In Iraqi Polycystic Ovarian Syndrome (PCOS), women are affected by oxidative stress, antioxidants, and a few biological factors

Shaymaa abed hasan[1] [1,3] Department of gynecology and obstetrics , college of medicine , Al- Iraqia University
*Ashaymaa684@yahoo.com

Nora Sabah Rasoul[2] [2] College of Medicine/ University of Kerbala
*Ashaymaa684@yahoo.com

Solafa Rabi Salih[3] [1,3] Department of gynecology and obstetrics , college of medicine , Al- Iraqia University

ABSTRACT

PCOS is a heterogeneous complicated ailment with a well-defined etiology that affects the majority of women of reproductive age. The study's purpose is to figure out what PON1 does, Mg, NO, and TAC activity in Iraqi women with PCOS. Eighty samples (40 PCOS patients and 40 controls) were collected between December 2021 and March 2022 for the study. Both groups had their Prolactin, luteinizing hormone (LH), follicle stimulating hormone (FSH), and body mass index (BMI) , fasting blood sugar (FBS), magnesium (Mg), and testosterone levels measured. ELISA was used to measure serum NO (nitric oxide), MDA (malondialdehyde), PON1 activity (paraoxonase 1), and TAC (total antioxidant capacity). When comparing the experimental group to the control group.In PCOS individuals, there was a significant increase in serum levels of LH, Testosterone, and Prolactin, as well as a decrease in serum FSH. Furthermore, FBS levels were considerably higher in PCOS patients, although serum magnesium levels were lower, indicating increased urine excretion of Mg in the presence of insulin. Changes in NO levels in PCOS are highly significant, serum PON1 activity was lower, while TCA was lower in the PCOS group.

Keywords: Antioxidant, oxidative stress, polycystic ovary syndrome, Paraoxonase-1

Introduction

PCOS is a severe public-health issue that affects women of reproductive age and is associated to reproductive, metabolic, and psychological problems. Hyperandrogenism and hirsutism are frequent in PCOS women, as are oligo or amenorrhea and anovulation. Despite a lengthy history of research on PCOS, its cause remains unknown [2].

Nitric oxide (NO) is a very stable gas free radical that diffuses through cell membranes and is a key regulator of vascular physiology. L-arginine is converted with oxygen and NADPH as cofactors, nitric oxide synthase (NOS) produces NO. NO can have a negative impact on carbohydrates, proteins, and lipids, resulting in cell damage when combined with other inflammatory mediators[2].

Total antioxidant capacity (TAC) refers to serum's ability to limit the generation of free radicals, hence protecting the cell structure from molecular damage [4]. TAC is a level measurement of antioxidant protection

present. This assay evaluates the antioxidant capacity of all of its constituents, such as vitamins, proteins, and lipids [3].

Magnesium is a cofactor of multiple enzymes involved in glucose metabolism, making it necessary for proper glucose use and insulin signaling. Magnesium has been discovered to function as a second messenger in insulin action. Low magnesium levels have been associated to poor glucose tolerance and an increased risk of type 2 diabetes [4].

Methodology

A total of eighty samples (40 PCOS patients and 40 controls) were obtained from 25–35 years between December 2021 and March 2022 collected from outpatient clinics. Body mass index (BMI) is computed by multiplying body weight in kilograms by body height in meters squared (kg/m2), from all patients. Fasting participant's blood samples were taken to assess fasting FBS, Mg, LH, FSH, Prolactin and testosterone using Cobas E411. The enzyme linked immunosorbent assay (ELISA) method was used to evaluate serum NO , PON1 activity, and TAC (Mybiosource, USA, Cat.No. MBS732723, MBS705307, MBS726896 respectively).

Statistical Analysis

The data was analyzed using the SPSS program version 20.0 software.

Results

The results shows of biochemical parameters when comparing between patients and control groups (Table 1). When compared to the control group, PCOS patients had significantly higher serum levels of LH, Testosterone, and Prolactin, as well as a lower serum FSH. FBS levels were also considerably higher in PCOS patients, while Serum magnesium levels were significantly decreased in PCOS patients. Also, highly significantly change in NO levels ,in the PCOS group, PON1 activity and TCA levels were lower than in the controls

Table 1 shows the differences in biochemical parameters between PCOS and non-PCOS women.

Variables	Sample	No.	Mean	S.E	P_value
BMI(kg/m^2)	patient	40	27.21	0.73	0.805
	control	40	26.95	0.77	
FSH(IU/mL)	patient	40	6.59	0.40	0.0001
	control	40	10.32	0.22	
LH(IU/L)	patient	40	7.59	1.15	0.021
	control	40	4.81	0.28	
Testosterone (ng/ml)	patient	40	10.77	0.97	0.001
	control	40	7.12	0.27	
Prolactin (ng/ml)	patient	40	21.45	1.37	0.0001
	control	40	11.65	0.39	
FBS (mmol/L)	patient	40	211.14	3.44	0.0001
	control	40	101.11	3.56	
Mg (mg/dL)	patient	40	0.35	0.01	0.0001
	control	40	1.43	0.11	
NO (nmol/ml)	patient	40	107.84	5.26	0.001
	control	40	81.49	5.21	
TAC (U/ml)	patient	40	38.29	1.98	0.0001
	control	40	101.13	1.51	
PON1 (U/mL) activity	patient	40	128.10	4.95	0.0001
	control	40	329.38	6.27	

The relationship between all parameters in the current investigation and chemical data was investigated using Pearson correlation analysis. Tables are used to portray the results as a whole (2). In this study, PON1 levels were found to have a significant negative relationship with Testosterone and Mg, as well as Mg with prolactin and Testosterone with LH, whereas FSH levels were found to have a substantial positive relationship with BMI and LH, as well as Testosterone with Mg

Table 2: Correlations between variables in PCOS patients group (r-value).

TAC	NO	Mg	FBS	Prolactin	Testosterone	LH	FSH	BMI	Variables
									PON1
	-.057	.207	.046	.053	.018	.094	.106	.048	.362*	1	BMI
	-.123	.135	-.165	.202	-.102	-.031	.011	.466**	1	.362*	FSH
	.274	.097	-.190	-.150	-.101	.163	-.349*	1	.466**	.048	LH
-.367*	-.043	.138	.346*	.101	-.267	1	-.349*	.011	.106	Testosterone
.054	-.085	-.031	-.343*	-.107	1	-.267	.163	-.031	.094	Prolactin
	.078	.038	.153	.110	1	-.107	.101	-.101	-.102	.018	FBS
	-.336*	.157	.043	1	.110	-.343*	.346*	-.150	.202	.053	Mg
	-.033	.138	1	.043	.153	-.031	.138	-.190	-.165	.046	No
	-.156	1	.138	.157	.038	-.085	-.043	.097	.135	.207	TAC
	1	-.156	-.033	-.336*	.078	.054	-.367*	.274	-.123	-.057	PON1

*At the 0.05 level, the correlation is significant. * At the 0.01 level, the correlation is significant.

Discussion

Women with PCOS, including those who were young and non-obese, had endothelial dysfunction. Patients with PCOS are said to be under a lot of oxidative stress. Several research have looked at nitrite in PCOS patients and analyzed the links between the two throughout the last decade [6]. On the level of nitrite in PCOS, there is conflicting evidence. Some research have identified lower nitrite levels in PCOS patients[7], which contradicts our findings, while others have found the opposite[8], which concurs with our findings. By detecting NO in PCOS patients and healthy controls, Ergen et al. studied the relationship between PCOS and oxidative stress state. The data revealed that PCOS patients had statistically greater NO levels than controls, which is in line with our findings [9].

TAC was considerably lower in PCOS patients compared to healthy controls, according to the present study's findings, which are comparable with those of Fathi in Mosul, Iraq [10], as well as Hilali et al., who reported a substantial reduction in mean serum TAC levels in the PCOS group versus controls [11].Also Sulaiman et al., [12].

FBS levels were substantially greater in PCOS patients, according to Aghade et al.,[13], despite serum magnesium levels being much lower, implying greater urine excretion of Mg in the presence of insulin, this agreement with study by Rajeswari et al.,[14], and agreement with our study , Low Mg levels in processed foods and common dietary staples such as meat, sugar, and white flour are just a few examples. Furthermore, cooking and boiling products diminish Mg content [15]. Because Mg is required for the conversion of vitamin D into its active form, excessive vitamin D doses may increase urinary Mg excretion [16]. Proton pump inhibitors (PPIs) and H2 blockers, and diuretics are some of the most frequent medicines that reduce Mg absorption [17].

The current investigation found that PON1 activity was considerably lower in PCOS patients compared to healthy controls, which is similar with a study by [18]. Changes in the redox state of the protein's free sulfhydryl group, which prevent reactive oxygen species from inhibiting PON1 function, have been

linked to a reduction in serum PON1 activity under oxidative stress [19]. Under recent studies, lower serum PON1 activity has been associated to a number of illnesses in oxidative stress and inflammatory settings [20]. There is a lack of research on the oxidative state of PCOS patients. Women with PCOS have been observed to have lower antioxidant levels and experience more oxidative stress [21].

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