World Journal of Pharmaceutical Sciences
ISSN (Print): 2321-3310; ISSN (Online): 2321-3086
Published by Atom and Cell Publishers
Available online at: http://www.wjpsonline.org/
Original Article

The relation between Hormonal disturbances, Liver enzymes and Body Mass Index in Selected Cases of Polycystic Ovarian Syndrome in Iraqis Women

Enas A. Abdulrasul Khazali[1*], Najat Sadeq Hasan[1], Hadeel Sameer Abd alwahab[2] and Intissar Kadhum Ali[2]

[1*]Department of Obstetrics and Gynecology, [1]Medical Research Unit and Medical Research Unit, College of Medicine, Al-Nahrain University, Iraq; hsaa10274@yahoo.com

Received: 26-11-2016 / Revised: 15-12-2016 / Accepted: 23-12-2016 / Published: 01-01-2017

ABSTRACT

Polycystic Ovarian Syndrome (PCOS) is a common disorder affecting up to 21% of women of childbearing age, thought to be primarily a reproductive disorder. **Objective**: To evaluate free testosterone, glucose. Total cholesterol, triglyceride, liver enzymes, thyroid hormones and prolactin in overweight PCOS Iraqi women compared with healthy lean women as a control group. **Materials and Methods**: This was a case-control study carried in Al-Imamaien Al-Kathumain hospital, Baghdad, Iraq; between June 2014 and December 2015. The study included 75 female patients suffering from PCOS. The age of involved patients was 22 - 44 years (32.610 ± 5.696 years). Control group was consisted of 30 healthy volunteer females, whose mean ages were matched (30.140 ± 5.198 years). **Results**: Our data showed that PCOS overweight women with general clinical signs of hyperandrogenism tended to have a higher BMI than healthy lean women 26.8 ± 4.6 (kg/m2) P <0.05, and total testosterone showed significant elevation 2.08±0.68 (nmol/L) P <0.05. Our data showed there were a significant increase in mean ± SD of serum level of glucose 95.00 ± 12.7(mg/dl) , total cholesterol 187.0 ±50 (mg/dl), triglyceride 79.5 ± 30.5(mg/dl) p<0.001 respectively, AST 19.14 ± 8.5(U/L), ALT 16.22 ± 4.5 (U/L) p<0.05 , TSH 3.4 ± 1.2 µIU/ml, T4 9.5 ± 2.5µg/dl, T3 2.6 ± 0.8 ng/ml p <0.01 and prolactin 27.00 ± 4.5 ng/ml p<0.001 in women with polycystic ovarian syndrome compared with healthy women. **Discussion:** In adult women with hirsutism and PCOS, obesity is associated with increased total testosterone and decreased SHBG, which results in significantly elevated free and bioavailable testosterone. **Conclusion**: The greater the BMI the more frequent the presence of steatosis, most of obese women had nonalcoholic fatty liver disease (NAFLD)

Keywords: Body Mass Index, Liver enzymes, Polycystic Ovarian Syndrome

INTRODUCTION

Polycystic Ovarian Syndrome (PCOS) is a common disorder affecting up to 21% of women of childbearing age [1].Initially thought to be primarily a reproductive disorder, recent findings suggest that 50–80% of women with PCOS are obese and have insulin resistance ,a hallmark of metabolic syndrome [2]. It therefore seems appropriate to consider PCOS as the ovarian manifestation of metabolic syndrome. Similarly, Nonalcoholic Fatty Liver Disease (NAFLD) has been defined as the hepatic manifestation of metabolic syndrome. Clinically, PCOS commonly coexists with NAFLD [3], which further complicates the therapeutic approach, especially when infertility is of concern. Nonalcoholic fatty liver disease (NAFLD) is the leading cause of chronic liver disease in developed countries and is increasing in prevalence with the rise of diabetes and obesity. In addition to obesity and age, gender may also influence the prevalence and severity of NAFLD. However, mechanisms underlying gender-based differences in NAFLD have not been clearly defined. Furthermore, alterations in body composition, fat distribution and/or hormonal or metabolic changes that occur following menopause and in the setting of polycystic ovary syndrome may influence the development and progression of NAFLD.

The first evidence for the association of NAFLD and PCOS was reported in 2004, when biopsy-documented NASH was described in a young patient with PCO [4]. It was then suggested that NALFD might occur in some patients with PCOS given that insulin resistance is a common feature in both NAFLD and PCOS and both disorders are

***Corresponding Author Address:** Dr. Enas A. Abdulrasul Khazali, Department of Obstetrics and Gynecology, College of Medicine, Al-Nahrain University, Iraq; enas.adnan@yahoo.com*

linked with metabolic syndrome. A few studies [5];[8];[7];[6] all retrospective except one[7], followed and showed an increased prevalence (15–55%) of NAFLD in women with PCOS based on abnormal aminotransferase levels and/or ultrasonographic evidence of hepatic steatosis. Moreover, six young patients with PCOS, all obese, have been reported with biopsy-documented NASH [8] .At variance with previous data, a recent small prospective study did not show evidence of NAFLD in young lean PCOS patients assessed both by imaging methods [ultrasonography and computed tomography (CT) of the liver] and by enzyme levels [9]. Therefore, factors associated with NAFLD in PCOS need to be clarified in order to identify which patients are at risk for developing NAFLD.

MATERIALS AND METHODS

This was a case-control study carried in Al-Imamaien Al-Kathumain hospital, Baghdad, Iraq; between June 2014 and December 2015. The study included 75 female patients suffering from PCOS. The age of involved patients was 22 - 44 years (32.610 ± 5.696 years). Control group was consisted of 30 healthy volunteer females, whose mean ages were matched (30.140 ± 5.198 years). PCOS patients further divided into obese and overweight groups according to Body Mass Index (BMI). Informed consent was obtained from each participant. Pre-prepared questionnaire including data concerning patients and their PCOS information (such as age, family history, type of treatment, and BMI) was used following the protocol of the ethical committee of School of medicine Alnahrain University. Venous blood sample (10 ml) was obtained at 8:00-10:00 AM in the follicular phase of the menstrual cycle from antecubital vein from patients and controls by standard venipuncture technique without venous stasis in serum separator tube (SST). After 15 minutes, serum specimens were collected in plane container after centrifugation at 3000 rpm for 5 minutes. The serum stored frozen (-20°C) in a tightly sealed tube for only 2 weeks and then analyzed. Specimens should be allowed to come to room temperature and then mixed thoroughly by gentle inversion before assaying. Then thyroxine (T4), triiodothyronine (T3), thyrotropin (Thyroid Stimulating Hormone, TSH) concentrations, as well as the prolactin (PRL) were measured by automated Enzyme-Linked Immunosorbent Assay (ELISA) kit as described by [10] and [11]. Within the Division of Medical Laboratory, two levels of control material and analyses were performed by according to the manufacturer. After an overnight fast: glucose, lipids, AST, ALT.The assays employed for endocrine and biochemical measurements have previously been reported [13].Liver enzymes (ALT, AST) were measured by the IFCC method.

Methods of BMI estimation: The BMI calculates a value indicative of the fat content of the body by dividing the body weight by the square of body height following the method adopted by [12]. The BMI categories as follow: Underweight is less than 18.5, normal weight is 18.5 - 24.9, overweight is 25 - 29.9, and obese is 30 or higher.

Statistical Analysis: Statistical package for social science (SPSS) version 16.0 for Windows program on the computer was used to compare the significance in the mean values in the comparison groups. All data were given as mean ± standard deviation (SD). Student t-Test was applied, $p<0.005$ was considered statistically significant.

Results

Variable	PCOS (N=75)	Controls (N=30)	P VALUE
Age (years)	32.610 ± 5.69	30.140 ± 5.19	
BMI (kg/m2)	26.8 ± 4.6	24.7 ±4.6	< 0.05%**
TEST. (nmol/L)	2.08 ± 0.68	1.7 ± 0.5	<0.05%**
GLU. (mg/dl)	180.00 ± 12.7	82.2 ± 12.5	<0.001*
T.CHOL. (mg/dl)	255.0 ±50	171.4±22	<0.001**
T.G (mg/dl)	79.5 ± 30.5	67.1±33.9	<0.001**
AST (U/L)	19.14 ± 8.5	17.7 ± 3.8	<0.05**
ALT (U/L)	16.22 ± 4.5	13.7 ± 6.5	<0.05**
TSH µIU/ml	3.4 ± 1.2	2.5 ± 1.1	<0.01**
T4µg/dl	9.5 ± 2.5	8.0 ± 2.2	<0.01*
T3 ng/ml	2.6 ± 0.8	1.41 ± 0.5	<0.01*
s.prola. ng/ml	27.00 ± 4.5	24.2 ± 5.2	<0.001**

Variable PCOS (N=75)
Controls (N=30)

As in table above our data showed that PCOS overweight women with general clinical signs of hyperandrogenism tended to have a higher BMI than healthy lean women 26.8 ± 4.6 (kg/m2) P <0.05, and total testosterone showed significant elevation 2.08 ± 0.68 (nmol/L) P <0.05.

Our data showed there were a significant increase in mean ± SD of serum level of glucose 180.00 ± 12.7(mg/dl) , total cholesterol 255.0 ±50 (mg/dl) , triglyceride 79.5 ± 30.5(mg/dl) p<0.001 respectively , AST 19.14 ± 8.5(U/L) , ALT 16.22 ± 4.5 (U/L) p<0.05 , TSH 3.4 ± 1.2 µIU/ml , T4 9.5 ± 2.5µg/dl , T3 2.6 ± 0.8 ng/ml p <0.01 and prolactin 27.00 ± 4.5 ng/ml p<0.001 in women with polycystic ovarian syndrome compared with healthy women.

DISCUSSION

Polycystic ovary syndrome (PCOS) is a common chronic condition with implications for morbidities, both in short-term (e.g., subfertility and pregnancy-related complications) and long-term risks (e.g., type 2 diabetes, cardiovascular disease, depression, poor quality of life, and overall mortality) [14]. In this case control study we showed a significant elevation of total serum testosterone in PCOS overweight women mean ± SD 2.08 ± 0.68 (nmol/L) P <0.05 compared with healthy lean women mean ± SD 1.7 ± 0.5 (nmol/L), In adult women with hirsutism and PCOS, obesity is associated with increased total testosterone and decreased SHBG, which results in significantly elevated free and bioavailable testosterone [15], so we agreement with study above. Our study showed there was a significant increase in serum glucose in PCOS overweight women mean ± SD 180.00 ± 12.7(mg/dl) p<0.001 compared with healthy lean women mean ± SD 82.2 ± 12.5(mg/dl) , because obese PCOS women are at significantly increased risk for IGT and type 2 diabetes mellitus [16]. We originally reported that only obese PCOS women had glucose intolerance. In our study we showed there were a significant elevation in serum total cholesterol and triglyceride means ± SDs 255.0 ±50 (mg/dl), 79.5 ± 30.5(mg/dl) p<0.001 respectively in overweight PCOS women compared with healthy lean women means ± SDs 171.4±22 (mg/dl), 67.1±33.9, this due to the pattern of dyslipidemia (increased TC and triglycerides with a trend toward higher LDL-C and lower HDL-C) demonstrated in the current study is consistent with previous literature showing abnormal lipid profiles (similar to the dyslipidemia of type 2 diabetes) in PCOS [17, 18, 19, 20].

In this case control study we found there were a significant increase in liver enzymes AST, ALT in serum of obese PCOS women mean ± SDs 19.14 ± 8.5(U/L), 16.22 ± 4.5 (U/L) p<0.05 respectively compared with so we consist with previous study which concluded that elevation aminotransferase ALT, AST and glutamyltransferase (GGT) levels were found in 15% of the 88 subjects (21). The greater the BMI the more frequent the presence of steatosis, 70% of obese women had nonalcoholic fatty liver disease (NAFLD) [21].

In our study we found there were a significant elevation of TSH, T4, T3 in serum of overweight PCOS women means ± SDs 3.4 ± 1.2 µIU/ml, 9.5 ± 2.5 µg/dl, 2.6 ± 0.8 ng/ml p <0.01 compared with healthy lean women means ± SDs 2.5 ± 1.1 µIU/ml, 8.0 ± 2.2 µg/dl, 1.41 ± 0.5 ng/ml this due to hypothyroidism , these findings are very close to the study done by Janssen, et al [22].

In our study Prolactin level was significantly high in serum of overweight PCOS women mean ± SD 27.00 ± 4.5 ng/ml p<0.001 as opposed to healthy lean women mean ± SD 24.2 ± 5.2 ng/ml . This finding agreed with Shibli-Rahhal and Schlechte [23] who described an association between prolactin and obesity. On top of that, Greenman et al [24] stated that weight loss was seen in 70% of prolactinomas patients and in 90% of who normalized their prolactin. Yet, one should bear in mind that this hyperprolactinemia developed in the context of PCOS and hypothyroidism. This consistent with Robin et al [25].

CONCLUSION

The greater the BMI the more frequent the presence of steatosis, most of obese women had nonalcoholic fatty liver disease (NAFLD).

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