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**RESEARCH ARTICLE**

# STUDY OF MAGNESIUM LEVEL IN POLYCYSTIC OVARIAN SYNDROME

**Usharani. M* Santhanalakshmi.L**
Madurai Medical College, Madurai, Tamilnadu.

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****Corresponding Author***

**Usharani. M**

## *Abstract*

Background: Polycystic Ovarian Syndrome, characterized by hyperandrogenism, oligomenorrhoea / anovulation and polycystic ovaries is the most common endocrine disorder in females of reproductive age group and are found to have an increased incidence of insulin resistance. As magnesium plays the role of a second messenger for the action of insulin, this study aims to investigate the level of serum magnesium in patients with polycystic ovarian syndrome.

Aim: To evaluate the level of serum magnesium in infertile women with polycystic ovarian syndrome and to study its possible association with insulin resistance.

Materials and methods: After getting Ethical Committee approval, informed, written consent were obtained from 30 infertile PCOS women aged 25 - 35 years (study group) and 30 age matched parous women (control group), history, general, systemic and laboratory examinations - fasting plasma glucose by Glucose Oxidase Peroxidase Method and serum magnesium by spectrophotometric method were carried out.

Result: Statistical analysis was done by student- t test and the results were compared between study group and control group.There was a **significant increase in fasting plasma glucose levels (p <0.001) with decrease in serum magnesium levels (p< 0.001)** in patients with PCOS as compared to controls.

Conclusion: This study confirms the association between serum magnesium and glucose levels in PCOS. Since women with PCOS are at a risk of developing Type 2 Diabetes Mellitus screening for magnesium is necessary in these patients.



## INTRODUCTION

Polycystic Ovarian Syndrome (PCOS) is the most common female endocrine disorder with a prevalence of 5-10% in women of reproductive age. PCOS is characterized by increased ovarian and adrenal androgen secretion, hyperandrogenic symptoms, menstrual irregularity and polycystic ovaries. Two out of the following three characteristics are required to confirm the diagnosis of PCOS according to Rotterdam criteria given below.

**The Rotterdam ESHRE/ASRM-sponsored PCOS consensus workshop group (2003)**

1. Oligo- and / or anovulation
2. Clinical and / or biochemical signs of androgen excess.
3. Polycystic ovaries.

PCOS is not only a reproductive endocrinopathy but also a metabolic disorder . Women with PCOS are known to be at increased risk for insulin resistance .

Magnesium, a cofactor of many enzymes involved in glucose metabolism, is required for both proper glucose utilization and insulin signaling. In particular it has been shown that magnesium plays the role of a second messenger for insulin action. The normal level of serum magnesium ranges between 1.5 to 2.5 mg/dl. Low magnesium concentrations are associated with impaired glucose tolerance and increased risk for type 2 diabetes mellitus.

**AIM**

The aim of our study is to evaluate the level of serum magnesium in infertile women with polycystic ovarian syndrome and to study its possible association with insulin resistance.

## MATERIALS AND METHODS

**Study Population:**

The Cross sectional study was carried out in the department of Obstetrics and Gynaecology at Government Rajaji Hospital, Madurai from June to September, 2015. A total of 60 consented women aged 25-35 years were enrolled in the study. The subjects were divided into two groups as patients and controls. The study group consisted of 30 infertile PCOS women diagnosed to have Polycystic Ovarian Syndrome (PCOS) by Rotterdam criteria. The control group consisted of 30 age matched parous women attending as outpatient in the department of Obstetrics and Gynaecology at Government Rajaji Hospital, Madurai.

Institutional Ethical Committee approval was obtained. The participation of the respondents was voluntary and informed consent was signed by each participant. Medical history was obtained, general and systemic examination was carried out.

**Inclusion Criteria :**

1.Infertile PCOS women.
2.25 – 35 years.
3.Attending as outpatients in the department of Obstetrics and Gynaecology.

**Exclusion Criteria :**

1.Diabetes Mellitus
2.Hypertension
3.Thyroid Disorder
4.Renal Disease
5.Cardiovascular Disease
6.Pregnant or lactating women
7.Usage of Oral Contraceptives
8.Any Hormonal Medications within previous 6 weeks

**Anthropometric Measurement**

All the subjects height and weight were recorded using standard apparatus. Body mass index (BMI) was calculated by dividing weight (kg)by height ($m^2$). Normal weight was defined as BMI < 25, Overweight as BMI between 25.0-29.9 and Obesity as BMI > 30.Out of the 30 cases 9 were overweight and 4 were obese.

**Blood Pressure:**

Blood Pressure was measured in the right arm, with the subjects in a relaxed sitting position using a mercury sphygmomanometer.

**Sample Collection and Storage:**

5 ml of venous blood samples was collected from healthy controls and women with PCOS after an overnight fast of 10 -12 hrs. 1 ml of sample was taken and analysed for fasting blood glucose by Glucose Oxidase Peroxidase Method. 4 ml of sample was taken and Serum Magnesium was evaluated by spectrophotometric method .

## RESULTS

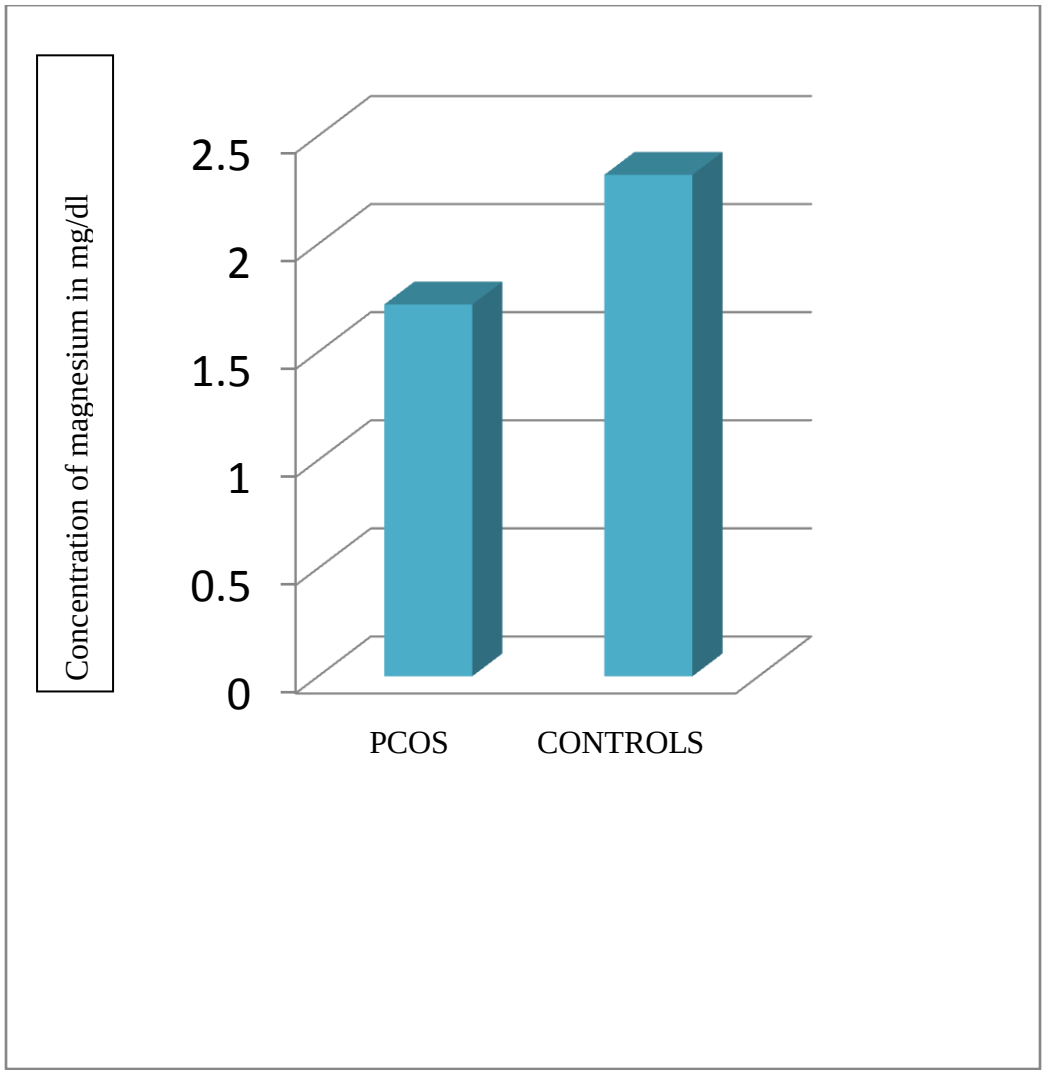
Data Analysis was performed using SPSS 20 Software. The values were expressed as mean ± Standard deviation. Deviation and the findings were analysed by student "t" test. A 'p' value of **< 0.05** was considered statistically significant.

Table given below shows Mean, Standard Deviation and p Values of Serum Magnesium and Fasting plasma Glucose in PCOS Patients and Control Groups.

| S No | Parameters | PCOS patients | Control group | p value |
|---|---|---|---|---|
| 1. | Serum Magnesium (mg/dl) | 1.72 ± 0.079 | 2.32 ± 0.083 | <0.001 Significant. |
| 2. | Plasma Glucose (mg/dl) | 97.73 ± 2.420 | 88.57 ± 3.202 | <0.001 Significant. |

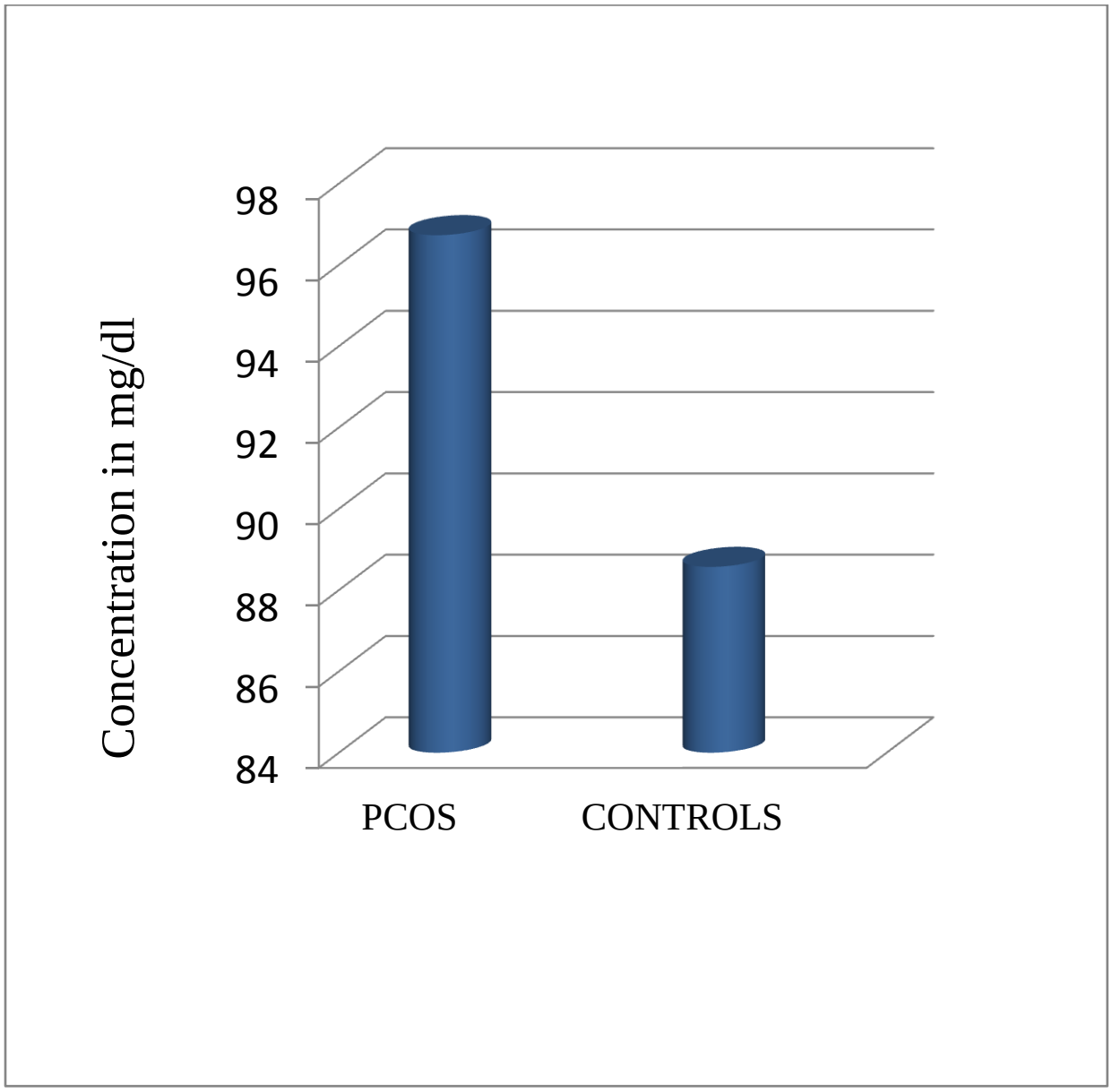
In this table Serum magnesium is lower in study group (PCOS patients) when compared to control group and fasting plasma glucose is higher in study group (PCOS patients) than control group.

**Comparison of serum Magnesium in PCOS patients and controls**



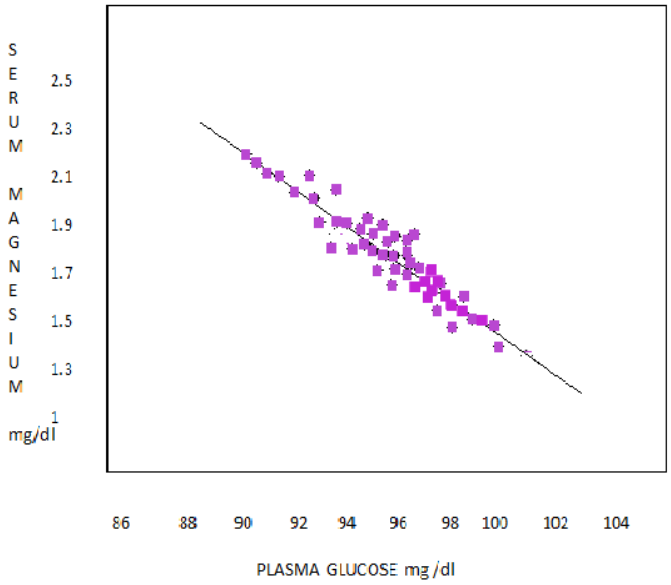

Above diagram shows the level of Serum magnesium lower in PCOS than controls.

**Comparison of plasma Glucose in PCOS patients and controls**



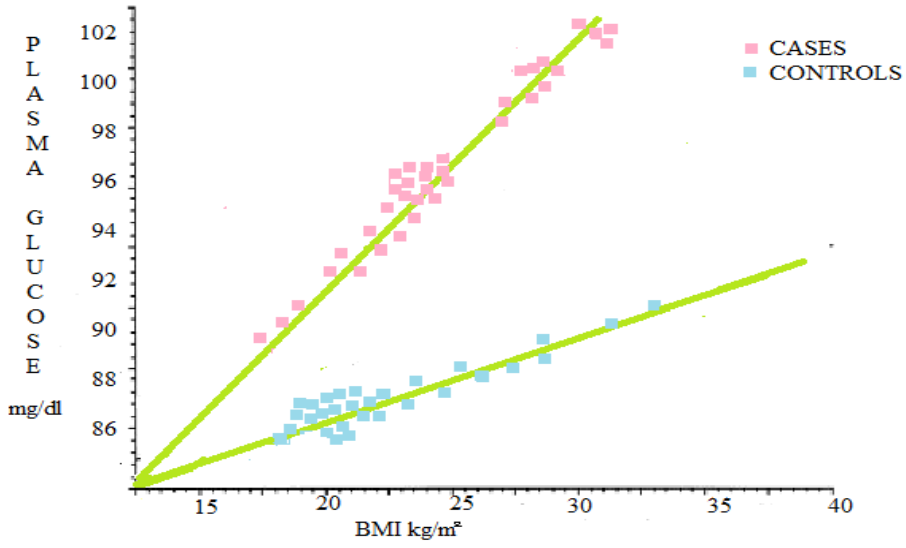

Above diagram shows fasting plasma glucose level in PCOS higher than controls.

**Comparison of serum Magnesium and Plasma Glucose in PCOS patients**




Above scatter diagram shows as the serum magnesium level decreases plasma glucose level increases in PCOS patients.

**Comparison of BMI with Plasma Glucose in PCOS and controls**




The above scatter diagram shows as BMI increases the plasma glucose also increases but in PCOS (upper line) even if BMI is in the normal range rise of plasma glucose is high when compared to the controls (lower line). This shows insulin resistance is independent of BMI in PCOS .

## DISCUSSION

A total number of 30 PCOS patients with infertility and 30 parous controls were selected to study the level of fasting Glucose and serum Magnesium. PCOS patients reported higher fasting glucose levels and decreased magnesium levels which were statistically significant as compared to controls.

The postulated mechanism of decreased magnesium level leading to insulin resistance and infertility are : Hypomagnesemia

1. alters glucose entry into the cells leading to insulin resistance.
2. contribute to spasms in the fallopian tubes causing difficulty in travel of the embryo to uterus thereby contributing to infertility.
3. causes dysregulation of the hypothalamo-pituitary-gonadal axis.
4. causes the stress hormone, cortisol, to elevate which in turn depletes magnesium in the body.

## CONCLUSION

A decrease in serum magnesium has been linked with insulin resistance and infertility in PCOS. Early detection of metabolic changes may help to identify women with PCOS at risk of developing type 2 diabetes mellitus.

We recommend routine monitoring and magnesium supplementation in PCOS patients.

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