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Comparative Indicators of Hormonal Changes in Women with Polycystic Ovary Syndrome Depending on Body Mass Index

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ABSTRACT: Comparative indicators of hormonal changes in women with polycystic ovary syndrome depending on body mass index

KEYWORDS: polycystic ovaries, hormones, hyperandrogenism, insulin resistance, obesity, overweight

Introduction. PCOS accounts for more than half of all cases of endocrine infertility (56.2%) and approximately 20-22% of the causes of infertile marriage. PCOS is characterized by a combination of changes in the endocrine and metabolic systems, accompanied by impaired reproductive function and provoke the development of gestational complications (miscarriage, gestational diabetes and preeclampsia) [4,5,7].A little-studied aspect of this problem is the determination of the role of insulin resistance (IR) in the development of reproductive dysfunction [6,9]. The question of the relationship between body mass index and anti-Müllerian hormone (AMH) in the development and progression of reproductive dysfunction in patients with PCOS remains open.

In recent years, it has been established that in PCOS there is a frequent combination of hyperandrogenism and insulin resistance. With insulin resistance, there is a decrease in the response of insulin-sensitive tissues to the insulin with its sufficient level in the blood. Insulin resistance is found in 30–70% of patients with PCOS who are overweight or obese, and in patients with normal body weight it occurs in 20–25% of cases [8].

The above facts, as well as our own observations, prompted us to analyze the studied women of fertile age with impaired reproductive system.

The purpose of this study was to study the indicators of some patients with PCOS, depending on the body mass index.

Material and research methods. The study included 115 women aged 18 to 35 years (mean age was 25.8±3.28 years) with clinical appearance of hyperandrogenism and impaired reproductive function, who applied for a consultation at the consultative clinic of the Republican Specialized Scientific and Practical Medical Center of Obstetrics and Gynecology of the Ministry of Health of the Republic of Uzbekistan.

All the patients underwent analysis of anamnestic information, the intensity of hirsutism on the Ferriman-Gallwey scoring, and the determination of body mass index.

Ultrasound examination was carried out on a modern ultrasound device of the expert class MindrayDC-70 with a sensor sensitivity of 7.5 MHz, preference was given to transvaginal access, if necessary, transabnominal access was also used. The patients with regular menstruation were examined in the early follicular phase (3-5 days of the cycle), and the patients with opso-/amenorrhea were examined on the day of arrival or on days 3-5 of induced bleeding after the progestogen test. The follicles were counted both in the longitudinal, transverse and anteroposterior sections of the ovaries, the ovarian volume, the average size of the follicles measured in three sections, and the index of the ratio of the stroma to ovarian area.

Hormonal study (FSH, LH, prolactin, AMH, DHEA-S, free testosterone) was carried out on an enzyme immunoassay analyzer Mindray 96 MR-96A China 2014.

The NOMA-IR index (Homeostasis Model Assessment of Insulin Resistance) was calculated by the following formula:NOMA = (fasting glucose level (mmol/L) * fasting insulin level (mcME/ml)) / 22.5 (normally does not exceed 2.7).

Statistical processing of the study results was carried out by conventional methods using a personal computer, Microsoft Word 2016, Microsoft Excel programs.

Results and discussion. The main complaints with which they came were menstrual dysfunction in the form of oligo- or opsomenorrhea, lack of pregnancy, acne, excessive hair growth, overweight, hair loss. Clinical signs of menstrual dysfunction were detected in 102 (88.7%) women in the form of oligo- and opsomenorrhea, hyperpolymenorrhea - in 38 (33%) women, chronic anovulation - in 76 (66%) and amenorrhea in 15 (13%) of the studied women.

Mild hirsutism was found in 93 (81%), moderate hirsutism in 12 (10.4%) participants, intense hirsutism was detected in 10 (8.7%) patients. Clinical appearance of hyperandrogenism, such as acne, were found in 48% of the subjects, acanthosis nigricans in 20% of women, alopecia was found in 11.4% of cases.

The determination of the body mass index in the examined women indicated that more than half of the patients were overweight and obese, which is one of the signs of the metabolic syndrome. Of the total number of patients examined, the first group included 82 (71.3%) women, of which in 53% of cases, overweight was detected, with an average BMI of 27.45 ± 0.18 kg / m², obesity of the 1st degree was recorded in 18 .3% of women with an average BMI - 32.82 ± 0.52 kg/m², the second group included 33 (28.7%) women with normal weight, the average body mass index was 23.11 ± 0.14 kg/m². The average age of menarche in both groups was 12.5±2.8 years. The majority of 78 patients (67.8%) had earlier onset of menarche at 12-13 years old, the beginning of menarche at 10-11 years old was in 10 patients (8.7%), at 13-14 years old - in 35 (30.4%)

In 74 examined women, infertility was diagnosed, of which 57 cases (77%) were primary infertility and secondary infertility occurred in 19 women (25.7%).

An ultrasound examination of the patients revealed an increase in the volume of the ovaries due to the hyperechoic stroma, the average volume varied from 14.07±0.4 cm3 to 17.3±0.7 cm3 (normally

8.6±0.3 cm3) with many (from 10 to 15-25) follicle with a diameter of 2-9 mm. The total area of the stroma was 2.4±0.6 cm2.

Table 1

Indicators of hormonal parameters and the HOMA index in women with PCOS depending on BMI

Studied parameters	Groups of examined patients	
	I – group (n=82) BMI>25	II- group (n=29) BMI≤25
Age	25,4 ±2,28	25,6±3,08
Average age of menarche	12,59 ± 1,50	12,50 ± 1,27
LH [0.9-15 mIU/ml]	21,4±0,97	20,3 ±0,7
FSH [<10 mIU/ml]	5,00 ± 1,83	5,41 ± 1,69
LH/FSH ratio	3,23 ± 2,58	2,19 ± 0,89
DHEA-S [0.8-3.9mcg/mL]	4,8± 2,95	3,6± 1,73
Freetestosterone [0-4.1ng/ml]	5,2±0,3	4,7±0,8
AMH [0.2-12.6 ng/mL]	18,07 ± 13,14	12,36 ± 9,06
HOMA index	3,9±1,7	3,07±1,37
Number of antral follicles	17,4 ±3,5	13,02 ± 2,07

Hormonal examination of patients revealed an increase in the level of LH in both groups, regardless of body weight, averaged 21.4 ± 1.0 mIU / ml, while the reference values in the follicular phase are 0.9-15 mIU / ml, while the FSH values in both groups were normal. In the first group, the ratio of the LH/FSH ratio was 3.23 ± 2.58, in the second group 2.19 ± 0.89 (p=0.07). In most cases, in the studied women, the concentration of prolactin in the blood was normal and averaged 407.8±228.4 mIU/ml.

In our study, there was a moderate increase in the concentration of free testosterone, in the first group it averaged 5.2 ± 0.3 ng / ml, in the second group with normal body weight, the level of free testosterone averaged 4.7 ± 0.8 (laboratory reference values 0-4.1 ng/ml), while DHEA-S levels in the blood of women with overweight and obesity were slightly higher 4.8+2.95 µg/ml, compared with the second group with normal body weight in which did not exceed the standard indicators and averaged 3.6+ 1.73 µg/ml, with reference values of 0.8-3.9 µg/ml. The level of AMH in the blood of the studied women in the first group averaged 18.07 ± 13.14 ng / ml, which significantly positively

correlated in both studied groups, with the number of antral follicles, which averaged 17.4 ± 3.5 pcs, in the ratio of the second group, the AMH values were slightly lower compared to the first group and averaged 12.36 ± 9.06 ng/ml with the number of antral follicles 13.02 ± 2.07 pcs.

Transvaginal ultrasound is a standard imaging method used to assess ovarian morphology, however, it is not suitable for use in virgin and obese girls. When using transabdominal ultrasound, diagnosis is difficult due to the difficulty of counting antral follicles, in such patients, the AMH level can be used as an alternative marker of PCOS, which is agreed with the data of other authors Vembur, ReddyNS [9] the AMH level in the blood accurately reflects the number of antral follicles in the ovary and is a potential diagnostic marker of PCOS.

Another candidate for the role of a factor that determines the increase in AMH levels in PCOS is insulin. In our study women with overweight <30 kg/m2, the HOMA index was 3.47 ± 1.37, and in women with obesity (BMI>30 kg/m2) - 4.5 ± 2.03, with normal weight body index HOMA was below 3.07 ± 1.37, however, it also exceeded the norm, which indicates the development of insulin resistance. Classic studies by Mitchell and Rogers showed that obesity was 3 times more likely to be associated with menstrual irregularities compared to women whose body weight was within the normal range. Hyperinsulinemia is more common in women with PCOS and anovulatory cycles than ovulatory cycles, and a decrease in insulin levels is associated with the restoration of ovulatory cycles.

Conclusion.

1. LH values, regardless of body mass index, were above normal values, while FSH values in both groups were normal, however, the ratio of the LH/FSH ratio was 3.23 ± 2.58 in the first group, in the second group 2.19 ± 0.89 (p=0.07).

2. Biochemical markers of free testosterone hyperandrogenism and DHEA-S were higher in women with BMI >25 compared to normal BMI.

3. The level of AMH in the blood of the studied women significantly positively correlated in both studied groups, with the number of antral follicles. The obtained results demonstrate the need to include the determination of the level of AMH as an additional diagnostic criterion for the diagnosis of PCOS.

4. The dependence of insulin resistance indicators in women on BMI indicators was established, which indirectly indicates the presence of metabolic syndrome in these women.

5. In connection with the foregoing, it is advisable for all overweight and obese women of fertile age, regardless of the types of reproductive dysfunction with an elevated HOMA index, to monitor BMI and take measures aimed at maintaining ideal weight and reducing related diseases.

References

1. Zawadski, JK.; Dunaif, A. Diagnostic criteria for polycystic ovary syndrome; towards a rationalapproach. In: Dunaif, A.; Givens, JR.; Haseltine, F., editors. Polycystic Ovary Syndrome. Vol. 1992. Boston, MA: Black-well Scientific; p. 377-384.

2. National Institutes of Health. Evidence-Based Methodology Workshop on Polycystic OvarySyndrome: Executive Summary. Washington: National Institutes of Health; 2012.

3. Azizova G.D., Asatova M.M., Nadyrkhanova N.S., Dauletova M.J. Polycystic Ovary Syndrome As A Predictor Of Metabolic Syndrome In Women Of Reproductive Age. Nat. Volatiles & Essent. Oils, 2021; 8(4): 15615-15618

4. Reinehr T, Kulle A, Rothermel J, et al. Longitudinal analyses of the steroid metabolome in obese PCOS girls with weight loss. Endocr Connect. 2017;6(4):213-224.

5. Moran C, Arriaga M, Arechavaleta-Velasco F, Moran S. Adrenal androgen excess and body mass index in polycystic ovary syndrome. J ClinEndocrinolMetab. 2015;100:c9999.

6. Pasquali R, Oriolo C. Obesity and androgens in women. Front Horm Res. 2019;53:120-134.1836.

7. Rosenfield RL, Ehrmann DA. The pathogenesis of polycystic ovary syndrome (PCOS): the hypothesis of PCOS as functional ovarian hyperandrogenism revisited. Endocr Rev. 2016;37(5):467-520.

8. Ryazantseva E.M., Potin V.V., Tarasova M.A., Misharina E.V. The role of hyperleptinemia, insulin resistance and hyperestrogenemia in the development of ovarian insufficiency in women with obesity // Journal of Obstetrics and Women's Diseases. 2016; 65(5). Page 56-63.

9. Vembu R, Reddy NS. Polycystic Ovary Syndrome (PCOS), Diagnostic Criteria and AMH. EndocrRev. 2017; 18(1): 17-21