Prevalence of Metabolic syndrome in Indian subcontinent women with PCOS compared to their Caucasian counterparts.

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The Prevalence of Metabolic Syndrome in Norwegian and South Asian Women with PCOS living in Norway

Abstract:

Purpose: Our objective was to study the prevalence of metabolic syndrome in PCOS Norwegian women and South Asian immigrant women living in Norway.

Methods: Our study included a total of 256 women with PCOS, 205 Caucasians (Norwegian women) and 51 Indian subcontinent women (IPW). These women were retrospectively identified in our clinical database with detailed records on hormone analysis in this cohort study.

Results: 27.8% of Caucasians and 54.9% of IPW had MS, p=0.000. There was no difference in age, BMI, or waist-hip-ratio between the two groups. The IPW had significantly higher insulin levels during a 2 hour oral glucose tolerance test.

Conclusion: MS and insulin resistance occurred significantly more often in IPW than in Caucasians. The higher occurrence cannot be explained by BMI or waist hip ratio as we did not find any significant differences in these parameters between the two groups. The difference in prevalence between the two groups may be explained by Yajniks "thin fat Indian" theory which is explained through epigenetic. The high prevalence of MS amongst IPW residing in Norway indicates that residence has no effect.

Introduction

Polycystic ovary syndrome (PCOS) is characterized by hyperandrogenism or hirsutism, oligomenorrhea, and polycystic ovaries(Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome (PCOS) 41-47) and affects about 6 % of women in their reproductive age.(Asuncion;Azziz;Diamanti-Kandarakis;Kumarapeli) It is a heterogeneous condition also involving insulin resistance.(Dunaif) Dysglycemia is central in the definition of metabolic syndrome (MS) where the other factors are raised blood pressure, elevated triglyceride levels, low high-density lipoprotein HDL levels and central adiposity.(Alberti) The etiology of PCOS is unknown but genetic predisposition and environmental factors during prenatal and postnatal life may play a role in the manifestation of both syndromes.(Yajnik;Crosignani and Nicolosi;;Xita and Tsatsoulis)

Although MS is common in women with PCOS (Wijeyaratne) there are ethnic disparities in the prevalence of dysglycemia.(Huddleston) Indian Sub-Continent PCOS women (IPW) have significantly higher rates of fasting insulin and lower rates of insulin sensitivity than Caucasian controls.(Wijeyaratne) In order to find out whether these differences are related to ethnicity or residence we did study the prevalence of MS in Norwegian and South Asian immigrant women with PCOS living in Norway.

Patients and Methods

Selection of patients

256 patients, 205 Caucasians and 51 IPW, with PCOS were retrospectively identified in our clinical database with detailed records on hormone analysis in this cohort study.

The diagnosis of PCOS was based on the Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group, 2004. That is, the presence of at least two of the following conditions: oligo/anovulation, hyperandrogenism/hirsutism and polycystic ovaries. Attenuated 21-hydroxylase activity, Cushing syndrome, androgen-secreting tumors and hyperprolactinemia were excluded by appropriate tests.

The diagnosis of MS was based on the 2009 joint interim statement of the International Diabetes Federation Task Force on Epidemiology and Prevention; National Heart, Lung, and Blood Institute; American Heart Association; World Heart Federation; International Atherosclerosis Society; and International Association for the Study of Obesity.

Data analysis

Data are shown as mean and standard deviation. Between-group comparisons were performed with chi-square test or independent sample t-test as appropriate. $P \leq 0.05$ was considered statistically significant. The SPSS 18 program package was used for statistical analysis.

Results

27.8 % of Caucasians and 54.9 % of IPW had MS, p = 0.000. Table 1.

Metabolic syndrome in Caucasian and Indian/Pakistanian PCOS women. Crosstabulation

			1=Caukas	2=IPW	
			1	2	Total
METABOLIC SYNDROME	Not MS	Count	148	23	171
		% within Caukas vs IPW	72.2 %	45.1 %	66.8 %
	Had MS	Count	57	28	85
		% within Caukas vs IPW	**27.8 %**	**54.9 %**	33.2 %
Total		Count	205	51	256
		% within Caukas vs IPW	100.0 %	100.0 %	100.0 %

Age, BMI, waist and waist-hip ratio (WHR) were not different between the two groups. However, the IPW had significantly higher insulin levels during a 2 hour oral glucose tolerance test

Table 2

	Caucasian	IPW	P-value
Age	27.3 ± 4.9	26.5 ± 5.7	0.31
BMI	29.0 ± 6.3	29.0 ± 5.6	0.99
Waist	98 ± 18	100 ± 13	0.48
WHR	0.90	0.92	0.43
Testosterone nmol/l	2.18 ± 0.99	2.23 ± 1.05	0.36
SHBG nmol/l	40.5 ± 29.3	24.7 ± 13.7	0.01
Ferriman-Gallwey score	3.7 ± 4.1	8.5 ± 7.5	0.00
Ferritin	64 ± 53	40 ± 30	0.01

Kreatinin	63 ± .7	58 ± 7.7	0.00
DHEA nmol/l	26 ± 16	16 ± 10	0.02
Insulin 0 min. pmol/l	100 ± 82	121 ± 70	0.14
Insulin 120 min. pmol/l	521 ± 469	796 ± 548	0.02
Glucose 0 min. mmol/l	5.2 ± 0.6	5.4 ± 1.0	0.18
Glucose 120 min. mmol/l	5.9 ± 1.9	6.2 ± 2.2	0.44
Apolipoprotein A1	1.43 ± 0.3	1.26 ± 0.2	0.00
HDL kolesterol	1.29 ± 0.36	1.17 ± 0.34	0.08
Triglycerider	1.17 ± 0.84	1.37 ± 0.81	0.19
Blood pressure, diastolic	76 ± 21	75 ± 24	0.60
Blood pressure, Systolic	119 ± 30	107 ± 33	0.02
Diabetes II No of individuals	5 = 3.3 %	2 = 4.8 %	0.65

Discussion

The study attempts to understand whether the disparities in the prevalence of MS between IPW and caucasian women with PCOS are related to ethnicity or residence. The study shows that women with PCOS from the Indian subcontinent have significant higher prevalence of MS than their Caucasian counterparts. MS is strongly associated with insulin resistance. Several studies conclude that metabolic disorder in these women cannot be explained by BMI alone (Kalra, Nair and Rai). IPW seem to display higher levels of insulin resistance, at lower BMI values than the Caucasian counterparts. A study from UK displays the similar findings as our study (Wijeyaratne).

There would seem to be a higher level of insulin resistance among Indian women compared to white women with the same BMI. Yajnik explains this through epigenetic and the”thin fat Indian” theory. There does however also seem to be evidence pointing in the direction of a

relationship between insulin resistance and the lipid profile in PCOS women (Slowinska-Srzednicka).

A cohort Swedish study (Hudecova) showed a twofold lower prevalence of MS in Swedish women with previous PCOS diagnosis compared to corresponding figures published for American and Asian populations, supporting the theory of difference in prevalence of MS amongst different ethnic groups. (Hudecova) In general, triglyceride levels also in this study were increased in women with PCOS. At the same time the study concluded that MS occurred more often in women with a previous diagnosis of PCOS than in healthy controls.

When comparing triglycerides, HDL and LDL among IPW and Caucasian women with PCOS, we noted a trend toward higher levels of TG and lower levels of HDL in the IPW group. There may be an association between insulin resistance and disturbance of lipid profile, independent of obesity, in PCOS women (Slowinska-Srzednicka).However a study which investigated the effect of BMI, insulin resistance and androgens on the lipid profile of adolescent girls concluded somewhat differently (Fulghesu). The study consisting of 71 PCOS and 94 control girls revealed that there were no differences in the lipid profile between the adolescent PCOS group and the control group. BMI, waist measurement and WHR were important factors contributing to lipid profile disturbance.

A small diversion, nevertheless an important angel in considering the disparities seen in these two groups is the overall prevalence of diabetes in India, a prevalence that seems to be rising in alarming figures(Diamond). India now presents with more people with type 2 diabetes than any other nation. High calorie intake and little exercise, the so called Western life style seems to be contributing factors according to Diamond. The higher prevalence of diabetes 2 occurs also in emigrant Indian communities having reached higher living standards much earlier than Indians in India. Several studies also indicate a higher prevalence of diabetes in urbanized areas compared to rural areas (Diamond; Misra and Khurana). Individuals who have moved from rural areas to urbanized areas show an increase in BMI. The common factor for the west and India is that diabetes is associated with obesity, high blood pressure and sedentariness. Unlike the West, however prevalence of the disease is higher among affluent, educated, urban Indians than among poor, uneducated rural people. Further diabetes presents at a lower BMI in Indians compared with their Caucasian counterparts (Ramachandran, Snehalatha, and Vijay) (The Obesity-Diabetes Association: What Is Different in Indians?).

The relationship of BMI and body fat percentage between Chinese, Malaysians and Indians compared with Caucasians, concluded that in the Asian group the same BMI corresponded with 3-5 percent higher body fat (BF) % in the Asian group (Deurenberg, Deurenberg-Yap, and Guricci). Yajnik has proposed that Indians show a larger percentage of BF compared with Europeans, despite their lean appearance giving rise to "thin-fat Indian" as a describing concept(Yajnik and Ganpule-Rao). Based upon these findings further investigations were promoted bringing us to one of the hallmark questions of present time; can these observations be seen as a reflection of genetic factors? Modern day investigations bring together genetic basis of biological characteristics and environmental influences in rise of epigenetic analysis. Barker, being the pioneer of the epigenetic theory showed twenty years ago that individuals with low birth weight were at greater risk of developing coronary heart diseases.(Barker)

In view of the epigenetic hypothesis, Yajnik proposes that a combination of intrauterine environment and maternal nutrition influences the phenotype(Yajnik and Ganpule-Rao). Being that different individuals respond differently to the same environment, permanent changes occurring during intrauterine life is known as fetal programming. Yajnik showed that Indian babies, despite lower birth weight had higher levels of BF percentage and higher levels of intra-abdominal fat, concluded that the "thin fat Indian" may well be the result of epigenetic regulation and fetal programming(Yajnik and Ganpule-Rao).

A large percent of PCOS patients are obese. IR is more frequently manifested in obese PCOS. Insulin resistance is associated with endothelial dysfunction which is one of the major causes in the development of atherosclerosis. (Sitia) Not treated properly MS may culminate into long term consequences as cardiovascular dysfunction and type 2 diabetes mellitus (Daniilidis and Dinas), implicating the importance of early intervention to reduce BMI and prevent onset of dyslipidemia in PCOS patients.

CONCLUSION:

MS and insulin resistance occurred significantly more often in IPW than in Caucasian counterparts. BMI levels and WHR did not differ between the two groups, and cannot explain the high levels of MS and insulin resistance in IPW. Neither does residence seem to play a significant role in the development of MS and insulin resistance.The difference in prevalence between the two groups may be explained by Yajniks "thin fat Indian" theory which is

explained through epigenetic. This theory may also explain the trend we found toward high TG and low HDL in IPW.

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