ORIGINAL RESEARCH PAPER

Biochemistry

A COMPARATIVE STUDY OF SERUM MAGNESIUM & GLUCOSE IN WOMEN WITH POLYCYSTIC OVARIAN SYNDROME AND HEALTHY CONTROLS

KEY WORDS: Magnesium, Glucose, PCOS, Cardio-metabolic syndrome

Dr Pankaj Birla* PG Resident, Department of Biochemistry, SMS Medical college, Jaipur, Rajasthan *Corresponding Author

Dr Lokeshwar Meena PG Resident, Department of Biochemistry, SMS Medical college, Jaipur, Rajasthan.

Dr Archana Parasher PG Resident, Department of Biochemistry, SMS Medical college, Jaipur, Rajasthan.

Dr Chitra Upadhyay Senior Professor , Department of Biochemistry, SMS Medical college, Jaipur, Rajasthan.

ABSTRACT

Background – Comparative study of serum magnesium and glucose in women with PCOS. **Method-** It was a prospective study. Data regarding various biochemical parameters were collected in PCOS females and compared with healthy females. Analysis and comparison was done using Student't' test and chi square test. Result – Serum magnesium levels were decreased and fasting glucose levels were increased in PCOS females. Mean magnesium show inverse relation with blood glucose. **Conclusion** - Use of these simple and cost-effective biochemical parameters might prove to be biomarkers in early detection of these metabolic changes and may help to identify women with PCOS at risk of cardio metabolic syndrome

INTRODUCTION

Polycystic ovarian syndrome is the most common endocrinopathy in the women of reproductive age with a prevalence of approximately 7-10 % worldwide[1]. It is characterized by serious health implications such as diabetes, coronary heart disease and also leads to infertility. One of the major biochemical features of PCOS is insulin resistance.[2] Hyperinsulemia produces hyperandrogenism which interfere with the pituitary ovarian axis leading to increased LH levels, anovulation, amenorrhea, recurrent pregnancy loss and infertility. Hyperinsulinemia has also been associated with high blood pressure and increased clot formation. Magnesium may influence glucose metabolism by acting as a cofactor for many enzymes involved in energy metabolism as well as being part of the Mg2+-ATP complex[3]. So there may be some association between Mg and Insulin resistance among individuals with PCOS, diabetes mellitus (DM) and metabolic syndrome. Measuring Serum Magnesium and Glucose are affordable, accurate, and minimally invasive which may help to identify women with PCOS who are at risk of cardio- metabolic syndrome.

AIMS & OBJECTIVES

To study, analyze and correlate serum magnesium and glucose level in women with PCOS and healthy controls.

METHOD

After necessary permissions & counselling the study was conducted at SMS Medical Collage and attached hospitals.

Study Type: Hospital based case control observational study

Study Period: Study was conducted from Jun 2021 to November 2022.

Sample Size –

A sample of 70 cases in each group is require at 95 % confidence interval and 80% power to verify expected difference of 0.25 mg/dl in mean and SD 0.53 to compare serum magnesium level in control and case groups.

Inclusion Criteria:

Cases: Female patients diagnosed with PCOS based on Rotterdam Criteria, not on any treatment, in the age group of 18-40 years.

Diagnosis based on Rotterdam criteria (2003)

1. Oligomenorrhoea / Amenorrhoea
2. Clinical / Biochemical signs of hyperandrogenism (Hirsutism, Acne, Alopecia, Elevated androgen levels)
3. Presence of Polycystic ovaries on USG

Exclusion Criteria

1. Volunteers with DM, HTN, thyroid disorders, renal diseases, cardiovascular diseases, cushing syndrome
2. Pregnant or lactating women
3. Women on Oral contraceptive pills
4. Volunteers on drugs like hypoglycemic agents, lipid lowering drugs and hormonal medicines within 6 weeks

Principle Assays

1. Glucose oxidase peroxidase (GOD - POD) method
2. Magnesium – Calmagite – EGTA - Colorimetric assay

RESULT

The age group of subjects is between 18-40 years. As shown in Table-1 BMI, waist circumference, waist hip ratio, systolic & diastolic BP are more in cases as compared to controls and this difference is statistically highly significant ($p < 0.001$). The mean Fasting blood sugar levels in PCOS cases (98.3 ± 7.89 mg/dl) is more as compared to controls (90.6 ± 8.06 mg/dl) and this difference is statistically highly significant ($p < 0.001$). The mean serum magnesium levels in PCOS cases (1.88 ± 0.21 mg/dl) is less as compared to controls (2.09 ± 0.27 mg/dl) and this difference is statistically highly significant ($p < 0.001$). When Pearson correlation applied to compare Fasting blood sugar and Serum Magnesium (Table-2, Figure-1), there is Negative linear correlation between mean Fasting blood sugar and Serum Magnesium and it is statistically highly significant ($p = 0.001$).

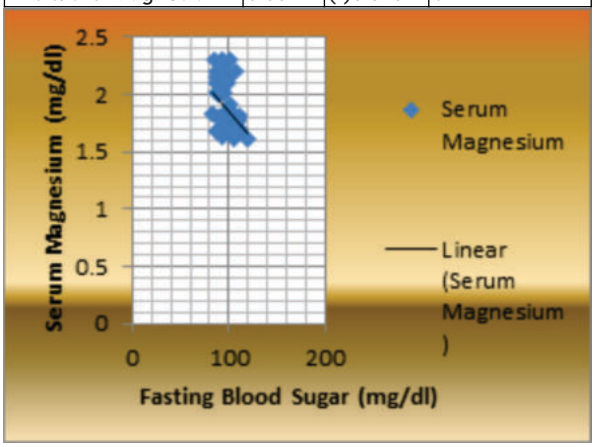
Table–1: Comparison Of Various Parameters B/w Cases & Controls

Para-Meters	Cases (n=70)	Controls (n= 70)	P-value
Mean Age (Years)	26.1 ± 3.99	27.21 ± 5.14	>0.05
BMI (Kg/M2)	27.75 ± 2.63	25.24 ± 2.29	<0.001*
Waist Circumfer-ence (cm)	86.03 ± 5.07	78.4 ± 4.30	<0.001*
Waist/Hip ratio	0.79 ± 0.06	0.73 ± 0.05	<0.001*

Systolic BP (mm of Hg)	118.09 ± 8.81	111.37±6.51	<0.001*
Diastolic BP (mm of Hg)	78.86 ± 5.35	74.65 ± 4.28	<0.001*
Fasting Blood Sugar (mg/dl)	98.3 ± 7.89	90.6 ± 8.06	<0.001*
Serum Magnesium (mg/dl)	1.88 ± 0.21	2.09 ± 0.27	<0.001*

Table–2: Pearson Correlation B/w Sugar And Magnesium

Parameter	P value	R Score	Significance
FBS v/s S. Magnesium	0.001	(-)0.379	S



Figure–1: Pearson Correlation B/w Sugar And Magnesium

DISCUSSION

PCOS is no more a pure gynecological disorder but a multisystem endocrinopathy. Due to its varied presentation and associations like Hirsutism, Oligomenorrhoea, diabetes, heart disease, infertility, endometrial cancer etc, it is important to look for its early predictors and markers. This present study is an attempt forward on series of previous studies done to study the pattern of biochemical abnormalities in polycystic ovarian syndrome. In this comparative study, we compared blood glucose and magnesium in 70 cases of PCOS with age matched healthy controls.

In our study, fasting blood glucose was significantly higher in PCOS cases. A study by Azevedo MF et al., reported higher fasting glucose levels in PCOS women which was statistically significant.[4] Our result was consistent with the study of Azevedo MF et al. Our study also showed significant negative correlation between fasting blood glucose and serum magnesium.

Our study reveals statistically significant lower levels of mean serum magnesium in PCOS cases than controls. Our study also showed significant negative correlation between fasting blood glucose and serum magnesium. In a cross sectional study by Shariffi et al involving 103 PCOS patients, the risk of PCOS was 19 times higher in subjects with Mg deficiency than those with normal serum Mg concentrations ($P \leq 0.0001$).[5] This study show that an association is known to exist between the low serum ionized magnesium (Mg^{2+}) and high ionized calcium to magnesium (Ca^{2+}/Mg^{2+}) ratio with insulin resistance, cardiovascular problems, diabetes mellitus and hypertension

SUMMARY & CONCLUSION

As per our study there is significant decrease in mean serum magnesium levels and it is inversely related to the glycemic levels. Thus low magnesium concentrations are associated with impaired glucose tolerance and increased risk for Type 2 diabetes mellitus. All the above derangements confirm that polycystic ovary syndrome contributes to place the patient at a higher risk of metabolic syndrome. Therefore, it is recommended that women with PCOS be routinely screened for these simple and cost-effective biochemical parameters which might prove to be biomarkers in early detection of these metabolic changes and so that treatment can be initiated at the earliest.

REFERENCES:

[1] Padubidri VG, Daftary SN. Disorders of the Ovary and Benign Tumours. In: Howkins and Bourne eds. Shaws textbook of gynaecology. 14th ed. India: Elsevier Publication. 2008: 331.
[2] Barbara Hoffman, John Schorge et al Williams Gynecology. Mc Graw Hill. Second Edition.
[3] Morais JBS, Severo JS, de Alencar GRR et al, "Effect of magnesium supplementation on insulin resistance in humans: a systematic review". Nutrition 2017;38:54–60.
[4] Azevedo MF, Costa EC, Oliveira AI, Silva IB et al. "Elevated blood pressure in women with Polycystic ovary syndrome: Prevalence and associated risk factors". Rev. Bres. Ginecol Obstet. (2011) ; 33(1):31-36.
[5] Sharifi F, Mazloomi S, Hajihosseini R, Mazloomzadeh "S. Serum magnesium concentrations in polycystic ovary syndrome and its association with insulin resistance. Gynecological Endocrinology. 2012;28(1):7-11.doi:10.3109/09513590.2011.579663. Epub 2011 Jun 23.