# The Correlation between First Trimesteric, Second Trimester HCG Serum Levels and Fetal Growth Restrictive Pattern and Development of Preeclampsia

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## Abstract

**Background:** The goal of the current research study is to assess and evaluate the correlation between free HCG raised serum levels and gestational complications, IUGR and development of PET. The correlation is assessed at two phases analyzing first and second β-HCG levels and correlating them to occurrence of gestational complications in the same pregnancy.

**Materials and methods:** This are a prospective cohort study conducted in Saedy polyclinic, KSA records that supplied data on measured HCG levels in gestations with IUGR and PET, the Laboratory that supplied the comparison between the two readings of β-HCG.

**Result:** No statistical correlation was displayed or revealed regarding gestational complications and β-HCG in first or second gestational trimester's measurements.

**Conclusion:** The obstetric risk of IUGR development is correlated with raised second gestational trimester β-HCG levels (>3.00 MoM).

**Keywords:** HCG; Biochemical screening; Gestational complications; IUGR; PET

## Introduction

Violence against women is widespread, occurs in nearly every countrHypertensive illnesses during pregnancy occur in cases with pre-existing 1ry (or) 2ry chronic hypertensive disease, and in cases that develop new onset hypertension in the second half of gestation SGA neonates (due to fetal growth restriction originating from placental disorders mainly) are frequent, with 20-25% of preterm deliveries and 14-19% of term deliveries in cases suffering pre-eclampsia being less than the tenth centile of birth weight for corresponding gestational age. Preeclampsia is pregnancy-induced hypertension occurring in connection with protein excretion in urine (>0.3 g in 24 hours) ± edema and almost any organ functional performance could be affected physiologically.

Human chorionic gonadotropin is a heterodimer glycol protein with alpha and β subunits produced by the syncytiotrophoblastic layer of cells. Placental functional disorders could cause gestational complications e.g., IUGR and PET which could be reflected by the levels of HCG secretion [1]. The Correlation between raised HCG levels and Down syndrome is well proven by various research studies. Additionally, various research studies and groups have revealed and displayed the correlation between raised HCG serum levels and various pregnancy complications. On the other hand, other research groups displayed debatable and contradictory findings regarding this aspect raising the need for more detailed research efforts in this area [2]. Meta-analysis is required to determine the usefulness of HCG as a biological marker and prognostic tool to detect and follow up high risk pregnancies and to determine if it could be used with other biological markers or clinical parameters to increase management protocols effectiveness [3]. Antepartum evaluation and categorization of risk factors for development of PET is considered a corner stone component in obstetric practice. Early

biological and clinical predictors of high risk gestations are an area of continuous research interest for various research groups [4].

The precise biological pathway for serum maternal HCG level rising in gestations with adverse clinical outcomes is still not fully clarified, but various etiopathological theories exist denoting placental functional immaturity and reduced perfusion that causes pathological placental vascular changes are implied. Reactive hyperplastic changes of cyto-trophoblastic layers of cells triggered by placental hypoxia due to hypertensive issues in gestation is considered one of the chief causes for raised synthesis and production pattern of HCG [5].

## Materials and Methods

This is a prospective research study performed from June 2016 till December 2017 in Al Saedy polyclinic, involving the medical records of recruited cases gestations diagnosed to be IUGR or preeclampsia are the cohort of the research study. IUGR was clinically diagnosed as EFW<10th centile for this particular cohort based on growth charts of gestational age and gender. Preeclampsia was diagnosed using the following clinical criteria blood pressure ≥ 140/90 and proteinuria >300 mg/24 hours. The control research group involved all gestations without IUGR or PET following up at the polyclinic at the throughout the same period of time. The first trimester HCG and second trimester HCG indices obtained were evaluated and categorized according to their serum levels>1.5, 2.0, 2.5 and 3.0 multiples of the median (MoM). All gestations were dated by the last menstrual period or early first trimesteric ultrasound gestations with fetal anomalies or multi-fetal gestations were excluded from the research study. The HCG serum levels were analyzed and determined by ELISA technique and adjusted and presented as MoM relying on gestational age and the corresponding medians in the poly clinic laboratory. The serum levels of first gestational trimester β HCG and second gestational trimester β HCG in the same gestation have been compared and contrasted in a statistical manner.

### Statistical analysis

Chi-square test was performed for categorical variables. Pearson or Spearman correlation tests were performed, each when appropriate. SPSS statistical software was used to analyses and displays the data significance. Statistical significance was defined as p<0.05 **(Table 1)**.

## Result

During the research study period, 750 gestations in which first and second gestational trimesters' biochemical screening data and clinical outcomes were available in medical records of the polyclinic and the hospital at which the delivery occurred.

## Discussion

Concerning 1st trimester β HCG 4% of cases had >3 MOM with IUGR, 9% of cases had PET with β HCG above 3MOM. On the other hand, in second trimesteric β-HCG 4% of cases with IUGR had β HCG>3MOM and cases with preeclampsia was 4% of cases. There were no statistically significant differences observed in all cases categories above 3MOM. Additionally, all other case categories in >2.5, >2.0, 1.5 MOM had no statistical significant difference observed. All these results have been displayed using statistical univariate analysis. The mean ± SD were 1.16 ± 0.80 MoM (actual value 42.47þ ± 28.54 µl/ml) for First trimester β-HCG and 1.12 þ± 0.65 MoM (actual value 24.68 ± 15.18 µl/ml) for second trimester β-HCG. Our research indices and obtained data have revealed no correlation association between first or second trimesteric β-HCG and IUGR and preeclampsia. A prior research study with similar approach to the current study performed in a prospective manner on 100 cases attending the outpatient clinic of the of the Raja Mirasudar Hospital [6]. All the cases performed analysis of serum β HCG and serum lipid profile in their early second gestational trimester (14-20 gestational wk) and clinically followed up till their time of delivery. Comparative analysis of serum levels of β-HCG and serum lipid profile levels were conducted between those who remain normotensive (research group 1) and those who developed pregnancy induced hypertension (Research group 2). They revealed the following results TG, HDL, VLDL, and LDL and β-HCG indices for gestations that developed pregnancy induced hypertension (research group 2) were statistically significantly greater than gestations that remained normotensive (research group 1), with p value of <0.01 which is statistically significant. The research group concluded the following maternal gestational lipid profile and β-HCG serum levels in second gestational trimester is considered a valuable noninvasive test for predictability of pregnancy induced hypertension before its clinical diagnosis. However the results of this study contradict with the current research and lipid profiles were not performed in our research study. However, in the current research we evaluated β-HCG in 1st and 2nd trimester and considered IUGR

Table 1 Univariate analysis of the association between first trimester β-HCG and second trimester β-HCG with IUGR and preeclampsia (n=750).

| Analyte (n; MoM) | IUGR N=150(%) | No IUGR N=250(%) | p-value | PET N=150(%) | No PET N=200(%) | p-value |
|---|---|---|---|---|---|---|
| 1st trimesteric HCG | | | | | | |
| >1.5 | 27 (18) | 55 (22) | 0.17 | 27 (18) | 44 (22) | 0.57 |
| >2.0 | 15 (10) | 30 (12) | 0.44 | 18 (12) | 22 (11) | 0.78 |
| >2.5 | 9 (6) | 15 (6) | 0.83 | 12 (8) | 12 (6) | 0.37 |
| >3 | 6 (4) | 10 (4) | 0.92 | 9 (6) | 6 (3) | 0.34 |
| 2nd trimesteric HCG | | | | | | |
| >1.5 | 36 (24) | 55 (22) | 0.55 | 36 (24) | 42 (21) | 0.61 |
| >2.0 | 12 (8) | 25 (10) | 0.60 | 18 (12) | 18 (9) | 0.46 |
| >2.5 | 6 (4) | 10 (4) | 0.51 | 9 (6) | 6 (3) | 0.12 |
| >3 | 6 (4) | 5 (2) | 0.03 | 6 (4) | 4 (2) | 0.36 |

and preeclampsia as gestational complications [7-13] points of weakness in the current study are the low number of patients with respect to the long time of the study (18 months).

## Conclusion

The obstetric risk of IUGR development is correlated with raised second gestational trimester β-HCG levels (>3.00 MoM). Even though 3.5% of gestations had elevated β-HCG serum levels during the first gestational trimester, only 14% also had raised βHCG serum levels. Extra research studies are required to reveal and clarify the correlation between raised first gestational trimester β-HCG serum levels and the hazardous obstetric risk of developing IUGR and PET and to consider racial, ethnic, and genetic differences.

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