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Research Article

Serum beta human chorionic gonadotropin and lipid profile in early second trimester (14-20 weeks) is a predictor of pregnancy-induced hypertension

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ABSTRACT

Background: A variety of biological, biochemical, and biophysical markers implicated in the pathophysiology of pre-eclampsia during the last two decades have instigated the growing interest in this study to include both βhCG and lipid profile studies in the early second trimester as early predictors of pregnancy-induced hypertension. Early identification of at-risk women may help in taking timely preventive and curative management to prevent or delay complications associated with pregnancy-induced hypertension.
Methods: A prospective study was performed on 100 patients attending the outpatient department of the Obstetrics and Gynaecology of the Raja Mirasudar hospital. All the patients were screened for serum βhCG and serum lipid profile in their early second trimester (14-20 weeks) and followed up till their delivery. Comparative studies of serum βhCG and serum lipid profile were performed between those who remain normotensive (group I) and those who developed pregnancy-induced hypertension (group II).
Results: TG, HDL, VLDL, and LDL and BETA HCG values for those women who developed PIH (group II) were significantly higher than those who remain normotensive (group I), with p value of <0.01 which is statistically significant. HDL and βhCG values for group II were not higher than those in group I with p value >0.05 which is statistically insignificant.
Conclusions: Maternal lipid profile and BETA HCG in second trimester is very good noninvasive test which can be used for prediction of pregnancy-induced hypertension before its clinical onset.

Keywords: Pregnancy-induced hypertension, βHCG, TG, Total cholesterol, VLDL, LDL

INTRODUCTION

Pregnancy is the most important period in women's life but it can be dangerous also. Pregnancy is a physiological state with increased alteration in biochemical and mechanical processes, if there are no pregnancy complications during pregnancy, these changes will reversible soon after delivery.[1]

Hypertension and proteinuria are the important complications of pregnancy and are associated with high maternal and perinatal mortality and morbidity.[2] "Berg and colleagues reported that 16%, 3201 of maternal death in US from 1991-1997 were complications of pregnancy induced hypertension. During this study black race had 3% higher mortality vasospasm and endothelial dysfunction plays an important role in development of GHT, but pathophysiology remains unknown.[3,4] According to several studies change in beta HCG and lipid profile seems to be important in the pathogenesis of GHT. Measurement of beta HCG and lipid parameters

may be of good predictive value in GHT, avoiding the costly endocrinal investigations.

METHODS

This was a prospective study conducted in OP population at Raja Mirasudar Hospital, Thanjavur from September 2014 August 2015. Total no of 100 pregnant women who attended antenatal clinic of department of O and G at RMH, Thanjavur were included. All the patients were screened for serum beta HCG and lipid profile in early second trimester between (14-20 weeks) to be followed up till their delivery. The study groups involved both primi and multigravida. They were selected on the basis of simple random sampling.

Table 1: Cut-off values.

	Normal	Abnormal
Beta HCG Miu/l	20000-25000	>25000
TG mg/dl	< 200	>200
VLDL mg/dl	<40	>40
TC mg/dl	<200	>200
LDL mg/dl	<130	>130
HDL mg/dl	>65	<65
BP mmHg	110-138/ 72-88	140/90

Fasting venous blood sample (3 ml) was collected and tested were carried out on the same day. Estimation of serum beta HCG was done by ELISA. Serum lipid profile estimation was done by enzymatic calorimetric test with lipid clearing factor using kits. The cases were followed up regularly in the antenatal OPD till delivery. All the detailed data were collected from the delivery log book. Data was analysed satistically. This study was approved by ethical and research committee of thanjavur medical college.

GHT was defined as systolic blood pressure more than 140 mmhg and diastolic blood pressure more than 90 mmhg occurring on two (or) more occasions after 20 weeks of gestation recorded 6 hours apart. Preeclampsia is defined as gestational hypertension and proteinuria of at least (2+)/1g/dl on dip stick (or) 24 hours urinary protein excretion > 0.3 g.

Inclusion criteria

- AN mother in gestational age (14- 20 weeks)
- Patients with previous history of GHT

Exclusion criteria

- Chronic hypertension
- Diabetics
- Multiple pregnancy
- Molar pregnancy
- Hypothyroid
- USG proven fetal congenital malformations
- H/O hypercholesterolemia

Statistical analysis

Data was expressed in terms of mean +/- SD. Chi square test was applied to estimate the difference between positive groups. Unpaired ‘t’ test was used to study the changes in the beta HCG and lipid profile values.

P value > 0.05 was taken as non-significant and P value < o.oo1 was taken as very highly significant.

RESULTS

The results obtained from this present study were categorised according to their initial beta HCG and lipid profile level. Those who had elevated beta HCG and lipid profiles categorised in study group.

Table 2: Age group years.

Groups	18- 20	21-25	26-30	>30
Ght	5	10	23	4
Normotensive	11	13	29	5
Total	26	23	52	9

Table 3: Gravida.

Groups	Primi	G2	G3	G4
Beta HCG (+ve)	5	2	12	1
Lipid profile (+ve)	4	13	1	0
Both (+ve)	15	11	10	1
Negative	15	13	13	4
Total	39	29	26	6

Table 4: Gestational age.

GA	14-16 weeks	17-18 weeks	19-20 weeks
Beta HCG (+ve)	6	3	1
Lipid profile (+ve)	4	2	2
Both (+Ve)	17	13	7
Negative	17	16	12

Table 5: Correlation between HCG and BP.

HCG	BP(<140/90)	BP (>140/90)	Total
<25000	42	10	X2 = 23.056 Df = 1 P <0.01 significant
>25000	16	32	

The age group of the subject was between 18-30 years. The mean and standard deviation in GHT was 24.48+2.08 years and in normotensive it was 23.65+2.47 years. There was no statistical significance.

Table 6: Correlation between TGL and BP.

TGL	BP <140/90	BP >140/90	Total
< 200	51	15	X2 = 29.599 Df = 1 P <0.01 significant
>200	7	27	

Table 7: Correlation between HDL and BP.

HDL	BP <140/90	BP >140/90	Total
>65	55	10	X2 = 54.005 Df= 1 P <0.01 significant
>65	3	32	

Table 8: Correlation between VLDL and BP.

VLDL	BP <140/90	BP >140/90	Total
<40	53	10	X2 =47.713 Df =1 P <0.01 significant
>40	5	32	

Table 8 (a): Correlation between LDL and BP.

LDL	BP <140/90	BP >140/90	Total
<130	55	6	X2 =66.424 Df=1 P <0.01 significant
>130	3	36	

TGL and LDL had high specificity (98%) and high positive predictive value (97%) than other parameters. Among them TGL and LDL can be used as a good predicting tool to identify those who developing GHT later.

For lipid profile, for one unit increase in LDL, pregnant women had 6% probability of developing GHT. For one unit increase in VLDL and Triglycerides and beta HCG there is 3.2% and 1.8% and 3.2% increased chance of developing GHT. On the contrary, with one unit increase in HDL, the women had 11.4% less chance of developing GHT.

Among this parameter those who had elevated VLDL lipoproteins are more prone to develop early onset GHT than others.

Table 8 (b): Correlation between BETA HCG and lipid profile.

	Beta HCG	TGL	HDL	VLDL	LDL
Sensitivity	65%	78%	69%	69%	78%
Specificity	80%	98%	90%	92%	98%
Positive predictive value	86%	97%	86%	88%	97%
Negative predictive value	74%	85%	77%	78%	85%

Table 9: Strength of association between beta HCG and lipid profile with GHT.

Parameters	Relative risk (%)
Beta HCG	3.2%
TGL	1.8%
HDL	3.2%
LDL	6%
VLDL	3.2%

Among fetal complication RDS was most common in GHT women. Women who had both beta HCG and lipid profile abnormalities had increased risk of having IUGR.

Women who had both beta HCG and lipid profile abnormalities, increased risk of developing complication than isolated abnormalities.

In GHT induction of labour was more common. As other causes of induction were not excluded in study, we cannot correlate significantly.

Table 10: Follow up study.

Parameter	Positive	No of GHT	6th month	7th month	8th month	9th month
Beta HCG	48	32	-	-	5	27
HDL	35	32	-	-	6	26
VLDL	37	32	-	4	10	18
LDL	39	36	-	1	6	29
TGL	33	27	-	-	12	15

DISCUSSION

Hypertension and proteinuria are the important complications of pregnancy. Abnormal placentation is the one of the important pathology for the development of GHT. Because of abnormal placentation there may be increased synthesis of beta HCG. There may be a dysregulation of lipoprotein lipase in GHT prone women, that causes elevated plasma lipid and lipoprotein levels, may induce endothelial dysfunction is the prominent pathology, usually occurs in early trimester (8-18 weeks) but signs and symptoms occurs in late trimester.

In this study serum beta HCG estimated in early second trimester, women with elevated levels, categorised under high risk group. So it is easy to identify the high risk women and kept under regular follow up. It is help in preventing development of complication in GHT.

It is a prospective study conducted on 100 pregnant women who attended the antenatal OPD in Raja Mirasudar Hospital, Thanjavur Medical College, Thanjavur. All the patients screened for BETA HCG and LIPID PROFILE in early second trimester (14-20 weeks) and followed up till their delivery.

Normally GHT is more common in teenage pregnancies. In our study most of the GHT patient within the age group between 26-30 years with standard deviation of 24.48+2.08 years. Normally GHT more common in primi gravid, in our study also more number of GHT cases were primi gravid.[5]

In our study statistical significant relationship exists between elevated beta HCG and development of GHT with p value <0.01. This is in accordance with the study done by Yaron et al ellis p et al Hijam et al, they also showed that there is significant increase in serum beta HCG in second trimester and development of GHT.[6]

In our study beta HCG showed 80% specificity and 86% positive predicting value. Similar results were obtained in Yaron et al. They shown that beta HCG had high positive predictive value of about 88%. They concluded that, serum beta HCG can be used as a predictor for GHT. In our study strength of association between beta HCG and GHT is about 3.2%. In Vidyabati et al proven that, one unit increase in beta HCG, pregnant women had 3.7% increasing chance of GHT.[7]

Table 11: Fetal complication.

Complication	Beta HCG (+)	Lipid profile (+)	Both (+)
IUGR	1	0	2
PRETERM	0	0	1
RDS	2	1	6

Table 12: Maternal complication.

Complication	Beta HCG(+)	Lipid profile (+)	Both
Pre eclampsia	0	0	2
Eclampsia	0	0	1
HELLP syndrome	0	0	0

We had a statistical significant relationship between elevated triglycerides and development of GHT with p value <0.01. In Clause t and Djurovic et al found that dyslipidemia seems to be more efficient marker in predicting GHT at early second trimester with statistical significance.[8,9]

Table 13: Mode of delivery in GHT population.

LN		LSCS		Assisted	Expulsion
spontaneous	induced	emergency	elective		
10	16	11	3	0	2

In our study elevated triglycerides value had 98% high specificity and 97% positive predictive value. In Pouta et al found that significant correlation between the elevated triglycerides and development of GHT with 96% specificity.[10,11] In our study strength of association between triglycerides and GHT is about 1.8%. In Vidyabati et al found that every one unit increase in triglycerides, pregnant women had 2.0% increase chance of GHT.[12]

We had a statistical significant relationship between reduced HDL and development of GHT with significant P value. Turtin et al and Islam et al revealed that women with reduced HDL value more prone to develop GHT with statistical significance value (p <0.05).[13] In our study HDL had 90% speficity and 86% positive predictive value. Similar results were obtained by Lima et al with 92% specificity and 88% positive predictive value.

In Vidyabati et al they proven that one unit increase in the HDL, a pregnant women had 3.7% less chance of GHT.[14]

We had statistical significant relationship between elevated VLDL and LDL and development of GHT with significant P value. In 1998 Taital mikic researchers and De et al they found that there is a significant rise in VLDL value in GHT women.[15] In 2005 Cekman et al found that there is a significant rise in LDL value in GHT Women.[16] In our study strength of association between LDL and VLDL with GHT was 6% &3.2% respectively. Wakatsuki et al had proven that similar association between the VLDL and LDL with GHT.[17] For every one unit increase in LDL and VLDL 6.8% and 4.5%. There is increased risk of developing GHT in pregnant women respectively.

Induction of labour is more common in GHT. This also happened in our study, but there is no statistical significance was obtained in our study. This may be due to small sample size variation in the gravid in total study population.

In our study 2 of them had severe pre eclampsia and 1 of them had eclampsia. Women with severe pre eclampsia had high levels of both beta HCG and TGs. This was supported by Turpin et al in the year 2003.[18] In our study fetal complications like IUGR and RDS are common in GHT patients. This supported by Gonen et al and Valiient et al, they found that they found that there is increased risk of development of IUGR and RDS more common in GHT than control groups.[19,20]

CONCLUSION

Even in this era of advanced medical knowledge what we don't know far outweighs what we know. The case is no different with GHT, a leading killer of mothers worldwide. Despite one of the top causes for maternal mortality and morbidity very little is known about its aetiology. Many studies were conducted to determine to exact sequence of events behind its presentation. Recent studies have found out that the clinical manifestation of GHT is preceded way back by biochemical and pathological changes in the body. This is the reason why all modes of treatment except delivery are only palliative.

If we can detect these changes beforehand a major share of maternal mortality can be prevented. The level of beta HCG and lipid profile are two factors strongly associated with development of GHT. These can be used as "powerful predictive tool" for obstetrician for early identification and expert management. Then close monitoring of maternal and fetal status of identified cases can be done in tertiary care centre like our institution resulting in a good maternal and perinatal care.

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