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Evaluation of serum hs-CRP concentrations in reproductive women with polycystic ovarian syndrome (PCOS).

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Abstract

Background: The polycystic ovary syndrome (PCOS) is an endocrine disorder in reproductive women, which interferes body structure, menstruation and fertility.
Objectives: The present study was to evaluate the high sensitivity C- reactive protein (hs-CRP) levels in serum among women with PCOS and normal women in relation to insulin resistance (IR) and body mass index (BMI).
Materials and methods: Twenty-five women with PCOS with age 18-35 years were taken as cases and twenty-five age-matched, normal and fertile women were considered as controls after obtaining written informed consent from all of them. Blood Samples were collected for estimation of fasting blood glucose, lipid profile, insulin and hs-CRP levels along with BMI estimation among all of them.
Results: Fasting Blood Glucose (FBG) and high-density lipoprotein (HDL) were not significant between PCOS and control groups. The PCOS group had a significant higher BMI (p=0.008), Insulin (p=0.002), total cholesterol (TC) (p=0.04), triglycerides (TG) (<0.001), LDL (p=0.004) and hs-CRP ($p \leq 0.001$) levels compared with the control group. hs-CRP levels were negatively correlated with low density lipoprotein (LDL) (r=-0.552, p=0.004) and TC (r=-0.569, p=0.003) in women with PCOS.
Conclusion: The obese woman with PCOS has higher hs-CRP levels, which is an inflammatory marker, estimation of this may give information related to the cardiovascular system of the woman with PCOS and helps to prevent complications among them.

Keywords: Fasting blood sugar, Hs-CRP, Insulin resistance, Lipid profile, Obesity, Polycystic ovary syndrome.

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Introduction

Polycystic ovary syndrome is an endocrine disorder in woman with unknown causes and it results excess production of female sex hormones from the ovary with insulin resistance and is characterised by anovulation, over activity of androgens, cysts in ovaries [1].

The prevalence of PCOS in India, estimated as 3.7%-22.5% [2,3], in that 9.13%-36% in adolescents [4,5]. Body Mass Index (BMI), Insulin Resistance (IR) increases the development of PCOS in woman [6], the PCOS causes development of many complications; few are endometrial hyperplasia, cardiovascular diseases, and abortions [7]. The PCOS is a proinflammatory condition and its low grade chronic inflammation causes metabolic derangements and ovarian dysfunction [8], visceral adipose tissue secretes inflammatory promoters like adipokines and vasoactive substances, these interfere with insulin action [9] and also diet induced inflammation results in over activity of androgens and inflammation of ovaries in PCOS [10-12], so obesity places a major role in the development of PCOS. Circulating C-reactive protein (CRP) is an acute phase protein secreted from the liver, which was stimulated by interleukin-6, originating from the adipose tissue was considered to estimate the low grade chronic inflammation in PCOS [13].

In many studies, CRP was studied extensively in relation to obesity [14-16]. In the present study, we considered to study the hs-CRP levels in obese women with PCOS, to rule out the relationship between inflammation, insulin resistance and cardiovascular risk among them.

Material and Methods

Study design

It is a case-control study and approved by the institutional ethical committee (011/ 02/ 2015/ IEC/ SU dated 12-02-2015).

Inclusion criteria

Twenty five women with PCOS with age 18-35 years were taken as cases and twenty five age matched, normal and fertile women were considered as controls after obtaining written informed consent from all of them. PCOS subjects were selected based on observation of oligoamenorrhea/anovulation, clinical or biochemical evidence of hyperandrogenism and/or polycystic ovaries on ultrasonograpy.

Exclusion criteria

We excluded subjects with systemic inflammatory diseases, congenital adrenal hyperplasia, hyperprolactinaemia, acromegaly and any medication which interferes with the normal function of ovary, recent and chronic infections.

Diagnosis of PCOS

PCOS was confirmed by transvaginal ultrasonography the test procedure and conformation of diagnosis was carried out by experienced gynecologist.

Estimation of body mass index (BMI)

BMI was calculated as weight in kilograms divided by Hight in meters and presented as Sq.m. BMI 18.0-22.9 kg/m^2, 23.0-24.9 kg/m^2, >25 kg/m^2 were considered as normal, overweight and obesity respectively.

Biochemical and hormonal analysis

Venous blood sample was collected from the subjects after overnight fasting for biochemical and hormonal assays on second or third day of their follicular phase. Fasting blood sugar level, lipid profile was carried out on Siemens-ADVIA Centaur Automated System and insulin, hs-CRP levels assayed by using chemiluminescent immunoassay technique (CLIA).

Statistical analysis

Statistical analysis was performed by using the SPSS statistical software version 9.0. P-value<0.05 considered statistically significant.

Results

Biochemical parameters of subjects mentioned in Table 1. FBG and HDL were not significantly different between PCOS and control groups. The PCOS group had a significant higher BMI (p=0.008), Insulin (p=0.002), TC (p=0.04), TG ($p \leq 0.001$), LDL (p=0.004) and hs-CRP ($p \leq 0.001$) levels compared with the control group. hs-CRP levels were negatively correlated with LDL (r=-0.552, p=0.004) and TC (r=-0.569, p=0.003) in women with PCOS.

Table 1. *Comparison of biochemical parameters in Controls & PCOS groups.*

Clinical characteristics	Control (n=25)	PCOS (n=25)	P-value
BMI	25.32 ± 5.95	25.96 ± 4.21	0.008
FBG	81.12 ± 9.06	94.08 ± 9.16	0.976
INSULIN	12.99 ± 5.27	16.49 ± 11.14	0.002
TC	152.60 ± 20.60	171.52 ± 39.05	0.04
TG	85.24 ± 28.02	120.36 ± 11.69	<0.001
HDL	43.88 ± 13.11	43.88 ± 10.45	9.37
LDL	92.76 ± 15.75	105.04 ± 31.84	0.004
hs-CRP	0.681 ± 0.88	4.68 ± 3.84	<0.001

mean ± SD; BMI: Body Mass Index; FGB: Fasting Blood Glucose; TC: Total Cholesterol; TG: Triglyceride

Table 2. *Comparison of subjects showing low, moderate and high hs-CRP levels.*

Groups	**Low hs-CRP levels**	**Moderate hs-CRP levels**	**High hs-CRP levels**
Control (n=25)	25 (100%)	0 (0.0%)	0 (0.0%)
PCOS (n=25)	7 (28.0%)	5 (20.0%)	13 (52.0%)
P-value	<0.001		

The distribution of hs-CRP levels in both cases and PCOS subjects were presented in Table 2 and the distribution was significantly different both control and PCOS group. Total control subjects had low hs-CRP levels; whereas in the PCOS subjects, 7 (28%), 5 (20%), 13 (52%) with low, moderate and higher hs-CRP levels respectively and it indicates that the hs-CRP levels are raised in PCOS subjects. In sub group analysis the hs-CRP level was a significantly different between Control normal wt. vs. PCOS normal wt. (<0.001), Control obese *vs.* PCOS obese (<0.001) and PCOS normal wt PCOS obese (<0.001) mentioned in Table 3. In PCOS obese sub group hs-CRP levels were negatively correlated with HDL (r=-0.467, p=0.037) and LDL (r=-0.649, p=0.001) and positively correlated with insulin. In PCOS normal wt sub group hs-CRP levels were positively correlated with FBG (r=-0.915, p=0.028).

Table 3. *Comparison of subjects showing low, moderate and high hs-CRP levels in Control and PCOS subgroups.*

Group	Mean ± SE	PCOS overall	Control obese	PCOS normal wt.	PCOS obese
Control overall (n=25)	0.68 ± 0.01	<0.001	-	-	-
PCOS overall (n=25)	4.68 ± 0.76	-	-	-	-
Control normal wt. (n=13)	0.66 ± 0.23	-	0.794	<0.001	-
Control obese (n=12)	0.77 ± 0.02	-	-	-	<0.001
PCOS normal wt. (n=5)	5.22 ± 2.04	-	-	-	<0.001
PCOS obese (n=20)	4.55 ± 0.84	-	-	-	-

Discussion

In the present study, presence of higher BMI, fasting insulin, triglycerides indicates presence of deranged lipid metabolism and higher hs-CRP levels indicates chronic low grade inflammation in PCOS group. In the present study, hs-CRP levels were significantly different between obese PCOS and obese controls and also between normal PCOS and obese PCOS, this indicating that chronic inflammation in PCOS could be because of or accentuated by increased body weight. Similar results found in previous study [17-19] and few authors found improved free androgen levels, insulin sensitivity and ovulatory function in PCOS with weight reduction [20]. Higher CRP levels in PCOS women than in normal women, stated that elevated CRP levels are independent of obesity in PCOS [21], obesity is mentioned as proinflammatory and is independently associated with elevation of markers IL-6, TNF-α and CRP [22,23], and adipose tissue is a known source of IL-6 and TNF-α, which stimulates CRP synthesis in the liver [24]. Few studies did not found relationship between obesity and serum CRP levels in PCOS [25-29]. Raise in hs-CRP levels indicates inflammatory process and its estimation helps in diagnosis of PCOS.

Conclusion

Serum hs-CRP levels are raised in PCOS women with obesity than PCOS with normal weight, its evaluation is essential to know the cardiovascular state of the PCOS subjects along with insulin resistance.

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