

# PREGNANCY INDUCED HYPERTENSION AND ITS RELATION TO VITAMIN D AND ALDOSTERONE IN IRAQI PREGNANT WOMEN

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**ABSTRACT :** Hypertension along with proteinuria after 20th week of pregnancy is classified as pregnancy induced hypertension or Preeclampsia. Risk factors associated with preeclampsia include first pregnancy, multiple pregnancy, high body mass index (BMI), medical history of chronic hypertension, diabetes, kidney disease, obesity, age>35 years and personal or family history of preeclampsia. The aim of the study is to determine the relationship between vitamin D, and aldosterone with pregnancy induced hypertension. Ninety pregnant women were participated in the present study; 60 pregnant women with Preeclampsia and 30 pregnant women with normal blood pressure with same age. Fasting blood sample (8ml) was collected by venipuncture and the following parameters were estimated in both cases and controls, which are serum uric acid, vitamin D, and alpha- feto protein, (ALP) according standard procedures. There is significant elevation in serum aldosterone in PIH pregnant women as compare with normotensive pregnant women. Also, there is significant elevation in serum alpha feto protein and uric acid in PIH pregnant women as compare with normotensive pregnant women. However, there is significant reduction in serum vitamin D in PIH pregnant women as compare with normotensive pregnant women.

**Key words :** PIH, aldosterone, uric acid, hypertension, pregnancy.

## INTRODUCTION

Hypertensive disorders complicate 5-10% of pregnancies and are a leading cause of maternal mortality. Hypertensive disorders are among the most common problem encountered during pregnancy. It accounts for approx. 5-10% of all the pregnancies. It is the leading cause of maternal morbidity and mortality, (1).

Hypertension along with proteinuria after 20th week of pregnancy is classified as Preeclampsia. Risk factors associated with preeclampsia include first pregnancy, multiple pregnancy, high body mass index (BMI), medical history of chronic hypertension, diabetes, kidney disease, obesity, age>35 years and personal or family history of preeclampsia (2,3).

There are various etiological factors for pregnancy induced hypertension. This is a disorder of hypothesis and affliction to involve all organs in the body. The potential causes of pregnancy induced hypertension are, (4),

1. Abnormal placentation.
2. Vasculopathy and inflammatory changes
3. Immunological factors
4. Genetic factors
5. Nutritional factors.

Vitamin D deficiency during pregnancy may lead to increase the risk of pre-eclampsia, gestational diabetes mellitus (GDM), bacterial vaginosis, and more chances of cesarean section, (5,6). Long term vitamin D deficiency increases the mother's risk of developing diabetes mellitus type 2, osteoporosis and cancer. Vitamin D plays an important role in insulin regulation, and bone mineralization, (7,8,9).

The aim of the study is to determine the relationship between vitamin D, and aldosterone with pregnancy induced hypertension.

## Patients and methods

Ninety pregnant women were participated in the present study; 60 pregnant women with Preeclampsia and 30 pregnant women with normal blood pressure with same age.

A case control study was done in department of Obstetric and gynecology in Balad hospital-Iraq from beginning of March to the end of June 2018. Ninety subjects (normotensive and hypertensive patients) were included 28 weeks to 40 weeks of gestational period. Information on age, education, parity, occupation, income and obstetric history was obtained from the mother using

a close ended questionnaire. Gestational age (in weeks) at enrolment was calculated from the reported first day of the last menstrual period.

**Inclusion criteria** Pregnant women with hypertension for the 1<sup>st</sup> time according to the definition of American College of Obstetrics and Gynecologists with an age ranging from 18 to 35 years.

### Control women

Thirty Pregnant women with normal BP, no proteinuria and without any other systemic or endocrine disorder. They were age matched with the cases. All subjects included were in their 2nd trimester (gestational age of  $\geq 24$  weeks).

**Exclusion criteria** included Pregnant women with early diagnosed pre-eclampsia, gestational diabetes mellitus with or without treatment, obesity, (BMI more than 30), severe anemia (Hb < 6 gm%) or subjects suffering from any other systemic or endocrine disorder. Patients with multiple pregnancy, chronic hypertension, pre-existing renal disease and diabetes mellitus were excluded. Women with renal disease, chronic liver disease, and patient taking antitubercular drugs or antiepileptic drugs were excluded from the study.

Fasting blood sample (8ml) was collected by venipuncture and the following parameters were estimated in both cases and controls, which are serum uric acid, vitamin D, and alpha- feto protein, (ALP) according standard procedures, (6,10).

Vitamin D was measured by Minividus instrument and done by using kit for 25 OH vitamin D (VITD - Biomerieux). Serum 25(OH)D3 was determined by immunometry (electrochemiluminescence: ECLIA) using an automated clinical chemistry analyzer (Modular E170, Roche Diagnostics®, Mannheim, Germany), (6).

There has been much controversy about the method of measuring blood pressure in pregnancy. In the UK, Korotkoff phase IV is generally used, but in other parts of the world, clinicians use Korotkoff phase V. A study by Brown and colleagues suggested that Korotkoff phase V is preferable.<sup>26</sup> For measurement of blood pressure, the woman should be rested and reclining

at an angle of 45. The blood-pressure cuff should be of appropriate size and placed at the level of the heart, (11) Brown *et al*, 1998).

## RESULTS AND DISCUSSION

Table 1 show the mean and standard deviation of serum concentration of vitamin D and aldosterone in patients and normotensive pregnant women.

There is significant elevation in serum aldosterone in PIH pregnant women as compare with normotensive pregnant women.

Also, there is significant elevation in serum alpha-feto protein in PIH pregnant women as compare with normotensive pregnant women.

Also, there is significant elevation in serum uric acid in PIH pregnant women as compare with normotensive pregnant women.

However, there is significant reduction in serum vitamin D in PIH pregnant women as compare with normotensive pregnant women.

In the present study, there is significant reduction in serum vitamin D in patients with PIH, as compare with normal control pregnant women.

The deficiency value of vitamin D was less than 20ng/ml, insufficiency (20-30ng/ml), sufficiency (30-100ng/ml). High prevalence of vitamin D deficiency in the general population and in women of childbearing age, worldwide, is known to be associated with an increased prevalence of preeclampsia, (12).

In the present study found high prevalence of vitamin D deficiency among pregnant women. Maternal serum 25(OH) D < 10 ng/mL was found in more than 50% of PIH women.

In a case control study, a total of 100 patients were divided into two equal groups (control and study groups of 50 each). They found more incidence of severe vitamin D deficiency (90%) in pre-eclampsia patients as compared to normotensive patients (13).

The result the present study revealed that in women who developed PIH, there is increased levels of maternal serum AFP progressively during the second trimesters.

**Table 1 :** The mean and standard deviation of vitamin D, Aldosterone, ALP, and uric acid in pregnancy induced hypertension (PIH) patients and controls.

Parameters	Normotensive	PIH	P value
Vitamin D ((ng/ml))	29.7 $\pm$ 4.6	11.3 $\pm$ 2.5	0.01
Aldosterone (ng/dl)	195 $\pm$ 45	319 $\pm$ 135	0.01
ALP (u/L)	85.5 $\pm$ 16.6	153.8 $\pm$ 26.2	0.01
Uric acid (mg/dl)	18.8 $\pm$ 5.1	31.3 $\pm$ 8.1	0.01

Previous studies found that AFP level increased with the gestational age and progression of pregnancy. Kuo *et al* (2003) investigated the association between elevation of AFP and pregnancy outcomes on 168 singleton pregnancies. They suggested that screening for pregnancies with elevated AFP and pregnancy outcomes included preterm labor, and preeclampsia would help to identify the low-risk cases (14).

Previous studies showed that increases risk of pregnancy-induced hypertension, and preterm labor are associated with elevated AFP levels, (15).

Walters *et al* reported that 13% of women with elevated AFP developed pre-eclampsia compared to 1% of the women with normal AFP, <sup>(16)</sup>. Williams *et al* compared 201 women with unexplained elevated AFP with 211 women with normal AFP. A significant association was found between elevated AFP and pre-eclampsia, (17).

In the present study, there is a significant elevation in the concentration of serum aldosterone in 2nd trimester in PIH pregnant women. In normal pregnancy, an increase in almost all the components of RAS occurs. As suggested sequence of events is as follows: initial vasodilation and a subsequent lower blood pressure, followed by increases in PRA release and angiotensin II generation for the maintenance of blood pressure within the normal range, (18).

There is broad agreement that the component of the rennin Angiotensin Aldosterone system are markedly reduced in women with preeclampsia, which could contribute to the reduced plasma volume in preeclampsia, (19). This study not agree with the present study because it is old study and with small sample of preeclampsia.

Previous study showed that plasma aldosterone is significantly higher in pregnant women with GDM with hypertension as compared to those women with normal glucose tolerance during pregnancy, (20).

In the present study, there is significant elevation in the concentration of serum uric acid in PIH pregnant women as compare with normotensive pregnant women.

Elevated serum uric acid levels due to decreased renal urate excretion are frequently found in women with preeclampsia. Soluble uric acid impairs nitric oxide generation in endothelial cells. Thus, hyperuricemia can induce endothelial dysfunction (21).

However, the present result is contradictory to some studies that the mean serum uric acid level in preeclampsia was not different from normal pregnancy (22,23).

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