

EFFECTS OF DIETARY INTAKE ON GLUCOSE METABOLISM AND REPRODUCTIVE HORMONES IN WOMEN WITH POLYCYSTIC OVARY SYNDROME

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Abstract

Objective: To understand the relationship of dietary intake on glucose metabolism and reproductive hormones in patients with polycystic ovary syndrome (PCOS) in Taiwan.

Design: Cross-sectional study.

Setting: Infertility Center, Taiwan Adventist Hospital.

Patients: Thirty-one patients with PCOS and thirty-six control infertility patients.

Intervention(s): None.

Main Outcomes Measure(s): Hormones assay, 75-g oral glucose tolerance test, 24-hour recall and 3-d dietary record.

Results: PCOS patients increased BMI and body fat percentage compared with non-PCOS patients. Significant positive correlations were observed between calorie intake and fasting blood glucose ($r = 0.47$, $P < 0.05$), fasting insulin ($r = 0.37$, $P < 0.05$), insulin resistance ($r = 0.41$, $P < 0.05$). Plasma testosterone concentration was positively correlated with dietary carbohydrate intake ($r = 0.40$, $P < 0.01$). Postprandial glucose concentration was positively correlated with dietary fat intake ($r = 0.45$, $P < 0.05$).

Conclusions: PCOS patients with greater BMI and body fat impair glucose metabolism and insulin sensitivity. Fat and carbohydrate intake is positively correlated with plasma testosterone and postprandial glucose concentrations, respectively.

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Introduction

Polycystic ovary syndrome (PCOS) is probably the most prevalent endocrine disorder in women and the most common cause of anovulatory infertility. Hyperinsulinemia in conjunction with hyperandrogenism was reported in 1980, and subsequently the presence of insulin resistance in women with PCOS has been well documented in several studies. Polycystic ovary syndrome has varied onset and clinical symptoms. Asian women display stigmata of insulin resistance at a lower body mass index (BMI) than other populations. Therefore, we designed a cross-sectional study to investigate the Chinese population at a single period and to observe blood glucose levels in Chinese patients with PCOS compared with other infertility patients. We also evaluated dietary intake associated with blood glucose and sex hormone levels in PCOS women.

Subjects and Methods

From August to December 2008, 67 patients who were out-patients in the Infertility Center of Taiwan Adventist Hospital were recruited in this study. This study was approved by and conducted in accordance with the guidelines of the Taiwan Adventist Hospital Investigational Review Board, and all patients provided written informed consent. A total of 31 patients with PCOS served as the PCOS group, and the remaining 36 infertility patients were in the non-PCOS group as a control. The PCOS women were diagnosed according to the presence of chronic anovulation associated with clinical or biochemical hyperandrogenism.

Results

Table 1 Demographic characteristics of non-polycystic ovary syndrome and polycystic ovary syndrome groups¹

	Non-PCOS (n = 36)	PCOS (n = 31)	P value
Age (years)	35.2 ± 3.9	31.7 ± 4.0	<0.001
Weight (kg)	54.6 ± 7.9	61.6 ± 13.2	<0.05
BMI (kg/m ²)	21.6 ± 2.8	23.9 ± 4.9	<0.05
Body fat (%)	27.5 ± 4.5	30.4 ± 6.1	<0.05
Visceral fat mass (kg)	1.7 ± 0.8	2.3 ± 1.3	<0.05
WC (cm)	72.2 ± 9.9	74.4 ± 10.3	NS
WHR	0.81 ± 0.06	0.82 ± 0.08	NS
FSH (ng/ml)	7.8 ± 2.7	6.3 ± 1.6	<0.01
LH (mIU/ml)	3.7 ± 2.0	5.1 ± 3.1	<0.05
LH/FSH ratio	0.8 ± 0.5	0.5 ± 0.44	<0.05
Estradiol (pg/ml)	36.0 ± 17.3	30.7 ± 7.9	NS
Testosterone (ng/ml)	0.4 ± 0.2	0.5 ± 0.2	<0.05
SHBG (nmol/ml)	68.7 ± 33.7	50.9 ± 32.6	<0.05
FAI	2.5 ± 1.5	5.2 ± 3.6	<0.001

¹Data are presented as mean ± SD.

BMI, body mass index; WC, waist circumference; WHR, waist-to-hip ratio; FSH, follicle stimulating hormone; LH, luteinizing hormone; SHBG, sex hormone-binding globulin; FAI, free androgen index; NS, not significant.

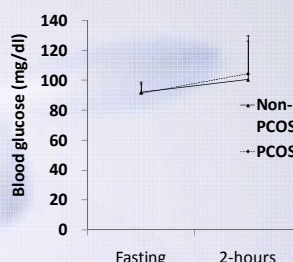


Figure 1 Blood glucose of the non-PCOS and PCOS groups

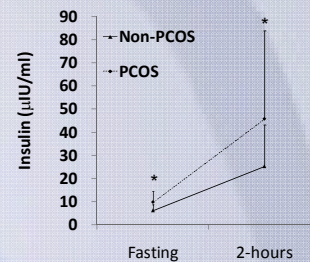


Figure 2 Blood insulin level of the non-PCOS and PCOS groups

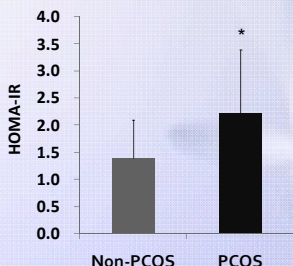


Figure 3 HOMA-IR of the non-PCOS (1.39 ± 0.71) and PCOS (2.21 ± 1.19) groups
* $P < 0.05$.

Blood insulin level and HOMA-IR were significant differences between the two groups. PCOS patients had increased calorie and fat intake compared with non-PCOS patients, but had less carbohydrate as the percentage of energy and dietary fiber intake, indicating unbalanced dietary intake in PCOS patients.

Table 2 Dietary pattern of non-polycystic ovary syndrome and polycystic ovary syndrome groups¹

	Non-PCOS (n = 36)	PCOS (n = 31)	P value
Energy (kcal)	1601 ± 224	1752 ± 254	<0.05
Carbohydrate (g)	212.4 ± 33.9	216.1 ± 47.7	NS
(% of energy)	54	49	<0.05
Fat (g)	53.7 ± 12.5	64.1 ± 12.1	<0.05
(% of energy)	30	33	<0.05
Protein (g)	59.7 ± 20.6	69.0 ± 25.3	NS
(% of energy)	16	18	NS
Dietary fiber (g)	15.2 ± 8.0	11.7 ± 4.1	<0.05

¹Data are presented as mean ± SD.

NS, not significant.

Table 3 Pearson's correlation coefficient between sex hormones and dietary intake or lifestyle¹

		Energy	Carbohydrate	Fat	Protein
FSH	Non-PCOS	0.21	0.11	0.15	-0.30
	PCOS	0.01	-0.12	0.01	0.16
SHBG	Non-PCOS	-0.44*	0.11	-0.13	-0.01
	PCOS	-0.24	0.13	-0.18	0.03
Testosterone	Non-PCOS	-0.25	-0.33	-0.09	0.35
	PCOS	0.21	0.40*	-0.29	-0.24
FAI	Non-PCOS	0.42*	-0.44	0.28	0.31
	PCOS	0.30	-0.01	0.05	-0.05
Fasting glucose	Non-PCOS	0.45*	-0.3	0.39	0.01
	PCOS	0.47*	-0.12	-0.03	0.24
Postprandial glucose	Non-PCOS	0.41*	-0.23	0.18	0.13
	PCOS	0.10	-0.26	0.45*	-0.18
Fasting insulin	Non-PCOS	0.43*	-0.22	0.28	0.0001
	PCOS	0.37*	-0.23	0.11	0.12
Postprandial insulin	Non-PCOS	0.44*	-0.28	0.24	0.13
	PCOS	0.36	-0.09	0.15	-0.06
HOMA-IR	Non-PCOS	0.47*	-0.25	0.34	0.0001
	PCOS	0.41*	-0.22	0.15	0.15

¹adjusted for age, * $P < 0.05$.

PSQI, Pittsburgh sleep quality index; PSS, perceived stress scale; FSH, follicle stimulating hormone; SHBG, sex hormone-binding globulin; FAI, free androgen index.

Conclusion

Increased fat and calorie intake is associated with impaired glucose metabolism and insulin sensitivity in PCOS patients.