diabetes

mellitus whereas 54 (30%) were observed having no information about diabetes mellitus history in family. (Figure 2) Based on BMI, 94 (52.22%) patients had BMI of  $\geq 25$  whereas 86 (47.78%) patients had BMI of  $< 25$ . (Figure 3) The overall frequency of insulin resistance observed in our study was 117 (65%). (Figure 4) A statistical significant association was observed between BMI of  $\geq 25$  and insulin resistance ( $p=0.021$ ). (Table 1)

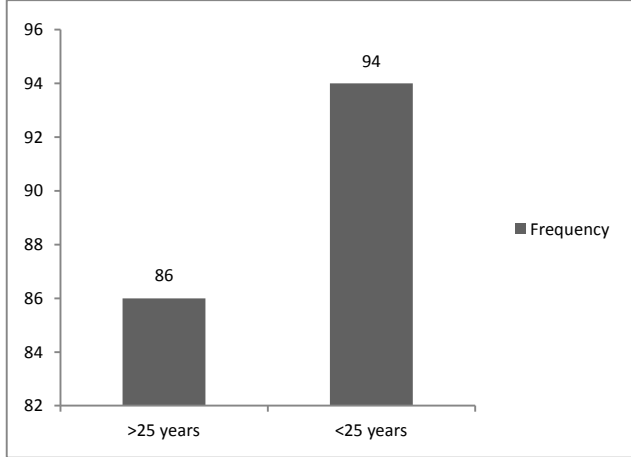


Figure 1: Distribution of patients based on age

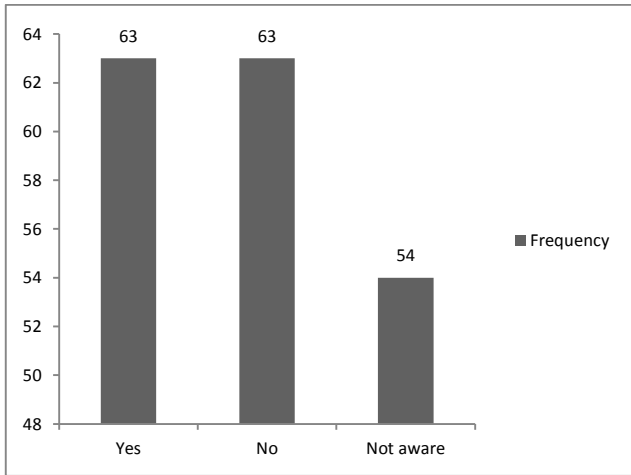


Figure 2: Distribution of patients based on family history of diabetes

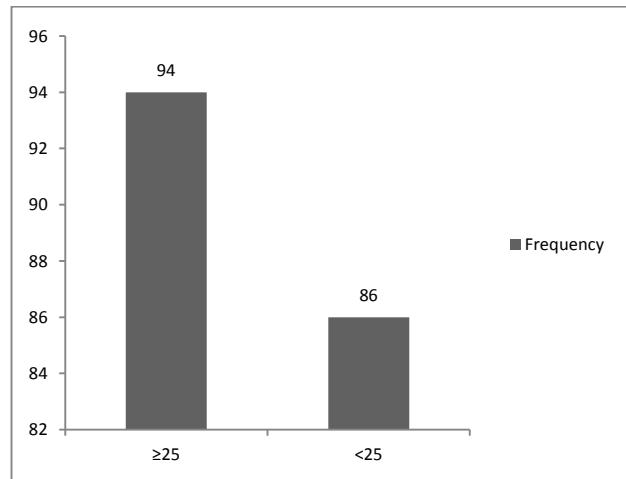


Figure 3: Distribution of patients based on BMI

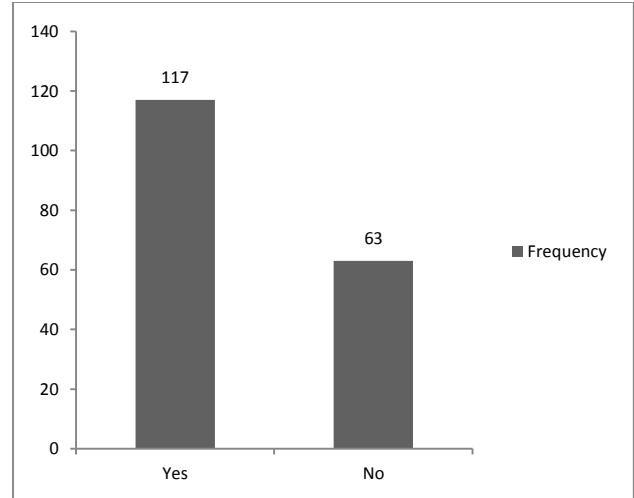


Figure 4: Overall frequency of insulin resistance

Table 1: Association between BMI and insulin resistance

Parameter	Number	Sub category	Insulin resistance		P value
			Yes	No	
BMI	94	$\geq 25$	117 (65%)	63 (35%)	0.021
	86	$< 25$	75 (79.79%)	19 (20.21%)	0.739

## DISCUSSION

Insulin resistance is thought to play an essential part in the pathophysiology of polycystic ovarian syndrome (PCOS), which is considered as the most prevalent endocrine condition in reproductive-aged women worldwide<sup>13</sup>. It is unclear how often this insulin resistance characteristic might be seen, as well as if IR exists in all PCOS-affected females<sup>14</sup>.

In our study, totally 180 patients participated. The mean age with  $\pm$ SD was  $26 \pm 4.23$  years. Based on distribution of age, 47.78% patients were  $> 25$  years while 52.22% patients were  $< 25$  years of age. Based on family diabetic history, 35% patients were observed with family history of diabetes mellitus, 35% patients were not observed with family history of diabetes mellitus whereas 30% were observed having no information about diabetes mellitus history in family. Based on BMI, 52.22% patients had BMI of  $\geq 25$  whereas 47.78% patients had BMI of  $< 25$ . The overall frequency of insulin resistance observed in our study was 65%. A statistical significant association was observed between BMI of  $\geq 25$  and insulin resistance ( $p=0.021$ ). In accordance with our study, another study reported similar mean age<sup>15</sup>. A previous study reported 39.35 frequency of insulin resistance which is not in accordance with our study<sup>16</sup>. A study carried out by Carmina and Rogerio in 2004 reported 77% prevalence of insulin resistance in PCOS which is almost similar to our findings<sup>17</sup>. A previous study from Karachi reported lower prevalence of IR in PCOS<sup>10</sup>. Another study from Karachi reported various frequencies of IR in PCOS by using different techniques<sup>12</sup>. A study carried out by Tosi F et al. in 2017 reported 74.9% prevalence of insulin resistant in PCOS patients which is in accordance with our results<sup>18</sup>. In our study, based on BMI, 52.22% patients had BMI of  $\geq 25$  whereas 47.78% patients had BMI of  $< 25$ . A statistical significant association was observed between BMI of  $\geq 25$  and insulin resistance ( $p=0.021$ ) in our study. In accordance with our study, a previous study also reported significant association between high BMI and insulin resistance<sup>11</sup>.

## CONCLUSION

Our study concludes that the frequency of insulin resistance in polycyclic ovarian syndrome is high. A statistical significant association was observed between BMI of  $\geq 25$  and insulin resistance in our study. A system should be created to test for insulin resistance easily by measuring fasting plasma glucose and

serum insulin levels. This must be done in order to encourage therapy that might protect from insulin resistances, and hence disorders such as metabolic syndrome, diabetes mellitus, and cardiovascular issues.

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