

Overweight and obesity prevalence in referral population of infertile women with polycystic ovary syndrome

Abstract

Background: Obesity and polycystic ovary syndrome are commonly associated, but data regarding overweight and obesity prevalence in PCOS patients remains controversial and depends on study population (referral or unselected) and PCOS phenotype. There are few studies which present ethnic differences in prevalence of overweight and obese women with PCOS.

Objective: To test the hypothesis that overweight and obesity prevalence is not similar in infertile women with PCOS and without PCOS and depends on ethnicity of patients.

Subjects and methods: A prospective study was performed in a referral (clinical) population, included 397 infertile women (134 with PCOS, aged 28.2±4.7years (Group A) and 263 without PCOS, aged 29.4±5.4years (Group B); 363 Caucasians and 34 Asians), who were referred for the evaluation of infertility at clinical research centers in Irkutsk and Ulan-Ude (Eastern Siberia) between 2007 and 2015, and agreed to participate in the prospective study. 53 fertile women aged 27.6±7.3years were recruited as controls. A complete medical history, physical examination with BMI calculation, laparoscopy, pelvic ultrasound and hormonal immunoassay analysis were performed in all patients.

Results: The mean BMI and obesity prevalence was significantly higher in both groups of infertile patients compared to controls without significant difference between women with PCOS and without PCOS. However, lower rate of subjects with normal BMI was demonstrated predominantly in the PCOS group. The increase of mean BMI vs controls was more significant in Asian infertile women with PCOS than in Caucasians.

Conclusion: Our study results suggest that the mean BMI and obesity prevalence are comparable in the referral population of infertile women with and without PCOS. Nevertheless, the lower number of patients with normal BMI, compared to fertile controls, have been found only in the group of PCOS infertile women. These findings may be explained by phenotype and ethnic heterogeneity of PCOS women. Asian infertile women with PCOS are more likely to have increased BMI than Caucasians. Due to study limitations more data is needed in referral as well as in unselected populations of PCOS women from Asian and Caucasian ethnic groups.

Keywords: overweight, obesity, prevalence, ethnicity

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Abbreviations: PCOS, polycystic ovary syndrome; BMI, body mass index

Introduction

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders affecting women of reproductive age worldwide.^{1,2} The diagnosis of PCOS is based on the ESHRE/ASRM 2003 criteria,^{3,4} with a detailed description of the PCOS phenotype.^{5,6} PCOS is characterized by a spectrum of clinical manifestations and associated morbidities. Previously it was reported that obesity is more prevalent in women with PCOS compare to patients without PCOS, however, the data on overweight and obesity incidence in PCOS patients remains controversial and depends on PCOS phenotype and study population (referral or unselected). It has been shown that PCOS patients from referral population have a greater mean BMI and higher

prevalence of obesity compared to women with PCOS diagnosed in the medically unselected population.⁷⁻¹²

The evidence that obesity is associated with higher prevalence of PCOS is conflicting too. Data from some retrospective and longitudinal observational studies have suggested the higher incidence of PCOS among obese women, but it was not supported by data obtained in other studies.¹³⁻¹⁸ Racial and ethnic characteristics are very important aspects to be considered in PCOS but there are few studies reported ethnic differences in overweight and obesity prevalence among women with PCOS.¹⁹⁻²² Siberia is a unique region where Caucasian and Asian populations live in similar geographic and socio-economic conditions since the 17th century. The main ethnic groups in Eastern Siberia are Russians (Caucasians) and Buryats (Asians). However, the ethnic impact on BMI in PCOS patients in Siberia have not been adequately investigated.

Objective

To test the hypothesis that overweight and obesity prevalence is not similar in infertile women with PCOS and without PCOS and depends on ethnicity of patients.

Subjects and study design

A prospective study was performed in a referral (clinical) population, included 397 infertile women (134 with PCOS (Group A) and 263 without PCOS (Group B); 363 Caucasians and 34 Asians), who were referred for the evaluation of infertility at clinical research centers in Irkutsk and Ulan-Ude (Eastern Siberia) between 2007 and 2015, and agreed to participate in the prospective study. 53 fertile premenopausal women were recruited as controls.

Methods

A complete medical history, physical examination, laparoscopy, pelvic U/S and hormonal immunoassay analysis (for total testosterone, DHEAS, LH, FSH, prolactin, TSH, and 17-hydroxyprogesterone) were performed using a standardized protocol in all infertile women to verify infertility causes. Hirsutism was defined by a modified Ferriman-Gallwey (mFG) hirsutism score >6 in Caucasians and >4 in Asians. Menstrual dysfunction (MD) was defined as menstrual cycles ≥ 35 and/or ≤ 23 days. Polycystic ovarian morphology (PCO)

was defined as an antral follicle count (2–9 mm diameter) ≥ 12 and/or an ovarian volume of $\geq 10\text{cm}^3$. Body mass index (BMI) was calculated on the basis of weight (kilograms) and height (meters). Subjects with BMI 25–29.9kg/m² were classified as overweight, and with BMI $\geq 30\text{kg/m}^2$ as obese. The study was approved by the Institutional Review Board of the Scientific Center of Family Health and Human Reproduction Problems. All subjects gave written informed consent. ANOVA, Mann-Witney test, χ^2 test and the Fisher’s exact test were used for statistical analysis, p-value less than 0.05 were considered as statistically significant.

Results

Baseline characteristics of the study population are presented in the Table 1. The data indicate that the mean BMI and obesity prevalence were significantly higher in both groups of infertile patients compared to controls without any difference between women with PCOS and without PCOS. However, only in the group A, consisted of PCOS subjects, the number of women with normal BMI was significantly lower in comparison with fertile controls. As shown in the Table 2, the difference in overweight and obesity in PCOS and non-PCOS women has not reached significance in Asian (Buryat) as well as in Caucasian (Russian) patients (all p>0.05). However, the increase of mean BMI vs controls was more significant in Asian infertile women with PCOS than in Caucasians (Table 3).

Table 1 Age and anthropometric characteristics of study population

Variables	Group A (PCOS) n=134	Group B (without PCOS) n=263	Controls n=53
	1	2	3
Age (years, mean±SD)	28.2±4.7	29.4 ±5.4	27.6 ±7.3
BMI (kg/m ² , mean±SD)	25,7±5,7**	25,1±5,4*	23,2±3,1
BMI lower than 18kg/m ² , n (%)	6(4.5)	7 (2.7)	1(1.9)
Normal BMI (18-24.9kg/m ²), n (%)	67(50)#	148(56.3)	37(69.8)
Overweight (25-29.9kg/m ²), n (%)	33(24.6)	62(23.6)	12(22.6)
Obese ($\geq 30.0\text{kg/m}^2$), n (%)	28(20.9)##	46(17.5)#	3 (5.7)

*p_U < 0,05 ; **p_U < 0,01 ; #p_{χ²} < 0,05 ; ##p_{χ²} < 0,01 , compared to controls

Table 2 Characteristics of Caucasian and Asian PCOS and non-PCOS infertile women from study population

Variables	Caucasians n=363		Asians n=34	
	PCOS n=123	Without PCOS n=240	PCOS n=11	Without PCOS n=23
Age (years, mean±SD)	28.3±4.8	29.2±5.4	28.3±4.4	32.1±4.9
BMI (kg/m ² , mean±SD)	25.6±5.8	25.2±5.5	26.5±5.9	23.9±4.7
BMI lower than 18kg/m ² , n (%)	6 (4.9)	6(2.5)	0	1 (4.3)
Normal BMI (18-24.9kg/m ²), n (%)	62(50.4)	136(56.7)	5(45.4)	12 (52.2)
Overweight (25-29.9kg/m ²), n (%)	29(23.6)	54(22.5)	4(36.4)	8(34.8)
Obese ($\geq 30.0\text{kg/m}^2$), n (%)	26 (21.1)	44 (18.3)	2(18.2)	2(8.7)

Table 3 Age and BMI of Caucasian and Asian infertile women with PCOS and controls

Variables	Caucasians		Asians	
	PCOS n=123	Controls n=33	PCOS n=11	Controls n=23
Age (years, mean±SD)	28.3±4.8	27.4±6.6	28.3±4.4	28.4±8.2
BMI (kg/m ² , mean±SD)	25.6±5.8*	23.4±4.2	26.5±5.9**	22.9±2.9

*p: 0,05; **p: 0,01, compared to controls.

Discussion

Obesity is a well known cause of menstrual cycle abnormalities, ovulatory disorders and infertility. Even though many obese people are fertile, BMI strongly contributes to the risk of impaired fertility and weight loss significantly increases the chances of getting pregnant.²³ It was previously demonstrated that prevalence of obesity in PCOS women is significant, correlates with severity of hyperandrogenism and exacerbates insulin resistance.¹⁰ At the same time some authors reported that the prevalence of metabolic syndrome does not differ in obese vs non-obese women with PCOS. This may be explained by the heterogeneity of the groups of infertile women due to different causes of infertility, PCOS phenotype and racial differences.

Our data has shown that obesity rate in fertile controls is significantly lower than in women with infertility regardless of PCOS presence. These findings did not depend on race: the prevalence of overweight and obesity in PCOS and non-PCOS women was comparable in Asian as well as in Caucasian infertile patients. Our results are not conflicting with recently reported data from Jordan, where was no statistically significant difference in BMI in infertile women with and without PCOS. However, in our study Asian PCOS patients demonstrated more significant increase of mean BMI compared to fertile controls than Caucasian women with PCOS. In our opinion, this emphasizes the importance of race when considering potential associations of PCOS and obesity and their interaction.

Study strength

Our study design allowed us to estimate overweight and obesity prevalence in infertile women with PCOS and without PCOS whilst taking into account their race. The main study limitations were as follows: only infertile patients were recruited in this study; a size of the group of Asian (Buryat) women with PCOS was relatively small due to lower rate of Buryats in the general population of Eastern Siberia; we used immunoassay method of androgen detection, whereas a mass spectrometry method is preferred.

Conclusion

Our study results suggest that the mean BMI and obesity prevalence are comparable in the referral population of infertile women with and without PCOS. Nevertheless, the lower number of patients with normal BMI, compared to fertile controls, have been found only in the group of PCOS infertile women. These findings may be explained by phenotype and ethnic heterogeneity of PCOS women. Asian infertile women with PCOS are more likely to have increased BMI than Caucasians. Due to study limitations more data on the ethnicity impact of PCOS on overweight and obesity is needed in referral as well as in unselected populations of PCOS women from Asian and Caucasian ethnic groups.

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None.

Conflict of interest

The author declares no conflict of interest.

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