Comparison of HbA1c levels in obese and non-obese polycystic ovarian patients

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Summary

Aim: To compare obese and non-obese polycystic ovary syndrome (PCOS) patients with respect to lipid profile, hormone profiles, and hemoglobin A1c (HbA1c) values indicating chronic hyperglicemia. *Materials and Methods:* Thirty PCOS patients with a body mass index (BMI) > 25 and 35 non-obese PCOS patients with BMI < 25 were compared with regard to basal luteinizing hormone (LH), follicle-stimulating hormone (FSH), prolactin (PRL), estradiol (E2), fasting blood sugar (FBS), low-density lipoprotein (LDL), high-density lipoprotein (HDL), total cholesterol (TCOL), triglyceride (TG), and HbA1c values. *Results:* HDL value (p = 0.005) was significantly higher in non-obese group while TG (p = 0.001) was higher in the obese group. No significant difference was found between other values. *Conclusion:* Lipid metabolism impairment seems to be more marked in obese PCOS patients. Moreover, it is obvious that insulin resistance is higher in obese group. The absent difference between obese and non-obese groups in terms of HbA1c values suggests that insulin resistance occurring in the obese group may also be important in the non-obese group. In this context, cardiovascular risks may increase in non-obese PCOS patients.

Key words: Polycystic ovary syndrome; Obese; HbA1c; Lipid metabolism; Insulin resistance.

Introduction

Polycystic ovary syndrome (PCOS) is the most common cause of anovulation and affects about 5%-10% of women in their reproductive age. Its clinical symptoms comprise acne, hirsutism, hyperandrogenemia, and endocrinological effects of high levels of luteinizing hormone (LH) [1, 2]. PCOS has also shown to be associated with insulin resistance, glucose intolerance, obesity, and some lipid abnormalities [1, 3]. It has been suggested that clinical and biochemical characteristircs of insulin resistance in PCOS are associated with obesity [4-6]. The aim of the present study was to compare certain biochemical and hormonal parameters, and hemoglobin A1c (HbA1c) levels between obese and non-obese PCOS patients.

HbA1c is considered a marker of chronic hyperglycemia and yields information on mean blood glucose levels within the last two to three months. HbA1c has advantages such as reproducibility and reflects mean blood glucose levels in non-fasting periods as well [7, 8].

Materials and Methods

Overall, 65 PCOS patients referring to the gynecology outpatient clinic of this hospital between January 2009 and December 2011 were included in the present study. Detailed menstruation histories of all patients were elicited. Their ages were recorded. Height and weight were measured and the presence of hursitism was detected with detailed examination. PCOS diagnosis was made according to revised Rotterdam criteria [9]. If they met at least two of following criteria, PCOS diagnosis was made:

1. Oligo-anovuation (less than six menstruations each year)
2. Clinical and biochemical symptoms of androgen excess including hirsutism (Ferriman-Gallwey score over 8, severe acne, and total testesterone levels over 0.8 ng/dl)
3. Ultrasonographic PCOS appearance [10].

Body mass index (BMI) of the patients included in the study was calculated by dividing their weight by meter square of their height. Accordingly, those with BMI over 25 were considered obese and those with BMI below 25 non-obese. There were 35 non-obese PCOS patients with BMI under 25 and 30 obese PCOS patients with BMI at or over 25. Patients with systemic disease other than PCOS, hypertension, diabetes, additional endocrinologic disease, and other gynecological pathologies were excluded from the study. Approval was obtained from the ethics committee and the study was carried out in accordance with the rules of Helsinki Declaration. Blood samples were drawn from all patients for the measurement of fasting follicule stimulating hormone (FSH), LH, estradiol (E2) and prolactin (PRL) hormone. In the determination of these parameters, immunoenzymatic method was used. In addition, fasting blood sugar (FBS), low-density lipoprotein (LDL), high-density lipoprotein (HDL), total cholesterol (TCOL), and triglyceride (TG) were examined by enzymatic colorimetric method. HbA1c analysis was made with high-performance liquid chromatography (HPLC) method. Data were transferred to computer with SPSS program and recorded as mean ± SD. In the comparison of the data, independent sample test was used.

Results

According to comparative results as shown in Table 1, no significant difference was found between the two groups in terms of age (p = 0.28), FBS (p = 0.16), LDL (p = 0.272), TCOL (p = 0.637), FSH (p = 0.398), LH (p = 0.297), PRL (p = 0.378), E2 (p = 0.591), and HbA1c

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Table 1. — *Summary of results*.

	BMI	MEAN±SD	*p*
Age	< 25	22 ± 4.2	0.028
	≥ 25	25 ± 6.5	
FBS	< 25	86 ± 7.7	0.16
	≥ 25	96 ± 9.1	
HDL	< 25	50 ± 16.1	0.005
	≥ 25	41 ± 8.4	
LDL	< 25	99 ± 28	0.272
	≥ 25	108 ± 34.8	
TCOL	< 25	175.6 ± 35.8	0.637
	≥ 25	179 ± 31.7	
TG	< 25	95.2 ± 48.2	0.001
	≥ 25	145.7 ± 68.9	
FSH	< 25	6.4 ± 2.3	0.398
	≥ 25	6.02 ± 1.3	
LH	< 25	8.1 ± 4.1	0.297
	≥ 25	9.6 ± 6.9	
E2	< 25	64 ± 52	0.591
	≥ 25	58 ± 36	
PRL	< 25	16.2 ± 9.5	0.378
	≥ 25	14.1 ± 9.5	
HbA1c	< 25	5.65 ± 0.69	0.243
	≥ 25	5.91 ± 1.07	

(p = 0.243) levels. However, HDL was significantly higher in (p = 0.005) non-obese group while TG (p = 0.001) was higher in the obese group (Table 1).

Discussion

Clinical and biochemical comparisons were made between obese and non-obese PCOS in various studies. In some of these studies, severe ovulatory dysfunction and higher serum total testesterone levels were found in the obese group [11]. In the present study, patients were standardized in terms of clinical examination findings (ovulation, acne, and hirsutism) and were compared with respect to biochemical and hormone laboratory parameters. In addition, HbA1c levels, which yield information on long-term blood glucose levels, were also compared.

Although mean LH values were found to be lower in the obese group, the difference between the two groups was not significant. Likewise, FSH level was also lower in the obese group without statistical significance. These results show that increase in LH/FSH ratio, which is the indicator of anovulation, is more marked in the obese group, which is in keeping with the results in the literature [4, 11]. On the other hand, no significant difference was observed between groups with regards to E2 and PRL levels. LDL and TCOL levels were not found to be different between two groups while TG was significantly higher in the obese group and HDL was significantly higher in the non-obese group. In the study carried out by EI-Mazny *et al*. [1], all lipid metabolism products were found to be higher in insulin-resistant group whereas in the present study, TG was higher in the obese group with HDL being higher in the non-obese group. According to these results, it may be stated that lipid metabolism disorders occur at a higher rate in obese PCOS patients. At this point, obese PCOS patients seem to be protected from future cardiovascular risks. These results stress the importance of weight-reducing diets in obese PCOS patients in order to decrease future cardiovascular risks [1].

There was no significant difference between two groups in terms of FBS values. When the authors considered HbA1c values, which is important as it shows blood glucose control within last three months, no significant difference was present between obese and non-obese groups. However, the value of 5.9 observed in the obese group, can be considered in the upper limit of normal. As it is known, HbA1c is an important value as it reflects mean blood glucose levels in the last two to three months. It shows chronic hyperglycemia and gives information not only on FBS levels but also on mean satiation blood sugar levels [8]. In PCOS, the relation between insulin resistance and metabolic syndrome is evident [3]. It is suggested that the most common cause of abnormalities in PCOS is insulin resistance [12]. Therefore, these patients run the risk of a higher rate of type II diabetes and have a four-fold higher cardiovascular disease risk [13]. This insulin resistance in PCOS has mostly been linked to obesity [4].

In the present study, no significant difference was found between obese and non-obese groups in terms of HbA1c values. These results is important since higher insulin resistance is expected in obese group. In previous studies [7], although high HbA1c value is weak diagnostic marker for diabetes, high HbA1c values in PCOS were linked to increased BMI and lipid profiles and indicates a possible increased risk of cardiovascular disease in PCOS patients. The present study demonstrated that HbA1c values in non-obese PCOS patients was similar to those in obese PCOS patients, which suggests that non-obese PCOS patients may also have higher risk of cardiovascular disease. Although it has low sensitivity for the diagnosis of diabetes mellitus [7], HbA1c levels is considered a gold standard in some studies for some cardiovascular events and mortality [14].

In addition, in some population-based studies, a close relation between BMI, lipid profiles, and HbA1c indicate that HbA1c may be utilized as an inflammatory marker in PCOS [15]. In conclusion, although the association of HbA1c and BMI is regarded important in obese PCOS patients, similar values in both groups obtained in our study, should alert us to the fact that cardiovascular risks may also be present in non-obese PCOS patients, suggesting that recommendations of life style changes and diet should be made for non-obese PCOS patients as well. Thus, HbA1c values should be measured in non-obese patients with the suspicion of PCOS and their probable cardiovascular risks should be kept in mind.

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