Short Communication

Biochemical Features of Obese Polycystic Ovary Syndrome Patients in Babylon Province

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Abstract

Background: Polycystic ovaries comprise of a huge number of follicles with >8 mm (approximately 0.3) in size. The eggs develop when the follicles are underdeveloped sacs. In PCOS, the ovulation does not take place because of the inability of these sacs to release an egg. PCOS is very common, it affect about 1 in every 10 women in the UK. **Objective:** To detect some biochemical parameters in relation with PCOS. **Material and Methods:** The study included approximately 80 women, ages 22–37 years, who were split into two groups of 40 women who have PCO. The second group comprises of 40 women who look to be in good health and serves as the control group. Women who smoke, have chronic conditions like high blood pressure, or who use illicit drugs were excluded from both groups. All females (patients and controls) have a body mass index (BMI) that is, used to determine their amount of overweight. **Results:** A considerable increase in serum level of preptin, amylin, adiponutrin, HbA1C, and HOMA-IR levels in PCO women than the control group ($P < 0.05$). **Conclusion:** The present study focusing on less frequently identified peptides and proteins that might be interrelate with the pathogenesis of PCOS. Beside the role of these proteins in PCOS disease and the probability and efficacy of assessing their levels in diagnosis.

Keywords: ELISA, Gal, IR, PCOs

Introduction

Polycystic ovary syndrome (PCOS) represent a syndrome of ovarian dysfunction, in reproductive aged women and it is the most common endocrine syndromes, about 5%–10% women affecting by it. The main causes of PCOS is quiet unknown, but it was the leading cause of infertility in female, irregularity menstruation with hirsutism and excess androgen. Also, PCOS is accompanying with obesity, insulin resistance, metabolic abnormalities, type II diabetes mellitus, hyperinsulinism, endometrial carcinoma, dyslipidemia, all of these elevated the risk of cardiovascular disease. The main structures of PCOS are Zeng *et al.*[1]:

- Disturbance in menstruation—that means the ovaries have irregularly release of eggs.
- Androgen excess—that may causes physical signs like excess hair in face or the body.
- Polycystic ovaries—when the ovaries become enlarged with many follicles that surround the eggs.

If patients have at least two of these signs, it might be identified with PCOS.[2]

The prevalence of PCOS is depended on the method of diagnosis, Word Health Organizations estimate the prevalence of PCOS worldwide is 2%–26%[3] with a high prevalence in obese patients at approximate 73%, the type of obesity is android, with a higher waist to hip ratio and fat in the front abdominal wall.[4]

A dysfunctional interaction of behavioral, environmental, and genetic factors causes PCOS. Enlargement of ovaries, as well as secreting higher levels of androgens than normal theca cells are the most common clinical presentations

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of PCOS. Increased androgenic secretion results from increased enzyme activity in the steroid production pathway. Also, extra insulin tiggers the ovaries to produce more male hormons.

Proteins and peptides have an important role in metabolic regulation of polycystic ovarian syndrome (PCOS), Such as amylin, preptin and Galectin-3.[5]

Amylin (a small peptide hormone) is a peptide hormone with 37-amino-acid, produced by the beta cells of the pancreas. Also amylin represent the islet amyloid peptide. Though insulin stimulates the utilization of glucose by peripheral tissues, amylin have a role in control glucose level by suppressing glucagon secretion from the cells, and suppressing the endogenous production of glucose from the liver. As well as, amylin slowing gastric emptying by reduce the absorption of glucose, stimulate satiety and reducing intake of food.[6]

Preptin is a peptide with 34-amino acids, secreted with insulin, amylin, and pancreostatin from pancreatic beta cells in response to glucose. Preptin release physiologically in stimulant of insulin secretion. The contact between peptides, gonads, adipose tissue, and central nervous system might be disturbed in PCOS. Failed expression of peptides might be the main causea of subfertility due to PCOS, in addition to insulin resistance and hyperandrogenism.[7] Instability in levels of any peptide in circulation might causes disturbed in release of GnRH and gonadotropins. This might lead in low implantation rates observed in PCOS women. Various studies examine the influence of peptides circulation levels on metabolic and reproductive actions. Yet, there is no information whether infertility in PCOS women is caused by an excessive or low peptide production or action. Even with several studies investigated preptin levels in circulation, and the role of amylin in metabolic disorders.[8]

Galectin-3 (Gal-3), identified as MAC-2 or CBP-35, is one member of the family of beta-galactoside-binding lectins, discovered in 1970s. Galectin-3 is a protein with 35-kDA coded by the LGALS3 gene and expressed in the immune, neural and epithelial cells have a role in cellular processes, like the cell cycle or cell growth. Also, Gal-3 has a role in cancer, cardiovascular diseases, and arthritis.[9] Recently Gal-3 studied as a probable biomarker for metabolic status in PCOS patients, as it has been shown to be associated to insulin resistance, pre and diabetes mellitus.[10]

Materials and Methods

The study involved independent 80 females, the age ranged between 22 and 37 years old, which were divided into two groups 40 women with Polycystic ovarian syndrome, subdivided to 40 female with overweight (BMI 24.2–29.7 kg/m^2). The second group is the control group, and it contains 40 women who appear to be in good health, age ranged between 21 and 37 years old. The PCO women were interviewed using a structured questionnaire to determine the smoking women and take other information like their medical history, family history, surgical history, and body mass index. A study was carried out in the Babylon Teaching Hospital for Maternity and Children in Hilla City and private clinics between July to December. An ELISA was used to estimate the serum concentrations of preptin, amylin, galectin-3 HOMA-IR, HbA1C levels, SHBG, Total Testosterone. Insulin by (enzyme-linked immunosorbent assay) and fasting blood glucose by spectrophotometric method. SPSS software was used to conduct the statistical analysis.

Ethical approval

Before collecting samples, all study participants were informed and allowed to verbally consent. A local college and hospital ethics committee examined and approved the study protocol, subject information, and permission form by the document number (IRB: 5448, April 15, 2023).

Statistical analysis

The results of study were shown as mean ± SD, for the evaluation of data Student *t* test and the linear

Table 1: Biochemical characteristics of the control and PCO populations

Parameters	PCO 40	Control 40	*P* value
BMI (Kg/m^2)	26.4 ± 2.4 (24.2–29.7)	25.3 ± 2.6 (23.8–28.3)	*P* > 0.05
Age (years)	28.3 ± 6.1 (22–37)	27.8 ± 5.8 (21–37)	*P* > 0.05
HbA1c %	6.34 ± 2.11	5.16 ± 0.21	*P* < 0.05
SHBG (nmol/mL)	41.11 ± 1.35	52.63 ± 11.6	*P* < 0.05
Total testosterone (ng/mL)	0.49 ± 0.08	0.24 ± 0.09	*P* < 0.05
FAI	4.74 ± 0.77	1.76 ± 1.05	*P* < 0.05
Fasting insulin (µu/mL)	12.5 ± 2.73	3.89 ± 0.54	*P* < 0.05
Fasting glucose (mg/dL)	126.10 ± 27.3	71.82 ± 16.94	*P* < 0.05
HOMA-IR	5.14 ± 2.03	1.33 ± 0.19	*P* < 0.05
Amylin (Pg/mL)	772.01 ± 18.05	463.40 ± 63.9	*P* < 0.05
Preptin (ng/mL(	275.09 ± 21.5	56.39 ± 4.6	*P* < 0.05
Galectin-3 ng/mL	3545.7 ± 1566.94	3491.3 ± 1212.04	*P* > 0.05

Significant = $P < 0.05$

Table 2: A correlation between the measured parameters sequence variables against each other

	Variables against each other	Correlation (r)	Sig. value
1	Amylin vs. Preptin	0.678	$P < 0.05$
2	Amylin vs. Galectin-3	0.71	$P < 0.05$
3	Galectin-3 vs. Preptin	0.65	$P < 0.05$
4	Amylin vs. IR	0.55	$P < 0.05$
5	Preptin vs. IR	0.495	$P < 0.05$
6	Galectin-3 vs. IR	0.32	$P < 0.05$

regression analysis were used. Confidence Interval 95% and *P* value were used for expression of data. SPSS (version 20) was performed for statistical analyses. *P* value was considered to be significant at 0.05 or less [Tables 1 and 2].

Results

Discussion

PCOS is a more common endocrine disorder linked with hyperandrogenemia, which is associated by obesity and infertility.

The deposition of adipose tissue around the abdomen affect the metabolism, secretion, and action of insulin. Liver, Insulin, adipose tissue and muscles have a role in ovary regulation. Insulin motivates the synthesis of steroid hormone from ovary by interrelating with insulin and insulin growth factor type I receptors, in thecal, granulosa, and stromal cells. 17-hydroxylase and 17–20 lyase activity elevated by insulin, as well as insulin stimulates the 3-hydroxysteroid dehydrogenase expression in granulosa cells.[11]

Proteins and peptides have a roles in metabolic homeostasis and represented the potential biomarkers in some health conditions, like obesity, diabetes mellitus and polycystic ovarian syndrome (PCOS), the abnormality of these biomarker linked with ovulation and metabolic abnormalities, like dyslipidemia, obesity, and hyperinsulinemia.[12]

Amylin is a peptide secreted with insulin and have a role in glucose metabolism. The amylin deposition begins in type 2 diabetes.[13]

Amylin accumulation are detected in pancreatic cells and before the beginning of fasting hyperglycemia. Then, amylin levels are probable to elevated in serum of insulin resistance patients.[14]

Studies,[15] achieved a case-control study comprise of 20 women with PCOS and 10 women with normal ovulation, and matching regarding BMI. PCOS patients have significant elevation of serum amylin than control group with positive correlation ($P < 0.05$) between fasting insulin and amylin levels in PCOS patients. The response of amylin was correlated with glucose response in PCOS women. An additional study, showed that amylin levels in serum are significantly higher in control than PCOS patients, anyway these patients have normal weight (BMI < 25 kg/m^2) or overweight (BMI > 25 kg/m^2). These results represent the mechanisms that prevent higher serum amylin level due to disturb glucose metabolism in PCOS patients.[16]

Preptin represent an oligopeptide produced by pancreatic β-cells that has developed as a probable novel biomarker for detecting PCOS as a result of its role in stimulating insulin secretion. Preptin is a peptide with 34-amino acid, produce by the same gene that produce Insulin-like growth factor 2 (IGF II); more accurately, it corresponds to the Asp69–Leu102 sequence of the E-domain of its precursor, proinsulin-like growth factor II. Ali *et al*. purified the peptide secretory from granules of cultured murine bTC6-F7 pancreatic b-cells. Preptin correlated positively with HOMA-IR, and fasting insulin.[17]

Studies the association between Gal-3, insulin, HOMA-IR and testosterone. Gal-3 level might be a probable marker of PCOS, but also might enable to identify the patients at higher risk of developing metabolic or cardiovascular. A number of studies have been directed to assess Gal-3 levels in serum and its association to metabolic parameters in PCOS women. Gal-3 levels elevated significantly in PCOS patients. Additionally, an associations between serum Gal-3 levels and HOMA-IR were observed, as well as an detected an association between Gal-3 levels and insulin hormone.[18]

Recently Gal-3 was studied intensively as a probable metabolic status biomarker of PCOS patients, it has been related to insulin resistance, pre-diabetes and diabetes mellitus. Furthermore, Gal-3 has pro-inflammatory properties. The direction of Gal-3 causes glucose intolerance and insulin resistance.[19]

Conclusion

According to the results of this study, peptides and proteins like (amylin, Gal-3, and preptin) have a roles in regulation of metabolism may be a possible biomarkers in some medical disorders, like polycystic ovarian syndrome (PCOS).

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Conflicts of interest

There are no conflicts of interest.

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