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Clinical, Biochemical and Hormonal Profile of Polycystic Ovary Syndrome

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Abstract

Background: The polycystic ovary syndrome is a heterogenous condition, the pathophysiology of which is multifactorial. It is considered as a systemic and metabolic disorder like hyperglycemia and insulin resistance with increased risk of type II diabetes mellitus and cardiovascular diseases. **Objective:** The purpose of the present study was to analyze the clinical, biochemical and hormonal profile of patients PCOS and to find out correlations among them. **Methodology:** This cross-sectional observational study was done including 100 diagnosed cases of PCOS attending the GOPD, BSMMU Hospital. This study was done to analyze the clinical, biochemical and hormonal characteristics of PCOS patients and to observe the correlations among them. **Result:** The mean age of study populations was 22.7± 6.9 years and more than half of them were overweight or obese. Menstrual abnormality like oligomenorrhoea and secondary amenorrhoea was found in 95% cases and 5% were eumenorrhic. Prevalence of hirsutism and subfertility was 69% and 50% respectively. More than half (52%) of cases had LH/FSH ratio >2 which is taken to be significant. About one-third (30%) of cases had total testosterone level above the reference range with a mean value of serum testosterone 71.4±27.9 ng/dL. **Conclusion:** Significant positive correlation was found among increased BMI, increased LH/FSH ratio, serum testosterone and serum TSH level. Further studies are needed to corroborate our findings and to find out the clinical, biochemical and endocrinological characteristics of our women of PCOS. [Journal of National Institute of Neurosciences Bangladesh, 2017;3(2): 94-98]

Keywords: PCO; oligomenorrhoea; BMI; hyperandrogenism; insulin resistance

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Introduction

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorder in women between the ages of 18 to 44 years[1]. It affects 8.0% to 20.0% of women of reproductive age worldwide[2]. It is a heterogenous, multifactorial disorder due to genetic and environmental factors[3]. The genetic component is inherited in an autosomal dominant fashion from either parents[4]. It is considered as a systemic and metabolic disorder like hyperglycemia and insulin resistance resulting in

increased risk of cardiovascular diseases and type II diabetes mellitus. The definition of PCOS is based on the consensus of several groups.

In May 2003 a consensus workshop was held in Rotterdam, Netherlands on PCOS, sponsored by European Society for Human Reproduction and Embryology (ESHRE) and the American Society for Reproductive Medicine (ASRM). It was suggested that the diagnosis of the syndrome should include the presence of two out of the three features like oligo- or anovulation, clinical and/or biochemical signs of hyperandrogenism, or polycystic ovaries[5], presence of 12 or more follicles with a diameter of 2 to 9 mm in one or both ovaries or ovarian volume ≥ 10 cm3. Obesity, specially the central obesity is an important feature of PCOS and approximately 50% women of PCOS are overweight or obese[6]. Obesity plays a key role in the pathophysiology and clinical features of PCOS, by raising the circulating free androgen in blood leading to alterations in ovarian granulosa cell function and follicle development[7].

Women with PCOS have insulin resistance and hyperinsulinemia which in turn affects the hypothalamic-pituitary-ovarian axis resulting into increased LH secretion over FSH, increased ovarian androgen production, decreased follicular maturation and decreased SHBG. High LH and hyperinsulinemia act synergistically to increase ovarian androgen production and stimulate ovarian growth as well as cyst formation. Approximately 70.0% of patients with PCOS present with hirsutism, more than 40% have impaired glucose tolerance and 10.0% have type 2 diabetes[8-10]. These patients are also at increased risk of developing endometrial carcinoma in later life. There are significant variations in clinical, biochemical and hormonal features among the women having PCOS. This study was therefore undertaken to observe the pattern of presentation and the correlation among various clinical, biochemical and hormonal profile of patients with polycystic ovary syndrome in Bangladeshi women.

Methodology

This was a cross sectional observational type of study includes 100 patients of PCOS attending gynaecology out-patient department of Bangabandhu Sheikh Mujib Medical University, Dhaka during the period of October 2013 to March 2014 for a period of 6(six) months. Women between 15 to 35 years of age giving consent, non-pregnant women, women presenting with oligomenorrhea or amenorrhea, hyperandrogenic features like hirsutism, acne and diagnosed as PCOS by ultrasound were included as study population. Women with the age of less than 15 years or more than 35 years, pregnancy, hormonal contraceptives users, hyperandrogenism due to other endocrine disorders like congenital adrenal hyperplasia, Cushing's syndrome, adrenal tumour, or virilizing ovarian tumour were excluded from this study. A detailed menstrual, obstetric and family history was obtained. Obstetric history was taken to classify the patients into fertile and infertile (primary or secondary) groups. Family history was obtained regarding menstrual disorders, hirsutism, obesity and diabetes mellitus in the first degree relatives. Patients were assessed for signs of hyperandrogenism e.g. acne and hirsutism. Height, weight, waist and hip circumferences were measured. Obesity was assessed according to WHO criteria as a body mass index (BMI) 30 to 34.9. Body fat distribution was assessed by calculating the waist to hip girth ratio (WHR). Ultrasonography of lower abdomen was done in each patient. Serum LH, FSH, prolactin and total testosterone were estimated on day 2 or 3 of menstrual cycle in menstruating women. In case of amenorrheic women it was done on any day. Blood sugar, lipid profile and insulin were done in fasting state to assess the metabolic status. Clinical features, ultrasonography findings, hormone profile and metabolic status all were analyzed. Statistical analyses were performed using the SPSS version 16.0. The qualitative observations were indicated by frequencies and percentages. The mean values were calculated for continuous variables. Pearson correlation coefficient was used for correlating different parameters in patients.

Results

Total 100 patients were included in this study according to the eligibility criteria. About two-third (62%) of the study population were in third decade and their mean age was 22.7± 6.9 years (Table 1).

In present study 68.0% of women were married and 32.0% unmarried. Among married women, about 23.52% were parous and 76.47% were nulliparous (Table 2).

Mean LH level was observed 12.79±7.1miu/mL. Mean serum testosterone was 71.4±27.9 ng/dl in these patients and 30.0% cases had total testosterone level above the reference range of 30-95ng/ml. In these cases mean serum prolactin level was found 315.15±80.5 µIU/ml with reference range 204-412 µIU/ml (Table 4).

Serum lipid profile was evaluated in every patients, mean total cholesterol was found 154±18.6 mg/dl with mean triglyceride and LDL level 87.0±46.6 and 86.8±14.8 mg/dl respectively. Mean HDL in this study populations was 50.4±10.6 mg/dl. In this series mean fasting blood glucose level was found 5.87±1.02mmol/L. According to the Matthews' formula HOMA-IR =fasting insulin (mIU/ml) x fasting glucose (mmol/L)/22.5 (Table 5).

Table 1: Demographic pattern of the study population

Variables	Values
Age (in year)	
≤20	22(22%)
21-30	62(62%)
>30	16(16%)
Mean±SD	22.7± 6.9
Range	15 to 35
Socio-economic status	
Low class	21(21%)
Middle class	78(78%)
High class	1(1%)
BMI(kg/m2)	
<18	4(4%)
18-24.9	44(44%)
≥25	52(52%)
Mean±SD	27.5±4.2
Range	18 to 34
Waist to hip ratio	
≤0.8	48(48%)
>0.8	52(52%)
Mean±SD	0.86±0.1
Range	0.7 to 0.9

Table 2: Marital and fertility status of PCOS patients

Characteristics	Frequency	Percentage
Marital status		
Unmarried	32	32.0
Married	68	68.0
Fertility status		
Parous	16	23.52
Nulliparous	52	76.47
Types of infertility		
Primary	43	86.0
Secondary	07	14.0

Table 3: Clinical Profile of 100 PCOS Patients

Signs of hyperandrogenism	Frequency	Percentage
Hirsutism	69	69.0
Acne	31	31.0
Acanthosis nigricans	08	8.0
Oligomenorrhea	74	74.0
Secondary amenorrhea	21	21.0
Ultrasonographic findings of ovaries		
Polycystic	81	81.0
Enlarged	15	15.0
Normal	04	4.0

Table 4: Hormonal profile of PCOS patients

Hormones	Mean±SD	Percentage
LH(mIU/ml)	12.79±7.1	
Reference range:16-19		
FSH(mIU/ml)	5.23±2.5	
Reference range:3.2-10		48
LH/FSH ratio		52
≤2.1		
>2:1	71.4±27.9	70
Testosterone(ng/dl)	≤95	30
Reference range:30-95	>95	
Prolactin (µIU/ml)	315.15±80.5	
Reference range:204-412	3.4±1.28	
TSH(µIU/ml)	0.5-5.5µIU/ml	81
Reference range:0.5-5.5	>5.5µIU/ml	15

Table 5: Biochemical profile of PCOS patients

Parameters	Mean±SD
Lipid profile	
Total cholesterol	154±18.6
Triglycerides	87.0±46.6
LDL	86.8±14.8
HDL	50.4±10.6
Fasting blood glucose	5.87±1.02
Fasting Insulin	30.15±12.13
Fasting HOME-IR	5.71±1.6
(Cut-off value: 6.8)	
≤ 6.8	58.0%
>6.8	42.0%

In the present study significant positive correlation was found among increased BMI, increased LH/FSH ratio, serum testosterone and serum TSH level. BMI had weak positive correlation with serum prolactin, serum cholesterol, fasting blood sugar, fasting insulin and insulin resistance (Table 6).

Table 6: Pearson's coefficient correlation between biochemical and hormonal parameters with BMI (n=100)

Parameters	r value	P value
LH/FSH	+.281**	0.005
Testosterone	+.366**	<0.001
Prolactin	+0.134	0.185
TSH	+.340**	0.001
Total cholesterol	+0.022	0.829
Fasting blood glucose	+.216*	0.031
Fasting insulin	+.162*	0.137
HOMA IR	+0.054	0.595

Discussion

PCOS is a common endocrine disorder in women of reproductive age with a wide range of clinical features and significant biochemical and hormonal changes. A total of 100 patients of PCOS were included in the present study. About two-third (62%) of the study population were in third decade and their mean age was 22.7± 6.9 years which is comparable to the study done by Codner et al where mean age of patients was 22.67± 6.3 years[11]. However, in two other studies mean age was found 25.6±3.9 and 27±5 years respectively[12-13]. In this series 16 cases were of above 30 years which is comparable to the findings of Sangabathula et al[14]. More than half (52%) of this study population were overweight or obese (BMI≥ 25) which is also comparable to Sangabathula et al[14] study where 59% were overweight or obese. Another Indian study done by Christodoulopoulou et al[15] revealed only 15.1% overweight, 24% obese and rest 60.8% were normal or underweight cases. However, mean BMI in this series (27.5±4.2) is comparable to Kumar et al[12] (27.0 ± 5.6) and Begum[16] (28.2±4.5); higher in comparison to Lee et al[17] (22.5 ± 4.4). In the present study waist-hip ratio >0.8 was observed in more than half (52%) of the patients and Begum[16] found it in 64% cases. The mean waist-hip ratio was found similar (0.86±0.1) in the present and Codner's series. Prevalence of hirsutism in our group (69%) is comparable to Spandana et al[13] (71%); however significantly higher than the findings of Yousouf et al18 (31%) and Joshi et al[19] (32.5%).

In present study 68.0% of women were married and 32.0% unmarried. Among married women, about 23.52% were parous and 76.47% were nulliparous. In a study done by Spandana et al[13] 31.1% of married women were parous and 68.9% were nulliparous. Half of this study population and Spandana et al[13] series had infertility with the incidence of primary infertility 86.0% and 82.0% respectively. The prevalence of infertility was found much higher (74.0%) in the study done by Yousouf et al[18]. In this study 74.0% had oligomenorrhea, 21.0% had secondary amenorrhea and 5.0% had regular menstrual cycles but in Spandana et al[13] series only 59.0% had oligamenorrhoea and 37.0% had regular cycles. In these patients 95.0% had either polycystic or enlarged ovaries which is comparable to Spandana et al[13] series where 93% had polycystic ovaries. Only 5% our cases had normal ovaries which is similar to result of Yousuf et al[18].

Mean LH level was observed 12.79±7.1miu/ml in present as well as Begum[16] study. Codner et al[11], Kumar et al[12] and Spandana et al[13] found it 9.3±5.0 miu/ml, 8.1±3.0 miu/ml and 8.68±5.5 miu/ml respectively. In more than half (52%) of the cases LH to FSH ratio was found >2, which is consistent with Begum[16] findings (51%) but the raised ratio was found only in 35% & 41% cases of two other studies.

Mean serum testosterone was 71.4±27.9 ng/dl in these patients and 30.0% cases had total testosterone level above the reference range of 30 to 95ng/ml. In these cases mean serum prolactin level was found 315.15±80.5 µIU/ml with reference range 204-412 µIU/ml but Begum[16] found it higher (415.15±180.5) in another group of Bangladeshi women. Islam et al[20] in another Bangladeshi study observed hyperprolactinemia in 18.6% cases of PCOS. In present study mean serum TSH was 3.4±1.28 µIU/ml which is consistent with Timpatanapong and Rojanasakul[13] (3.53±3.28 µIU/ml), slightly higher than the level found by Christodoulopoulou et al[15] (2.39±1.63). Islam et al20 found hypothyroidism in 11.4% of PCOS patients.

Serum lipid profile was evaluated in every patients, mean total cholesterol was found 154±18.6 mg/dl with mean triglyceride and LDL level 87.0±46.6 and 86.8±14.8 mg/dl respectively. Silfen et al21 found the mean total cholesterol 164.0 ± 32.1 mg/dl which is comparable with the current study. On the other hand Leustean et al[22] and Kumar et al[12] observed the mean total cholesterol 214±40.08 mg/dl and 214±35.7 respectively. Mean triglyceride in this study (87.0±46.6mg/dl) is also comparable to the results of Silfen et al[21] (92.2 ±59.7mg/dl) and Christodoulopoulou et al[15] (94.7± 70.7mg/dl). Mean LDL in this study populations was 86.8±14.8 mg/dl which is consistent with the result of Silfen et al[21] (86.9±14.7). However, Christodoulopoulou et al[15] and Kumar et al[12] observed mean values 110.7±33.5mg/dL and 130±30.2mg/dL in their studies respectively.

In this series mean fasting blood glucose level was found 5.87±1.02mmol/L which is consistent with the level found by Begum16 (5.93± 1.08) among Bangladeshi women. However, mean FBS was found 4.58 ± 0.52 mmol/L in a study done in Macedonia[23]. Among these study populations mean fasting insulin level was found 30.15±12.13 and mean fasting HOMA-IR (Homeostatic Model Assessment of Insulin Resistance) value was observed 5.71±1.6 with a cut-of value taken as 6.8 for insulin resistance. In this study 42.0% of cases had fasting HOMA-IR above the cut-off value. Begum[16] also showed mean fasting HOMA-IR 5.71±1.6 and insulin resistance in 42.32% of her cases, which is comparable to result. In the present study significant positive correlation was found among increased BMI, increased LH/FSH ratio, serum testosterone and serum TSH level. BMI had

weak positive correlation with serum prolactin, serum cholesterol, fasting blood sugar, fasting insulin and insulin resistance

Conclusion

Most of the study populations were in 3rd decade and overweight or obese. Oligomenorrhoea, hirsutism, subfertility were common features in these patients. More than half of cases had LH/FSH ratio >2. Positive correlation was found among increased BMI, increased LH/FSH ratio, serum testosterone, serum TSH, fasting blood sugar, fasting insulin and insulin resistance. As there is wide variations in presentation and hormonal and metabolic characteristics in these patients further larger multicentic studies can be undertaken to determine the clinical and metabolic behavior of Bangladeshi women with PCOS.

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