INFLUENCES OF OBESITY ON INFERTILITY DUE TO POLYCYSTIC OVARY SYNDROME

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Abstract: The polycystic ovary syndrome is considered one of the most frequent diseases affecting the fertile women and the most important cause for anovulatory infertility. Up to 50% of women with polycystic ovary syndrome are overweight or obese. This study approaches the association between obesity and infertility in three groups of patients with polycystic ovary syndrome, the first group is made up of normal-weight patients (BMI 19,0-24,9 kg/m²), the second is made up of overweight and obese patients (BMI over 25,0 kg/m²) and the third group includes all patients with PCOS, disregarding their BMI.
Keywords: obesity, infertility, polytheistic ovary syndrome
Rezumat: Sindromul ovarelor polichistice este considerat una dintre cele mai frecvente afecţiuni apărute la femeile de vârstă fertilă şi totodată cea mai frecventă cauză de sterilitate anovulatorie. Obezitatea se asociază sindromului ovarelor polichistice în aproximativ jumătate din cazuri. Cercetarea urmăreşte implicaţiile obezităţii asupra infertilităţii din sindromul ovarelor polichistice, prin analiză statistică a rezultatelor obţinute pe trei loturi de paciente cu ovar polichistic, un lot cu paciente normoponderale (IMC 19,0-24,9 kg/m²), cel de-al doilea, cu paciente supraponderale şi obeze (IMC peste 25,0 kg/m²) si un lot martor cu totalitatea pacientelor incluse în studiu, indiferent de IMC.
Cuvinte cheie: obezitate, infertilitate, sindromul ovarelor polichistice

INTRODUCTION

Although the first description of polycystic ovary syndrome was made in 1935 and was attributed to Stein and Leventhal, it could have been observed since 1721, when the Italian science man Antonio Vallisneri mentioned "a young peasant, married, moderate obese and infertile, with two ovaries larger than normal, whitish, shiny, firms, just like the pigeon eggs". This picture resembles to the polycystic ovary syndrome, where infertility and obesity are frequently encountered. Another long period of time had passed until in 192, when Achard and Thiers observed a correlation between hyperandrogenism and insulin resistance in their research about "the diabetic woman with beard". This aspect also occurs in polycystic ovary syndrome, being called "hirsute woman with hyperinsulinemia".

Obesity and overweight increase the insulin resistance and are associated with disorders of human reproduction mechanisms, including menstrual disorders, infertility and complications during pregnancy and birth giving.

OBJECTIVES

Within this paper, we aimed at researching the implications of obesity and overweight on infertility due to PCOS.

MATERIAL AND METHOD

The research took place between 1.01.2003-31.12.2006 and included 112 patients.

Regarding all patients, the following items were followed: age, number of pregnancies, number of spontaneous abortions in first trimester of pregnancy and the number of births, irrespective of the ways in which they ended: naturally or through Caesarean operation. The frequency of anovulatory cycles was assessed with the help of the manometric curve. All patients included in the study were measured in terms of weight and height, calculating the body mass index (BMI).

The results obtained were statistically processed with the help of Windows Excel and SPSS programmes. Pearson Chi-Square and Likelihood Ratio tests within SPSS v 10.0 were also used.

Three study batches were established:
- **batch 1** – normal-weight patients with polycystic ovary syndrome (body mass index between 19,0-24,9 kg/m²);
- **batch 2** – overweight and obese patients (body mass index over 25,0 kg/m²).
- **batch 3** – the total of normal-weight and obese patients with polycystic ovary syndrome included in the research.
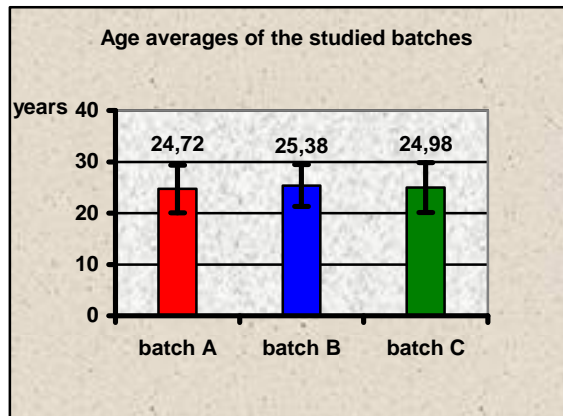
RESULTS

The studied patients were women in fertile period, aged between 17 and 34 years old, with an average age of 24,98 years and a standard deviation of ±4,88. Batch A, comprising normal-weight patients, was made up of 16 patients under the age of 20 (24%), 37

patients in the third decade (54%) and 15 patients more than 30 years old. In 6 cases, the overweight patients were under 20 years old, in 34 cases (78%), they were between 20-30 years old and in 4 cases, over 30 years old. The analysis of age averages and standard deviations of the patients with polycystic ovary syndrome on the three batches was represented in the graphic below (graphic 1).

Graphic 1. Patients' age averages and standard deviations.

The age averages of the batches A and B were compared with the help of the Independent-Sample T test, resulting that the values do not differ significantly from the statistical point of view; the batches were homogenous from the point of view of the patients' age (p=0,557).

a. The number of previous pregnancies of the women with polycystic ovary syndrome, included in the study, represented the first question regarding the obstetrical antecedents. Affirmative answers were given by 16 normal-weight patients (24%) and by 6 overweight and obese patients (13%). The results on those three batches are represented in the graphic below (graphic 2).

Graphic 2. Frequency of pregnancies within the personal physiologic antecedents regarding the study batches.
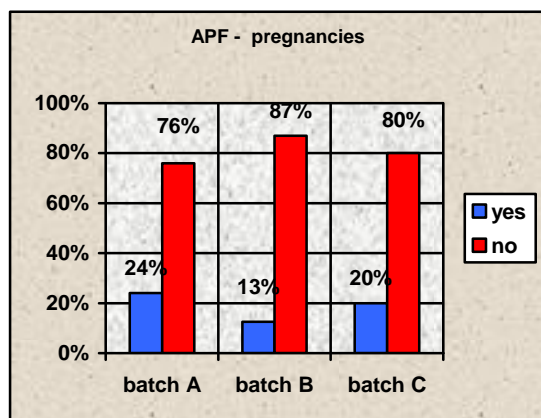
a. The investigation of infertility continued with the quantification of the first trimester-pregnancy loss existence, when the synthesis of the ovarian hormones, especially of progesterone, plays an important part. Regarding the antecedents of the patients investigated for polycystic ovary syndrome, the frequency of spontaneous

abortions varied between 5% for the batch B and 9% for the batch A (graphic 3).

Graphic 3. Frequency of spontaneous abortions in the first trimester of pregnancy within the personal and physiological antecedents of the study batches.
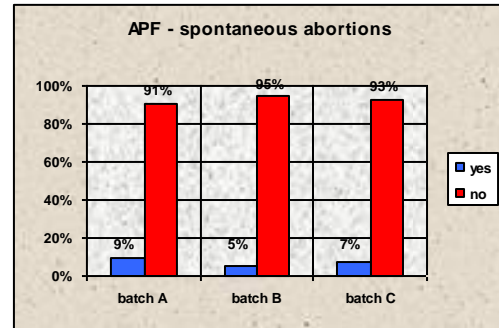

Also, the existence of pregnancies antecedents ended by birth giving, irrespective of the way (naturally or though Caesarean operation) was assessed; the results obtained on the three batches varied between 6 and 12% (graphic 4). All cases in which the product of conception was considered as new born (registered in the Registry of Births) were taken into consideration, irrespective of the gestational age.

Graphic 4. Births frequency in personal and physiological antecedents of the study batches.
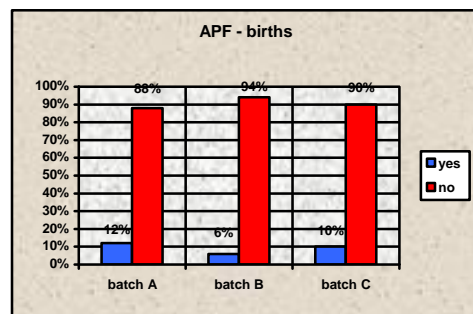
With the help of the manometric curve, the frequency of the ovulatory cycles was investigated, emphasizing the postovulatory thermal ascension. Out of the total number of patients, 55 were ovulating during the investigation. Ovulatory cycles were identified in 46 normal-weight patients and in 9 patients with BMI>24,9 kg/m2 (graphic 5).

Graphic 5. Ovulation frequency in patients with polycystic ovary, included in the study.
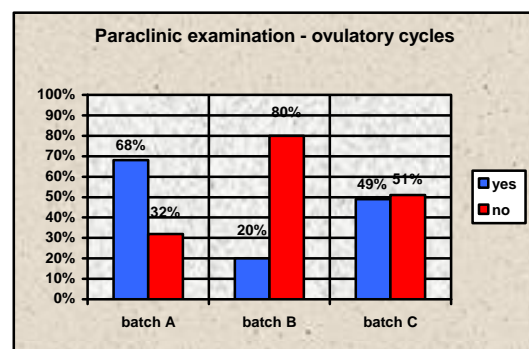
DISCUSSIONS

PCOS patients frequently present disorders of the reproduction function (4). The ovarian function in the case of the infertile patients presenting PCOS is characterised by inter-correlated disorders in folliculogenesis and steroidogenesis. The most frequent reasons for which a PCOS patient goes to the doctor's are: menstrual disorders, hyperandrogenism effects and disorders of the reproduction function. The problems of reproduction consist, both in primary sterility due to the chronic anovulation and in the rate of the first trimester miscarriages.

Within our study, the number of previous pregnancies represented the first question regarding the obstetrical antecedents. The normal-weight patients reported previous pregnancies more frequently in comparison with those overweight and obese; this aspect was not significant statistically speaking (p>0,05).
The research made in 2000 by Asuncion M, Calvo RM et al. quantized a rate of previous antecedents of PCOS patients of 0,7±0,9. Within our research, 20% of PCOS patients presented previous pregnancies (graphic 2).

The patients' investigation continued with the assessment of the existence of first-trimester spontaneous abortions, when the ovarian synthesis of pregnancy protector hormones, especially of progesterone, plays an essential part.

The rate of first-trimester spontaneous abortions was larger in normal-weight patients than in the obese patients, but there is no negative relation between obesity and miscarriage risk, the estimated p, as a result of Likelihood Ratio test, being of 0,594. Regarding the total number of patients having PCOS, the rate of first-trimester miscarriages was of 7%.

The specialized literature mentions a rate of miscarriages in the case of the PCOS patients between 0,3±0,1 and 0,7±1.

The incidence of the spontaneous abortions in our country is of about 15-20%, being difficult to establish due to the different classification criteria, to the diagnosis difficulties in certain cases, as well as due to insincerity of the persons under consideration. Out of these, 85% are produced in the first trimester of pregnancy. The more reduced rate of the spontaneous abortions in the first trimester of pregnancy within our study, in contradiction with the literature data, which sustain a more increased frequency of miscarriages in the case of PCOS patients, may be due to the selected age segment, where 83% of the patients are under 30 years old. Yet, having in view that the rate of the previous pregnancies was of 20%, it may be suggested the fact that one of two pregnancies ended by a miscarriage (either by a spontaneous abortion in the first trimester of pregnancy – 70%, either in the second trimester or upon request – 30%).

It was also assessed the existence of previous pregnancies ended with births, either naturally or though Caesarean operation in proportion of 10% (graphic 14). Although the frequency of previous births is larger in PCOS normal-weight patients, this difference is not significant from the statistical point of view. There is no relation between obesity and the previous births (p>0,05). The studied papers mentioned a rate of births 0,4±0,8, in the case of women with polycystic ovary.

In the case of our study, anovulatory cycles were identified in 51% of cases (graphic 5). This percentage corroborates with the frequency of oligomenorrhea and spaniomenoreea. (taken together, these occur in proportion of 49%) within the integral batch; this aspect was also supported by the literature data (9, 10, 11).

Table 1. Batches comparison according to the presence of ovulatory cycles in patients with polycystic ovary syndrome.

BMI	Paraclinic examination – ovulation		Independent-Sample T test	
	yes	no	Value t	p
Batch A	68%	32%	- 8.485	0.000*
Batch B	20%	80%		
Batch C	49%	51%		

Obesity influences the incidence of anovulatory cycles. In the case of the overweight and obese patients, the anovulatory cycles are 2,5 times more frequent than in the case of the normal-weight patients (graphic 5). This difference is significant from the statistical point of view, suggesting a negative correlation between obesity and ovulation (table 1).

CONCLUSIONS

1. Polycystic ovary syndrome is considered one of the most frequent affections in fertile women and at the same time, one of the most frequent causes of anovulatory sterility.
2. The cases were investigated based on a standard sheet, the positive diagnosis of PCOS being established according to the criteria of the Rotterdam Agreement 2003, and obesity/overweight by calculating the Body Mass Index.
3. The research was made on a number of 112 patients with polycystic ovary syndrome made between 1.01.2002 – 31.12.2006, out of which 68 (60,71%) were normal-weight and 44 (39,29%) were overweight or obese. In the moment of their inclusion in the study, the patients' age was between 17-34 years old, with an age average of 24,98 years.
4. We did not succeed in proving the influence of obesity regarding the presence of previous pregnancies, abortions in the first trimester of pregnancy and births in PCOS patients.
5. In the case of the overweight and obese patients, the anovulatory cycles were 2,5, times more frequent than in the case of the normal-weight patients with PCOS.
6. The incidence of the ovulatory cycles is negatively correlated with the relation waist/hips, sagittal abdominal diameter and the echographic quantification of the visceral aqueous tissue. Thus,

we can speak about a direct influence of obesity and especially of those with android type distribution on the inhibition of ovulation, in the case of women with PCOS.

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