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Prospective Study for the Prediction of Preeclampsia with Urinary Calcium Level

[1]Debobroto Roy, [2]Banhi Shikha Modak, [3]Krishna Pada Das and [4]Goutam Chatterjee

[1]Department of Obstetrics and Gynecology, Burdwan Medical College, Bardhaman University, Burdwan, West Bengal 713104, India
[2]Department of Obstetrics and Gynecology, Chandannagar Sub Divisional Hospital, Chandannagar, Chinsurah, West Bengal 712136, India
[3,4]Department of Obstetrics and Gynecology, Burdwan Medical College, Burdwan University, Burdwan, West Bengal 713104, India

ABSTRACT

The process of pregnancy is physiological. However, among women who were not previously hypertensive, pregnancy may cause hypertension, and in those who were, it may cause aggressive hypertension. About 10% of pregnancies are complicated by hypertension, which also has a major impact on maternal and perinatal morbidity and death. The study of urinary calcium level has been estimated of the primigravida from the antenatal clinic 4 weeks interval within 16-20 weeks of pregnancy and continue till EDD/onset of labour. The study has been done for prediction of preeclampsia by measuring urinary calcium level. The present study was a prospective study. This Study was conducted from One year-July 2021 to June 2022 at Gynaecology and Obstetrics department, Burdwan Medical College and Hospital, Burdwan. Total 60 patients were included in this study. B group of blood is most common (50%). Rh (-) blood is seen in 10% cases. Both study group and control group non users of contraceptives are the maximum percentage. In control group Serum uric acid level of the study group at the beginning (20 weeks) and at 40 weeks or at the time of delivery was always below 4.5 mg dL^{-1}. Preeclampsia is a multisystem illness with a complicated etiology that is now incurable. Therefore, if preeclampsia is predicted during the first few weeks of pregnancy problems. We will have the ability to lower maternal and fetal Numerous forecasters have been put out. A kind of this prediction is hypocalciuria. It was shown in the aforementioned study that preeclampsia patients experienced hypocalciuria.

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Key Words
Preeclampsia, prediction, urinary calcium and hypertension

Corresponding Author
Banhi Shikha Modak,
Department of Obstetrics and Gynecology, Chandannagar Sub Divisional Hospital, Chandannagar, Chinsurah, West Bengal 712136, India

Author Designation
[1,3]Assistant Professor
[2]Specialist Medical Officer
[4]Clinical Tutor

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INTRODUCTION

The process of pregnancy is physiological. However, among women who were not previously hypertensive, pregnancy may cause hypertension, and in those who were, it may cause aggressive hypertension. The 10% of pregnancies are complicated by hypertension, which also greatly increases maternal and perinatal morbidity and death[1].

Pregnancy-related hypertensive disorders cover a broad range of conditions, from simple hypertension to more complex kidney-related states that show up as proteinuria leading to "preeclampsia" or even convulsions leading to the dreaded "eclampsia."

The Greek word "Eklampein" was used by Hippocrates to designate a fever of sudden onset. The word "Eclampsia" dates back to the 17th century where it was first mentioned by Varandaus in 1619 in a "Treatise on Gynaecology" to describe the fits in pregnancy-indeed the word owes its very sense of fulminance to its Greek derivation which literally meant "a flash of lightening". The magnitude of concern for this disease since early days is reflected in the observation of Alexander Hamilton (1781), who described eclampsia as a disease, which is always attended with the utmost hazards and kills the women like a fit of apology. The term "preeclampsia" has been used to describe the state preceding an eclampsia seizure, which of course in present days is definable, by definite clinical criteria and all the management protocols are directed to prevent its unfortunate progress to eclampsia.

Preeclampsia is a multisystem pregnancy disease. Preeclampsia (PE) is of great concern to all obstetricians because to the risk for maternal mortality (12.6%) and fetal problems[2]. Endothelial dysfunction is the major pathology and it can start as early as 8-18 weeks, although the extreme stages of the illness don't show symptoms until the late midtrimester.

This element has been the subject of so many ideas that Zwefel referred to it as the "disease of theories" in 1916. Jeffcoate further stated that "preeclampsia is a disease of theories" in 1966, after 50 years had passed. Just like with any other illness of this kind, the cause is still unknown, hence the therapy is yet empirical. There have been a number of intriguing recommendations for treating it that include medicinal, surgical, and even aligning women's heads northward along the earth's magnetic field. Unfortunately, no government has been able to completely eradicate this terrible illness. Thus there is a pressing need for screening of the potential high-risk cases at the earliest possible opportunity.

It has been suggested that preeclampsia can be predicted by measuring a range of biological, biochemical, and biophysical indicators involved in the pathophysiology of the condition early in pregnancy or during pregnancy. There has been an effort to pinpoint early indicators of improper placentation, including decreased placental perfusion, endothelial cell activation and malfunction, and coagulation activity. Serum uric acid, microalbuminuria, urine calcium or kallikrein, microtransferrinuria, and N-aceyl-glucosaminidase are additional tests used to indicate preeclampsia in renal impairment[3]. For the arrest of the disease process in the initial stages and to prevent complications prediction is very much important.Hypocalcuria is one such predictor[1]. Thus, the present study was under taken with an intention to predict preeclampsia with 24 hrs urinary calcium estimation at 4 weeks interval and regular follow up and early intervention with its prediction to prevent maternal and foetal complications.

MATERIALS AND METHODS

Study area: The prospective study has been conducted in the antenatal clinic of Gynaecology and Obstetrics department, Burdwan Medical College and Hospital, Burdwan.

Study population: Antenatal mother within 16-20 weeks of pregnancy and the age group within 20-30 years attending the antenatal clinic of BMC and H.

Study period: One year: July 2021 To June 2022

Sample size: 60 cases.

Inclusion criteria:

- Primigravida
- 16-20 weeks of pregnancy
- 20-30 years of age group

Exclusion criteria:

- Preexisting hypertension
- Diabetes mellitus
- Chronic renal disease
- Immunological disorder
- Anaemia

RESULTS

B group of blood is most common (50%). Rh (-) blood is seen in 10% cases. Both study group and control group non users of contraceptives are the maximum percentage. In control group Serum uric acid level of the study group at the beginning (20 weeks) and at 40 weeks or at the time of delivery was always below 4.5 mg dL^{-1} (Table 1 and 2).

DISCUSSIONS

These findings demonstrate that in women who are predisposed to develop preeclampsia, urine calcium and the calcium creatinine ratio gradually decline until term. This result is consistent with the findings of other studies (Table 3).

There has been a noticeable downward trend in the calcium-to-creatinine ratio in preeclampsia patients. About 11 people who utilized this ratio as a test to predict PE disagreed with this conclusion, despite the fact that it is simple to quantify[4].

Reduced plasma volume appears to be the cause of mild to moderately impaired glomerular filtration in the majority of preeclampsia patients. In certain situations, intrinsic renal alterations brought on by severe vasospasm may result in a significant decline in GFR. Thus, hypocalciuria in PE may be caused by this. In PE patients, there was a statistically significant decrease in calcium excretion starting at week 28. Throughout the pregnancy, the control group's calcium excretion did not change. In the control group, there was also a notable decrease in the Ca: Cr ratio.

At 20 weeks of gestation, the study group's mean calcium level was 292.3 mg/24 hrs. With n = 10, the standard deviation (SD) is 6.093 and the standard error of the mean is 1.927.

At 40 weeks or at the time of delivery the mean calcium level of the study group was 87 mg/24 hrs, n = 10

Standard deviation (SD) = 3.590, Standard error of mean = 1.135.

The range

In the control group

Al 20 weeks of gestation mean calcium level = 307.86 mg/ 24 hrs.

Standard deviation = 72.492, Standard error of mean = 10.252

At 40 weeks or at the time of delivery - 24 hrs. -the mean calcium level 303.68 mg/ N=50

Standard deviation = 17.7, Standard error of mean = 2.503, The range of calcium = (260-330) mg/24 hrs.

For, the reduction of calcium in the preeclampsia patients is statistically significant. The prediction of preeclampsia with this hypocalciuria is a very good predictor.

Measurement of 24 hrs urinary calcium, creatinine, and protein excretion are non invasive, inexpensive and easy to carry out.

The 24 hrs urine calcium creatinine ratio has also decreased in this investigation. The calcium creatinine ratio in the study group was 0.349 at 20 weeks and was 0.1108 at 40 weeks at the time of delivery. The calcium to creatinine ratio did not significantly alter in the control group; at 20 weeks, it was 0.3801 and at 40 weeks, at the time of birth, it was 0.358.

Proteinuria and hypertension are the unavoidable criteria for the diagnosis of preeclampsia. Oedema may or may not be present; as a natural condition, mild oedema is prevalent during pregnancy.

The cut mark level of Blood Pressure has been taken as 140/90 mm of mercury. The cut mark level for proteinuria as 300 mg or more per 24 hrs urinary excretion. In the starting that is 20 weeks the mean 24 hrs urinary protein was 269.6 mg.

At 40 weeks or at the time of delivery the mean 24 hrs urinary excretion of protein was -431.3 mg.

Urinary excretion within the range was (260-460) mg/24 hrs. The 24-hour urine protein in the control group was consistently less than 300 mg. When serum uric acid levels reach 4.5 mg dL^{-1} or above, preeclampsia is definitively diagnosed (Table 4).

The mean blood uric acid level in this research was 3.317 mg dL^{-1} after 20 weeks. The mean serum uric acid level at 40 weeks, or the time of birth, was 4.78 mg dL^{-1}.

The range was (3.22 to 5.6) mg dL^{-1}. In the control group-it was always below 4.5 mg dL^{-1}. The 24 hrs urinary calcium excretion has been reduced from 28 weeks of gestation. It then begun to reduce markedly as the pregnancy advances.

The normal 24 hrs urinary excretion of calcium is 300 mg. In the study group in every patients it was always below 100 mg/24 hrs at 40 weeks or at the time of delivery which ever is earlier.

According to Pedersen *et al.*[5], preeclamptics' third-trimester fractional excretion of calcium was lower than that of normotensives. because the preeclamptic patients' levels of calcitonin and parathyroid hormone were unaffected. They came to the conclusion that variations in the choice of these hormones had nothing to do with the variations in calcium metabolism. The study revealed that

Table 1: Blood group of study group

Blood group	Percentage
A	
B	50
AB	10
O	40
Rh (+)	90
Rh (-)	10

Table 2: Previous contraceptive practice in the study and control group

Contraceptive methods	Study group N = 10	Control group n = 50
Barrier method	1 (10%)	6 (12%)
ocp	2 (20%)	10 (20%)
IUCD	1 (10%)	5 (10%)
Natural method	2 (20%)	12 (24%)
None	4 (40%)	17 (34%)

Table 3: 24 hrs Urinary creatinine of the study group and control group at the beginning and at the 40 weeks or at the time of delivery

	At 20 weeks Mean value (mg/24 hrs)	At 40 weeks or at the time of delivery mean value (mg/24 hrs)
Study group n = 10	837	785
Control group n = 50	809.94	846.24

Table 4: Serum uric acid level of the study group at the beginning (20 wks) and at 40 wks. or at the time of delivery

	At 20 weeks mean value (mg dL^{-1})	At 40 weeks or at the time of delivery mean value (mg dL^{-1})
Study group	3.317	4.78

preeclampsia patients, indicating that screening for this illness may benefit from calcium monitoring. Although, there are only little variations in the blood levels of total ionized calcium during pregnancy, there is a noticeable increase in the excretion of calcium in the urine during a typical pregnancy[6].

Huikeshoven and Zuiderhoudt[7] observed a substantial reduction in the 24 hrs calcium excretion in hypertensive preeclamptic participants after studying urine calcium excretion in 41 women in the third trimester.

They came to the conclusion that measuring urine calcium excretion may be helpful in the treatment and research of pregnant patients with hypertensive diseases. They also discovered moderate hypocalciuria in women with gestational hypertension who did not have proteinuria.

Patients with preeclampsia had mean blood pressures that were greater than those of the controls ($p<0.001$). The paired t test was used to compare the levels in each group. P values were regarded as statistically significant if they were less than 0.05.

CONCLUSION

Preeclampsia is a multisystem illness with a complicated etiology that is now incurable. Therefore, if preeclampsia is predicted during the first few weeks of pregnancy problems. We will have the ability to lower maternal and fetal Numerous forecasters have been put out. A kind of this prediction is hypocalciuria. It was shown in the aforementioned study that preeclampsia patients experienced hypocalciuria. Preeclampsia hypocalciuria occurs regardless of renal function. It represents a sophisticated change in the cellular homeostasis of calcium. Thus, preeclampsia prediction may be made using it.

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