ORIGINAL RESEARCH

A Prospective Study Comparing Serum Homocysteine Levels in Eclampsia, Abruptio Placenta and Normal Pregnancies

Dr. V.K.T.Annuradha[1], Dr. S.Sangeetha[2], Dr. R. Anitha[3]

[1-3]Assistant Professor, Department of Obstetrics & Gynaecology, Coimbatore Medical College Hospital (CMCH), Coimbatore, Tamil Nadu, India

Corresponding author
Dr. V.K.T.Annuradha
Assistant Professor, Department of Obstetrics & Gynaecology, Coimbatore Medical College Hospital (CMCH), Coimbatore, Tamil Nadu, India

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ABSTRACT

Background: Pregnancy-related hypertensive disorders are one of the three lethal triads that contribute to maternal morbidity and mortality, along with infection and bleeding. Serum homocysteine levels can be measured to predict preeclampsia and prevent its consequences, such as eclampsia and placental disruption.

This study aims to determine the correlation between blood homocysteine levels in a typical pregnancy and a pregnancy complicated by abruption and eclampsia.**Methods:** This prospective study was conducted over the course of a year, from October 2022 to September 2023, in prenatal patients with eclampsia, abruption, and normal pregnancies who were attending the Department of OBG, Coimbatore Medical College and Hospital.**Results:** Eclampsia is prevalent in primigravida in our study. CVT was frequently observed in 20% of cases of eclampsia. There was no discernible link between abruptio placenta and serum homocysteine levels, which are markers of the severity of eclampsia.**Conclusion:** Hyperhomocysteinemia is a predictor of eclampsia, according to this study. As a result, estimating serum homocysteine levels can be a standard part of prenatal care management at all hospitals.

Keywords: Serum Homocysteine, Eclampsia, Abruptio Placenta.

INTRODUCTION

Pregnancy complications from hypertensive diseases affect 5–10% of pregnancies. They contribute to maternal morbidity and mortality as one of the three fatal triads, along with infection and hemorrhage. Endothelial dysfunction is the primary pathophysiology in the development of pre-eclampsia. A rare yet dangerous side effect of severe pre-eclampsia is eclampsia. Eclampsia is more likely to occur in women with greater homocysteine levels.

Methionine is converted into the sulfur-containing amino acid homocysteine. It is necessary for the body's tissues and cells to grow. Age, genetics, nutrition, and pregnancy are some of the variables that affect homocysteine levels. Plasma homocysteine levels typically range between 10 and 12 micromoles/liter.

Maternal blood homocysteine levels typically fall with increasing gestational age. Preeclampsia, eclampsia, HELLP syndrome, deep vein thrombosis, IUGR, preterm birth, LBW, neural tube abnormalities, and repeated miscarriages are all linked to elevated homocysteine levels in pregnant women.

AIMS AND OBJECTIVES

- To investigate the connection between normal pregnancy serum homocysteine levels and pregnancies complicated by eclampsia and placenta disruption.
- To lower maternal morbidity and death by determining whether serum homocysteine levels are suggestive of eclampsia and disruption.

MATERIALS AND METHODS

This prospective study was carried out in the Coimbatore Medical College and Hospital's Department of Obstetrics and Gynecology over the course of a year, from October 2022 to September 2023. Informed consent was obtained after each patient was briefed on the study's inclusion requirements and participation. There were 120 pregnant women in the sample.

Inclusion Criteria

- Gestational Age: 34 - 40 weeks
- Booked antenatal women 21 - 35 years of age

Exclusion Criteria

- Diabetes mellitus
- Chronic hypertension
- Liver disease
- Multiple pregnancies
- Severe anaemia
- Recurrent pregnancy loss
- Smoking and tobacco chewers
- Pregnancy with APLA syndrome
- Polyhydraminos
- Thyroid disorders

Age, race, parity, socioeconomic position, menstruation, medical, obstetric, previous, nutritional, and treatment history are all included in the patient's comprehensive medical history. Routine investigations, obstetric examinations, and general examinations were conducted. There were three groups of women.

Group 1: 40 healthy, normotensive expectant mothers.

Group II: 40 pregnant women with pre-eclampsia and sudden-onset generalised tonic-clonic seizures/coma.

Group III: 40 women who experienced abruption during pregnancy.

The unpaired "t" test was used to compare the group means. The Mann Whitney U-testand Pearson's chi-squared test were used to assess non-parametric data.A p-value of less than 0.01 was regarded as significant. Tables and graphs were used to display the final data.

RESULTS

Seventy-eight percent of the patients in our study, which compared the serum homocysteine levels of normal expectant moms with mothers who experienced complications from abruptio placenta and eclampsia, were between the ages of 21 and 30. 13.1% of the study's participants were gravida three or more, 38.1% were second gravida, and 48.8% were primigravida. Of these, 41.9% were between 34 and 36 weeks along, and 58.1% were between 37 and 40 weeks. 92.5 percent had a BMI below 30, while 7.5% had a BMI over 30. 75% of eclampsia occurs in primigravida, while 77.5% occurs in those aged 21 to 30. Ages 31 to 35 account for 62.5% of abruption cases. 37.5% of abruption instances were G2, G3, and 25% were primigravida. Whereas 77.5% of eclampsia happened between weeks 37 and 40, 72.5% of abruption happened between weeks 34 and 36. According to our study, eclampsia accounts for 20% of CVT cases. Eclampsia severity was indicated by serum homocysteine levels.

		Risk Factors			Total	P-Value
		Eclampsia	Abruption	Normal Pregnancy		
Age	21- 30 years	77.5%	37.5%	100%	73.8%	0.000
	31-35 years	22.5%	62.5%	0%	26.2%	
Total		100%	100%	100	100%	

Table 1: Distribution of Patients According to Age and Risk Factors

		Risk Factors			Total	P-Value
		Eclampsia	Abruption	Normal Pregnancy		
Parity	First pregnancy	75%	25%	20%	48.8%	0.000
	Second pregnancy	20%	37.5%	70%	38.1%	
	Third pregnancy or more	5%	37.5%	10%	13.1 %	
Total		100%	100%	100%	100%	

Table 2: Distribution of Patients According to Parity and Risk Factors

		Risk Factors			Total	P-Value
		Eclampsia	Abruption	Normal Pregnancy		
Gestational Age	34- 36 weeks	22.5%	72.5%	15%	41.9%	0.000
	37 – 40 weeks	77.5%	27.5%	85%	58.1%	
Total		100%	100%	100%	100%	

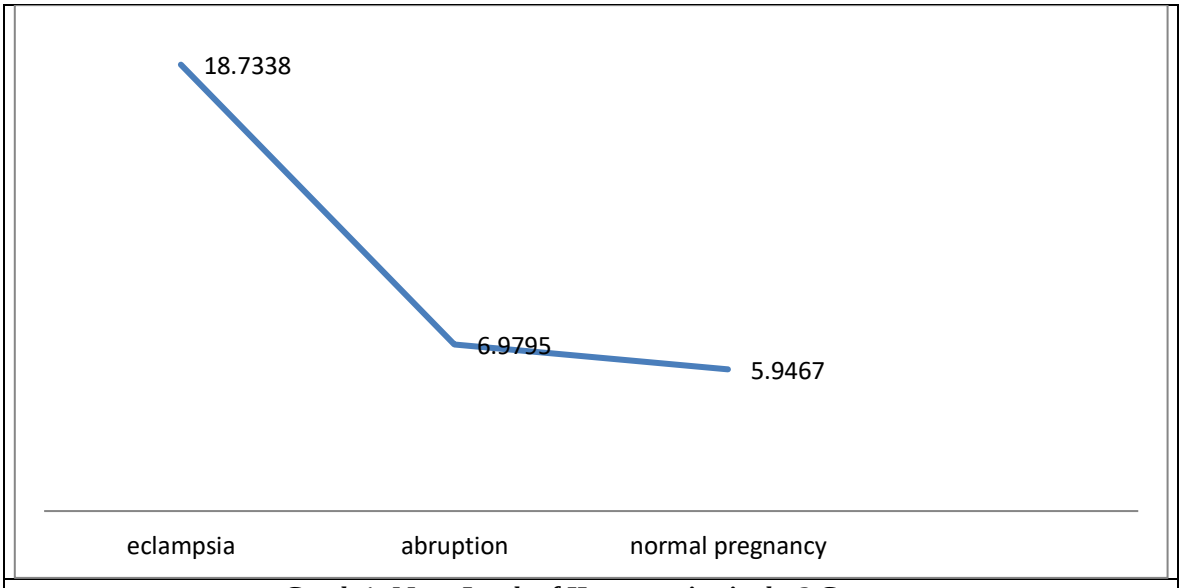
Table 3: Distribution of Patients According to Gestational Age in Weeks and Risk Factors

		Risk Factors			Total	P-Value
		Eclampsia	Abruption	Normal Pregnancy		
Pre-Pregnancy BMI	> 30	12.5%	0%	7.5%	7.5%	0.022
	<30	87.5%	100%	92.5%	92.5%	
Total		100%	100%	100%	100%	

Table 4: Distribution of Patients According to PrePregnancy BMI and Risk Factors

Risk Factor	Mean	N	Std. Deviation	P-Value
Eclampsia	18.773	40	1.6188	**0.000***
Abruptio Placenta	6.9795	40	0.71221	
Normal Pregnancy	5.9467	40	0.41856	

Table 5: Distribution of Patients According to Serum Homocysteine Levels and Risk Factors



Graph 1: Mean Levels of Homocysteine in the 3 Groups

Maternal Complications	Mean	N	Std. Deviation	P-Value
Renal failure	11.8982	11	6.10805	0.000*
HELLP	17.5033	6	2.06152	
CVT	18.9585	13	2.19650	
DIVC	8.5350	2	.07778	
Pulmonary Complications	20.1750	2	2.62337	
Shock	6.9500	1	.	
PPH	6.7500	1	.	
Sepsis	7.0500	1	.	
Maternal death	8.9500	1	.	
No complications	10.4761	82	5.00589	

Table 6: Distribution of Patients According to Serum Homocysteine Levels and Maternal Complications

DISCUSSION

Eclampsia is a potentially fatal side effect of pregnancy-related hypertension diseases that is typified by the abrupt onset of seizures without any apparent neurological explanation. This condition is most dangerous during the first week after giving birth, but it can happen before, during, or after labor. Although preeclampsia, which is characterized by proteinuria and hypertension, frequently occurs before eclampsia, it can sometimes appear suddenly. Although eclampsia might appear unexpectedly, symptoms like excruciating headaches, visual abnormalities, and impaired mental status are typical. Preventing maternal and fetal problems requires prompt management, which includes magnesium sulfate-assisted seizure control and an on-time delivery. These problems are lessened when medical practitioners are able to identify the symptoms of eclampsia, comprehend its risk factors, and apply evidence-based therapeutic strategies.

Despite the fact that hypertension problems complicate 10% of pregnancies, 0.8% of women with hypertensive disorders still get eclampsia.

Many of the risk factors for eclampsia and other pregnancy hypertensive diseases are similar, including chronic hypertension, younger age, poorer educational attainment, and first-time mothers.A recent Eclampsia study found that women under the age of 20 accounted for almost one-third of all Eclampsia cases. Previous history of hypertensive disorders during pregnancy, preeclampsia in the family, chronic hypertension, comorbid conditions like diabetes, renal

disease, and autoimmune disorders, maternal obesity (body mass index >30 kg/m2), low socioeconomic status, inadequate prenatal care, maternal age over 35, multifetal gestation, and an interval since previous birth of 10 years or more, African American ethnicity, and in vitro fertilisation are additional risk factors.

The premature separation of the placenta from the uterine decidua before the conclusion of the second stage of labor is known as placental abruption. It is among the reasons why women bleed in the second half of their pregnancy. A relatively uncommon but dangerous pregnancy complication that endangers the health of both the mother and the fetus, placental abruption is frequently linked to severe preeclampsia and the eclampsia spectrum.

It can either be hidden with blood or exposed with bleeding that seeps between the uterus and membranes before escaping through the cervix to cause external hemorrhage. Vaginal bleeding, abdominal pain, uterine contractions and tenderness, and occasionally variable fetal heart rate are its common characteristics. These are linked to an increased risk of stillbirth, preterm delivery, hemorrhage, hysterectomy, DIC, and death. This obstetric problem has been linked to elevated homocysteine levels, one of the many variables contributing to its pathogenesis.

The following clinical findings are used to categorise placental abruption:

Class 0: Asymptomatic

- Discovery of a blood clot on the maternal side of a delivered placenta.
- Diagnosis is made retrospectively**.**

Class 1: Mild

- No sign of vaginal bleeding or a small amount of vaginal bleeding.
- Slight uterine tenderness.
- Maternal blood pressure and heart rate normal.
- No signs of fetal distress.

Class 2: Moderate

- No sign of vaginal bleeding to a moderate amount of vaginal bleeding.
- Significant uterine tenderness with tetanic contractions.
- Change in vital signs: maternal tachycardia, orthostatic changes in blood pressure.
- Evidence of fetal distress.
- Clotting profile alteration: hypofibrinogenemia.

Class 3: Severe

- No sign of vaginal bleeding to heavy vaginal bleeding.
- Tetanic uterus/board-like consistency on palpation.
- Maternal shock.
- Clotting profile alteration: hypofibrinogenemia and coagulopathy.
- Fetal death.

Folic acid deficiency may raise the risk of preterm birth, low birth weight, fetal growth restriction, and neural tube defects, according to some research. Insufficient folate has a metabolic effect that raises plasma total homocysteine levels. It is unclear if a greater total homocysteine level is dangerous on its own because of vascular action or if it is merely a sign of folate status. It can be inferred that high levels of homocysteine are associated with the spectrum of hypertension disorders since the vascular changes caused by homocysteine are similar to those caused by pregnant hypertensive disorders. It is uncertain, therefore, how hyperhomocysteinemia raises the risk of pregnancy issues and other adverse consequences. It is hypothesized that endothelial dysfunction caused by elevated homocysteine levels increases the likelihood of endothelial dysfunction in the placental vascular system in women. Transmethylation of methionine results in the production of homocysteine, which is how hyperhomocysteinemia causes increased risks. The key players in their metabolism are three enzymes and a number of cofactor vitamins. Genetic defects in these enzymes or a deficiency in these vitamins cause hyperhomocysteinemia. Homocysteine levels rise with aging and are lower in women than in males.[1] This is because homocysteine levels in women are lowered by estrogen, and as people age, their levels rise because of a decline in kidney function. Pregnancy-related hypertensive diseases, abruption, fetal development limitation, and recurrent miscarriages are all linked to abnormal placental vasculature and have a common placental pathophysiology. Therefore, elevated homocysteine has a direct effect on the placenta, increasing its susceptibility to pregnancy problems that may have direct or indirect effects on the mother and fetus.

Serum homocysteine levels [2,3]	
Non-pregnant adults	4.4 to 10.8 micromoles/L
First trimester	3.34 to 11 micromoles/L
Second trimester	2.0 to 26.9 micromoles/L
Third trimester	3.2 to 21.4 micromoles/L
HomocysteineConcentrationsinPlasma	
Normal	<10–12 micromoles/liter
Moderate	12–30 micromoles/liter
Intermediate	>30-100 micromoles/liter
Severe	> 100 micromoles/liter

Maternal serum homocysteine levels fall with increasing gestational age. The physiological pregnancy response could be the cause, or it could be the result of increased estrogen, decreased albumin, hemodilution brought on by an increase in plasma volume, or an increase in the mother's and fetus's requirement for methionine. Fetal utilization is another process that has been suggested.

In our study, the majority of patients (73.8%) are between the ages of 20 and 30. All of the patients in a related trial by MozammelHoque et al.,[4] were between the ages of 20 and 30. All of the patients in our study are between 30 and 40 weeks pregnant, and 48.8% of them are primigravida.

With mean homocysteine levels of 18.73 micromol/L in eclampsia, 6.97 micromol/L in abruption placenta, and 5.94 micromol/L in normal pregnancies, and a p-value of 0.000, our study found a direct correlation between the severity of eclampsia and hyperhomocystenemia.

According to our study, homocysteine levels are elevated in eclampsia (18.7 micromol/L), which is comparable to the findings of the MozammelHoque et al.,[4] study, which found that levels in eclampsia are 10.57 +/- 3.39 micromol/L. The mean plasma levels of homocysteine in women with eclampsia (16.5 ± 9.6 μmol/l, mean ± S.D., n = 16) were considerably greater than those in normal pregnancy, according to another study by Ingec et al.[5]

Serum homocysteine levels and abruptio placenta did not significantly correlate in our investigation. Abruption was found to have mean blood homocysteine levels of 6.9795, which is just somewhat higher than the 5.9467 levels reported in normal pregnancies. In their cohort analysis of 7587 participants, Chaudhry et al. did not find a significant correlation between placental abruption and maternal plasma homocysteine levels.[6] There is no correlation between serum homocysteine levels and placental abruption, according to research by Qureshi et al.[7] and Steegeres et al.[8] Although abruption and homocysteine levels did not correlate in the Stein Emil Volsett et al. investigation, there was an elevated risk of abruption when total homocysteine levels exceeded 15 micromoles/L.[9]

In contrast to our investigation, a different study by Goddign et al. (2010)[10]revealed a significant rise in homocysteine levels in patients with abruption placenta.

	MozammelHoque et al.,		**Qureshi et al.,**		**Our study**	
Age	20-30 years		22-32 years		20–35 years	
Gestational Age	26-34 weeks		32-40 weeks		34-40 weeks	
	Patient Count	Serum Homocysteine Levels(micromoles/L)	Patient Count	Serum Homocysteine Levels(micromoles/L)	Patient Count	Serum Homocysteine Levels(micromoles/L)
Normal Pregnancy Eclampsia Abruption	136 120	6.86 +/- 2.47 10.57 +/- 3.39	112 49 110	8.19 +/- 3.05 10.07 +/- 7.71 7.83 +/- 4.65	40 40 40	5.94 18.70 6.97
P-Value	0.000		0.01		0.000	

CONCLUSION

Serum homocysteine levels can be measured as part of standard prenatal care management since they can be used to anticipate the onset of eclampsia and abruption. Serum homocysteine levels can be used to determine the severity of the illness. Studies have shown that taking supplements of folic acid and B complex vitamins helps lower homocysteine levels, preventing problems for both the mother and the fetus.

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