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OVARIAN VOLUME AND FASTING PLASMA INSULIN RESISTANCE AND LEVELS IN WOMEN WITH POLYCYSTIC OVARIES- ANALYSING THE CORRELATION

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ABSTRACT

Background: Polycystic ovarian syndrome, or PCOS, is a lifestyle-related condition whose prevalence has been rising worldwide, including in India, and which calls for further research.

Aim: The purpose of this study was to use a HOMA 2 model to evaluate how insulin resistance increases as ovarian size increases. Using hemostasis model assessment 2 (HOMA 2), the study evaluated the relationship between ovarian volume and fasting plasma insulin resistance and levels in females with polycystic ovaries.

Methods: Transabdominal sonography was used to measure the ovarian capacity in 108 female PCOS patients. Blood samples were taken from each participant under very rigorous aseptic and sterile circumstances, and they were submitted to be tested for fasting plasma insulin levels and fasting blood sugar. Insulin resistance, insulin sensitivity, and beta cell function were evaluated using the HOMA 2 calculator. The collected data were subjected to statistical analysis.

Results: The research participants' mean BMI was 25.55 kg/m2, and they were 26.1 years old. Male pattern pubic hair, clitoromegaly, acanthosis, acne, hirsutism, alopecia, and hoarseness of voice were observed in 1.85%, 48.15%, 75.92%, 12.96%, 59.26%, 72%, and 79.6% of their respective research participants.

Insulin resistance and BMI (p=0.02), fasting plasma insulin and total ovarian volume (p=0.003), and fasting plasma insulin and BMI levels (p=0.02) all showed a significant positive connection. Additionally, a negative correlation between insulin sensitivity and ovarian volume and a positive correlation between insulin resistance and large ovarian volume were observed.

Conclusion: The current study comes to the conclusion that in females with PCOS, an increase in ovarian volume may be interpreted as a sign of increased insulin resistance.

Keywords: obesity, polycystic ovarian syndrome, PCOS, insulin resistance, and insulin sensitivity

Introduction

Polycystic ovarian syndrome, or PCOS, is an illness that is influenced by lifestyle choices and affects many women worldwide, including in India. Changes in lifestyle, stress, modernization, and westernization have all been linked to an increase in PCOS incidence in developing countries like India. Alongside the global rise in the incidence of Type 2 diabetes mellitus, the prevalence is also rising.[1]

In 1935, Irwing F. Stein and Michael L. Leventhal were the first to identify a symptom complex linked to anovulation. They clarified that seven of the individuals experienced amenorrhea, hirsutism, and enlarged polycystic ovaries. The authors also noted that two of the female individuals became pregnant following bilateral ovarian wedge resection, which involved removing ½ to 3/4 of each ovary, and that all women experienced normal menstrual periods. One of the most prevalent disorders affecting women in the reproductive age range is PCOS, which affects 8–13% of women and goes untreated in approximately 70% of cases. Compared to Caucasian persons, Indian subjects have higher incidences of PCOS.2

Two out of every five teenage females and one out of every five females in the reproductive age group have PCOS, depending on the geographic area. In the Indian setting, the estimated prevalence is close to 225 females. Additionally, compared to women living in rural regions, there is a growing trend among metropolitan women. Additionally, because of increased insulin resistance, overweight, and obesity rates brought on by sedentary lifestyles, labor-saving technology, and easy access to high-calorie meals, the condition is more common in upper socioeconomic groups. Numerous research in the literature have shown conflicting evidence that there is no connection between PCOS and obesity, supporting the idea that there is a greater hereditary component.3

Insulin resistance is less prevalent in slim female PCOS patients and more common in obese ones. Between 50% and 75% of women are affected overall. Women with PCOS have a mean 35–40% worse insulin sensitivity than women without insulin-dependent diabetes mellitus. 7–10% of female PCOS patients have diabetes mellitus, and almost 35% have impaired glucose tolerance. Conversely, women with type 2 diabetes mellitus are six times more likely to develop PCOS than women of the same age who do not have the disease. However, other from the oral glucose tolerance test (OGTT), there is currently no clinical test available for identifying insulin resistance in general patients.4

The current study used HOMA 2 (homeostasis model assessment 2) to evaluate insulin resistance and the relationship between fasting plasma insulin levels and ovarian volume in females with polycystic ovaries.

MATERIALS AND METHODS

The goal of the current cross-sectional clinical investigation was to evaluate insulin resistance using HOMA 2 (homeostasis model assessment 2) in females with polycystic ovaries, as well as the relationship between fasting plasma insulin levels and ovarian volume.

Prior to their involvement in the study, all individuals gave their written and verbal informed consent. 108 participants who attended the institution within the designated study period were evaluated for the study. Nulliparous females between the ages of 18 and 35 who were willing to participate in the study and had been diagnosed with polycystic ovaries according on Rotterdam criteria met the study's inclusion requirements. Subjects using metformin throughout the trial period, women with a history of PCOS who had already had ovarian surgery, and participants who did not provide their consent for study participation were excluded.

Following the research participants' final inclusion, each participant had a thorough medical history taken, and a thorough clinical examination was conducted, with a primary focus on the menstrual history and clinical signs of hyperandrogenism. To measure the ovarian volume, the subjects were then sent for transabdominal ultrasonography.

L x B x H/2 was the anticipated ovarian volume. One examiner who was a specialist in the area measured the ovarian volume. The fasting blood sugar and fasting plasma insulin levels were measured using a single venous blood sample. A pre-made, organized proforma was used to collect the data.

In order to evaluate insulin resistance, the collected data was put into an MS Excel format. BMI, age, beta cell function, insulin resistance, insulin sensitivity, pubic hair pattern in men, clitoromegaly, acne, alopecia, hirsutism, and ovarian volume were among the parameters evaluated. The HOMA2 calculator, which provides insulin sensitivity, beta cell function, and insulin resistance for a given plasma insulin and fasting blood sugar readings, was utilized to assess insulin resistance.

RESULTS

The goal of the current cross-sectional clinical investigation was to evaluate insulin resistance using HOMA 2 (homeostasis model assessment 2) in females with polycystic ovaries, as well as the relationship between fasting plasma insulin levels and ovarian volume. Transabdominal sonography was used in the study to measure the ovarian volume in 108 female PCOS patients.

Blood samples were taken from each participant under very rigorous aseptic and sterile circumstances, and they were submitted to be tested for fasting plasma insulin levels and fasting blood sugar. The mean age of the 108 female research participants was 26.1 years, with the majority falling between the ages of 21 and 25. With 58 obese and 32 overweight women in the research, it was observed that 83% of the females had a high BMI. The research participants' average BMI was 25.55 kg/m2. Only modest menstrual cycle disturbances were noted by 89% of the female participants.

Alopecia, which affected 80% of females, was the most prevalent physical characteristic, followed by clitoromegaly, which affected 75% of females. Additional characteristics included hirsutism, acne, male pattern pubic hair, and acanthosis in 13%, 48%, 72%, and 59% of females, respectively.

According to the study's findings, there was a significant positive association (p-value of 0.02) between the study participants' BMI and plasma insulin levels. Additionally, there was a substantial positive connection (p=0.02) between insulin resistance and BMI. Additionally, the study's findings revealed a strong positive connection (p=0.003) between the fasting plasma insulin level and total ovarian volume (Table 1).

Additionally, a positive connection (p=0.004) between ovarian volume and insulin resistance was identified. BMI and beta cell function were shown to be positively correlated. The change was not statistically significant, though. Likewise, there was a positive but non-significant correlation between insulin resistance and the size of the big ovary. Additionally, a favorable relationship between total ovarian volume and beta cell function was observed. Conversely, there was a negative relationship between insulin sensitivity and both the overall ovarian volume and the size of the big ovary (Table 2).

DISCUSSION

In this investigation, transabdominal sonography was used to measure the ovarian volume in 108 females with PCOS. Blood samples were taken from each participant under very rigorous aseptic and sterile circumstances, and they were submitted to be tested for fasting plasma insulin levels and fasting blood sugar. The mean age of the 108 female research participants was 26.1 years, with the majority falling between the ages of 21 and 25. These findings were similar to those from earlier studies by Reid SP et al. (2017) and Keen M et al. (2017), in which the authors evaluated PCOS participants and provided demographic and illness data similar to the current study.

According to the study's findings, 83% of the female participants had a high BMI, with 58 of them being obese and 32 being overweight. The research participants' average BMI was 25.55 kg/m2. Only modest menstrual cycle disturbances were noted by 89% of the female participants. Alopecia, which affected 80% of females, was the most prevalent physical characteristic, followed by clitoromegaly, which affected 75% of females. Additional characteristics included hirsutism, acne, male pattern pubic hair, and acanthosis in 13%, 48%, 72%, and 59% of females, respectively.

These outcomes were in line with those of Gracelyn Let al. (2017) and Singh A et al. (2018), whose findings on the clinical characteristics of PCOS were similar to those of the current study. With a p-value of 0.02 for the quantitative values, it was shown that the research participants' BMI and plasma insulin level had a significant positive connection. Additionally, there was a substantial positive connection (p=0.02) between insulin resistance and BMI. Additionally, the study found a strong positive connection (p=0.003) between the fasting plasma insulin level and total ovarian volume.

These results concurred with those of Sowmya D et al. (2017) and Choudhary A et al. (2017), who found a substantial positive connection between plasma insulin level and BMI that was comparable to the current study, according to the authors.

Additionally, the findings of the study demonstrated a significant link (p=0.004) between ovarian volume and insulin resistance. BMI and beta cell function were shown to be positively correlated. The change was not statistically significant, though. Likewise, there was a positive but non-significant correlation between insulin resistance and the size of the big ovary. Additionally, a favorable relationship between total ovarian volume and beta cell function was observed.

Conversely, there was a negative relationship between insulin sensitivity and both the overall ovarian volume and the size of the big ovary. These findings were consistent with those of Malik S et al. (2011) and Balaji S et al. (2015), who similarly observed a favorable connection between insulin resistance and ovarian volume and between beta cell function and BMI, similar to the current study.

CONCLUSIONS

The present study, within its limitations, concludes that an increase in the volume of the ovary can be taken as an indicator of an increase in insulin resistance in females with PCOS. However, further longitudinal studies in the future will be needed to reach a definitive conclusion.

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Parameters	Pearson correlation	p-value
Insulin resistance	0.300	**0.02**
Insulin sensitivity	-.258	0.06
Beta cell function (%)	.132	0.333
The volume of the large ovary	.0.32	0.805
Total ovarian volume	.116	0.394
Fasting plasma insulin	0.306	**0.02**

Table 1: Correlation of BMI to other parameters in study subjects

Parameters	Pearson correlation	p-value
Insulin resistance	0.385	**0.004**
Insulin sensitivity	-.174	0.201
Beta cell function (%)	.218	0.112
Fasting plasma insulin	.395	**0.003**
BMI	.116	0.394

Table 2: Correlation in total ovarian volume and other parameters in study subjects