ANTHROPOMETRIC STUDY OF POLYCYSTIC OVARY SYNDROME (PCOS) IN WOMEN

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Abstract

The study focused on anthropometric measurements and their relationship with the increase in the incidence of polycystic ovary syndrome (PCOS) in women, where 61 samples were collected for women with the syndrome and 45 samples as a control group. The results showed that the Body Mass Index (BMI) of the affected women group was higher than the control group at ($p=0.05$), the waist-hip ratio (WHR) of the affected women was higher than the control group at ($p=0.003$), and age was a major factor affecting on the levels of female hormones (estrogen and progesterone). Elderly women are usually more likely to develop PCOS due to the increase in obesity around the abdominal area and the effect on the ovulation process with age. Finally, the study proved that BMI and WHR are two new markers of increased risk factors for PCOS in women of different ages.

دراسة القياسات الأنثرومبومترية لمتلازمة تكيس المبايض (PCOS) لدى النساء

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ملخص البحث:

ركزت الدراسة على القياسات الأنثرومبومترية وعلاقتها مع زيادة الاصابة بمتلازمة تكيس المبايض (PCOS) لدى النساء، حيث تم جمع ٦١ عينة لنساء مصابات بالمتلازمة و٤٥ عينة كمجموعة سيطرة. أظهرت النتائج أن مؤشر كتلة الجسم (BMI) لمجموعة النساء المصابات أعلى من المجموعة الضابطة وعند مستوى إحتمالية ($p=0.05$)، ونسبة الخصر إلى الورك (WHR) للنساء المصابات أعلى من المجموعة الضابطة وبمستوى إحتمالية ($p=0.003$)، والعمر عامل رئيسي يؤثر على مستويات الهورمونات الانثوية(الإستروجين والبروجستيرون)، وعادة ما يكون النساء كبار السن أكثر عرضة للإصابة بمتلازمة تكيس المبايض بسبب زيادة السمنة حول منطقة البطن وتأثيرا على عملية الاباضة مع تقدم العمر. أخيراً، واثبتت الدراسة أن مؤشر كتلة الجسم و نسبة الخصر إلى الورك هما علامتان جديدتان لزيادة عوامل الخطورة للإصابة بمتلازمة تكيس المبايض لدى النساء بمختلف الفئات العمرية.

الكلمات الدالة: متلازمة تكيس المبايض (PCOS)، BMI، WHR، الإستروجين, البروجستيرون.

Introduction:

American gynecologists (Irving F Stein and Michael Leventhal) initially characterized polycystic ovarian syndrome (PCOS) in (1935 AD), naming it Stein Leventhal illness, an endocrinopathy that affects an increasing number of women. It is known as Hyperandrogenic Anovulation Syndrome because it occurs between puberty and menopause and relates to a combination of symptoms that develop at the same time [1, 2].

Body Mass Index indicates the number of fat cells, and the more fat cells there are more estrogen, which is responsible for the growth of the endometrium, and the increase in hormone levels means endometrium thickening, which affects fertility in terms of the length of the menstrual cycle and its irregularity accompanied by pain, as well as the failure of implantation of the fertilized egg due to the thickening of the endometrium [3, 4].

There is also another trend in the rise of estrogen, which is the disruption of insulin function (insulin resistance), and thus diabetes mellitus with polycystic ovary syndrome, and the two diseases cause a decrease in the incidence of natural pregnancy, and this is known as estrogen dominance [5]. This disorder leads to disruption of the work of some systems such as the reproductive system and irregular menstruation due to low estrogen levels. Therefore, the mass index can indicate that the body needs a balance between the amount of fat and the levels of sex hormones [6], while the waist-hip ratio (WHR) is a rapid measure of fat distribution that may help indicate the general health of a person. For the World Health Organization (WHO), a WHR of more than 1.0% may increase the risk of developing overweight conditions [7]. The aim of study to found the effects of BMI and WHR on polycystic ovarian syndrome.

Materials and Methods:

PCOS Group: 61 PCOS women were included in this study; they were diagnosed by experts in AL-Salaam Hospital / Mosul- Iraq from October 1, 2021, to April 20, 2022. Their ages range from 20 to 43 years, and clinical data for each patient was collected using a specially designed questionnaire.

Control group: Consisted of 45 Young fertile women ranging in age from 20 to 42 years old.

During the early follicular phase, blood samples were obtained in the morning following 12 hours of fasting (day two or three of the menstrual cycle) for sex hormones (LH, FSH, E2) and INS, IGF-1, AntiInsulin Ab (AIA). While progesterone is at ovulation (day 13 or 14 of the menstrual cycle) for both groups. PRG, E2, LH, and FSH variables were measured using a specific kit (Bio Merieux Kits) from Minividas-France. Cobas-e411 uses Roche kits for the INS and IGF-1 variants and Alegria uses a special kit (Orgentec Kits) for AIA, The following formula was used to determine (BMI):

$$BMI(Kg/m^2) = weight(Kg) / length(m^2)$$

WHR was calculated, using the following formula:

$$WHR= W (Waist)/ H (Hip)$$

Finally, SPSS software was used to analyze the data.

Results and Discussion:

Comparison of age and anthropometric measurements between women with PCOS and the control group (Healthy women):

When comparing age and anthropometric measurements between women with the syndrome and the control group, the results listed in Table-1 show that the body mass index (BMI) of the group of affected women was higher than the control group and at a ($p=0.0\circ$), and the waist-hip ratio (WHR). for the affected women is higher than the control group and at a level of probability ($p=0.003$), these results may have an effect on the ovulation process due to obesity in the abdominal area of the body (Abdominal Obesity), as the fat accumulated in the abdomen is associated with the absence of ovulation [8].

Table-1: Comparison of age and anthropometric measurements between women with PCOS and the control group.

Age and Anthropometric Measurements	PCOS Group Mean ± SD	Control Group Mean ± SD	P-value
Ages	27.63 ± 7.16	٣٠,٠٤ ± ٦,٣١	٠,٠٧٥
BMI Kg/m^2	27.19 ± 5.53	25.43 ± 4.33	٠,٠٥*
WHR	0.79 ± 0.05	0.76 ± 0.06	0.003**

*Significant differences at P≤0.05, **Significant differences at P≤0.01

Correlation between hormonal and Biochemical Variables for the effect of the Waist: Hip ratio in women with PCOS:

The results listed in Table-2 show that there is a correlation factor for PCOS, waist-hip ratio, which confirms that abdominal obesity is a risk factor for PCOS, as the table indicates. Significant positive correlation between WHR and each of insulin and body mass index at (p=0.001) and (p=0.001) respectively. While the results showed a significant negative association with both insulin antibody and IGF-1 at (p= 0.001), (p=0.029), respectively, being overweight would increase the levels of growth factor, but with obesity, the reactions of free IGF-1 increase the secretion of growth hormone and it gradually prevails and leads to a decrease in the total circulatory level [9]. The results showed an inverse relationship with FSH, estrogen and progesterone, while WHR and LH had a positive correlation which is consistent with what was found by Al-Ta'i and Al-Jawadi 2021 where it mentioned that obesity indices and hormonal imbalances among infertile women have been linked [10].

Table-2: Correlation between hormonal and Biochemical Variables for the effect of the Waist: Hip ratio in women with PCOS.

Hormonal & Biochemical Variables	r correlation value	P-value
Insulin Antibody (AIA) U/ml	0.337-	0.001**
Insulin-Like Growth Factor-1 (IGF-1) ng/ml	0.279-	0.029*
Insulin (INS) µU/ml	0.566	0.001**
Follicle-Stimulating Hormone (FSH) mlU/ml	0.017-	0.96
Ovulation Hormone (LH) mlU/ml	0.107	0.431
Estrogen (E2) pg/ml	0.079-	0.85
Progesterone (P4) ng/ml	0.221-	0.079
BMI Kg/m^2	0.650	0.001**

* Significant differences at P≤0.05**, Significant differences at P≤0.01

Comparison of the different age groups with the level of hormonal and biochemical variables for women with PCOS:

When comparing the difference of age groups with the level of hormonal and biochemical variables for women with the syndrome, the results in Table-3 showed a significant increase in the level of each of the follicle-stimulating hormone, estrogen, progesterone, and insulin, with a probability level (p=0.001), (p=0.05), (p=0.001), (p=0.058), respectively, the reason may be due to the increase in estrogen and progesterone hormones disturbances with age and before menopause it increases and menstruation becomes irregular and thus ovulation becomes ineffective and the emergence of several symptoms including weight fluctuations and usually an increase in Weight with increased appetite, depression, hot flashes or may be the cause of disorders related to the adrenal gland and its excessive production of its hormones [11, 12]. The increase in follicle-stimulating hormone with age is due to the decrease in ovarian reserve due to the increase in body mass index, so obesity must be treated before starting reproductive function treatment [13]. As for the rise in insulin level with age, it is caused by several factors, including intracellular fat accumulation, increased inflammation; changes in the activities of enzymes that regulate insulin sensitivity and endoplasmic reticulum stress [14].

The results also showed a significant decrease in the level of the ovulation hormone at the level of probability (p= 0.012) as a result of the decrease in the size of the ovaries and the number of follicles with advancing age for women with and without polycystic ovaries [15]. The results did not show a statistically significant difference in the level of all antibodies to insulin and insulin-like growth factor-1.

Table-3: Comparison of the different age groups with the level of hormonal and biochemical variables for women with PCOS.

Hormonal & Biochemical Variables	20-30 Mean ± SD	31-40 Mean ± SD	≥ 40 Mean ± SD	p-value
Insulin Antibody (AIA) U/ml	2.67±1b	5.86±4.2a	6.02±3.8a	0.465
Insulin-Like Growth Factor-1 (IGF-1) ng/ml	182.3±59.7a	201.3±69.8 a	187.8±31.5a	0.586
Insulin (INS) µU/ml	14.11±6.5b	14.09 ±7.3b	20.95±2.6a	0.058*
Follicle-Stimulating Hormone (FSH) mIU/ml	6.15±2.6b	7.34±3.1b	12.24±1.3a	0.001**
Ovulation Hormone (LH) mIU/ml	9.71±5.9a	5.31±1.2b	6.28±3.06 ab	0.012*
Estrogen (E2) pg/ml	70.18±7.4b	122.2±12.9 a	130.1±30.04a	0.05*
Progesterone (P4) ng/ml	0.15±0.1b	0.21 ± 0.1 b	0.52 ± 0.2 a	0.001**

* Significant differences at P≤0.05, **Significant differences at P≤0.01

Conclusion:

The study found a link between PCOS and waist-hip ratio, confirming that abdominal obesity is a risk factor for PCOS. BMI and WHR are novel markers for growing PCOS in women of various ages. Therefore, obesity must be treated before starting the treatment of polycystic ovary syndrome.

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