# ROLE OF COMBINED UTERINE ARTERY DOPPLER AND β-HUMAN CHORINIC GONADOTROPHIN IN PREDICTING PREGNANCY RELATED HYPERTENSIVE DISEASES AND FETAL GROWTH RESTRICTION

**Thesis**

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بسم الله الرحمن الرحيم

( و ما أوتيتم من العلم إلا قليلا )

صدق الله العظيم

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# ENGLISH ABSTRACT

**Key Words:**

(Uterine artery Doppler,RI, B-hCG, first trimester, pregnancy related hypertensive disorder, preeclampsia, JUGR)

. …….

**THE AIM** is to assess the role of combined uterine artery Doppler & B-hCG in predicting pregnancy related hypertensive diseases & JUGR. to assess the value of determining the ovarian volume by ultrasound and studying Doppler of ovarian vascularity in diagnosis of PCOD.

**METHODS:** 46 pregnant females were included; they were subjected to Uterine artery Doppler & measurement of B-hCG at 11-14 weeks gestation.. All pregnancies were followed until 24 weeks for development of preeclampsia and IUGR.

**RESULTS:** cases that developed preeclampsia (compared to those who didn't develop preeclampsia) already have increased prevalence of unilateral/ bilateral diastolic notching;

.higher RI; lower B-hCG levels. All these were of statistically significant difference .

**CONCLUSION:** combined use of uterine artery Doppler and B-hCG in the first trimester of pregnancy is valuable in predicting development of preeclampsia.

**To study the phenomenon of disease without books is to sail an uncharted sea, while to study books without patients is not to go to sea at all.**

**Sir William Osler**
***Professor of Medicine, Oxford***
***(1849-1919)***

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**This work is dedicated to *my husband, my parents and my beloved son Mohammed* for their endless support. God bless them.**

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| | |
|---|---|
| **β-hCG** | **Beta-Human chorionic gonadotropins** |
| **CRL** | **Crown-rump length** |
| **CFPD** | **Color flow pulsed Doppler** |
| **CW Doppler** | **Continuous wave Doppler** |
| **Doppler US** | **Doppler ultrasound** |
| **EFW** | **Estimated fetal weight** |
| **FSH** | **follicle-stimulating hormone** |
| **GnRH** | **Gonadotrophin releasing hormone** |
| **hCG** | **Human chorionic gonadotrophin** |
| **IUGR** | **Intrauterine growth restriction** |
| **LH** | **Leutinizing hormone** |
| **LMP** | **Last menstrual period** |
| **MSAFP** | **Maternal serum alpha-fetoprotein** |
| **PE** | **Preeclampsia** |
| **PW Doppler** | **Pulsed wave Doppler** |
| **RI** | **Resistance index** |
| **S/D ratio** | **Systolic/diastolic ratio** |
| **SGA** | **Small for gestational age** |
| **TAS** | **Transabdominal sonography** |
| **TAV** | **Time-averaged mean velocity** |
| **TSH** | **thyroid-stimulating hormone** |
| **TVS** | **Transvaginal sonography** |
| **U/S** | **Ultrasound** |

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# INTRODUCTION

Hypertensive disorders during pregnancy are among the most common gestational disorders, complicating approximately 10-16% of pregnancies and accounting for nearly 25% of maternal morbidity and mortality **(Steinhard and Klockenbusch., 2004; Cunningham et al., 2005).**

Fetal intrauterine growth restriction (IUGR), the commonest fetal complication of uteroplacental insufficiency, is defined as a condition in which the fetus is unable to achieve its genetically determined potential size and is associated with high perinatal mortality, short and long term postnatal morbidity **(Terry et al., 2005).**

Pregnancy is associated with physiologic changes in the uterine circulation resulting in a major increase in blood flow. This is thought to be the consequence of a decrease in downstream resistance through trophoblastic invasion of the maternal spiral arteries, a process beginning at conception and continuing until the end of the second trimester. Histological studies of the placenta have shown that incomplete spiral artery invasion is associated with preeclampsia with its potential life threatening maternal and fetal complications as heart failure, renal failure mostly with placental abruption, hepatic rupture, consumptive coagulopathy and intracranial hemorrhage. While fetal complications include growth restriction, prematurity and stillbirth **(Aries et al., 2004; Dugoff et al., 2005).**

Thus early recognition before fetal viability affords opportunities to direct women to regional perinatal care centers for enhanced maternal fetal surveillance. These screening programs are cost

effective because existing patterns of care are utilized. This lead to the emergence of measurements in early pregnancy of a variety of biological, biochemical and biophysical markers to predict faulty placentation before actual development of hypertension and associated IUGR **(Whittle et al, 2006).**

Doppler ultrasonography, a non-invasive method for studying the uteroplacental circulation, provides the capability to qualitatively evaluate blood flow in small branches of the uterine arteries. In normal pregnancy impedance to flow in the uterine arteries decreases with gestations. However, in cases of impairment of trophoblatic invasion Doppler studies showed increased impedance to flow in the uterine arteries as they failed to develop into low resistance vessels **(Schuchter et al., 2001; Dugoff et al., 2005).**

Doppler screening studies performed at (18-20 weeks gestation) can demonstrate an association between increased impedance to flow in the uterine arteries with subsequent development of pregnancy related hypertensive disorders and their complications. In addition, several studies showed that elevated first trimester uterine artery mean resistivity index (RI) is significantly associated with fetal IUGR **(Schuchter et al., 2001; Dugoff et al., 2005).**

Doppler proved to be more efficient at predicting pregnancy complications in high-risk patients, including very young or old women, patients with chronic hypertension, those with history of hypertensive disorders in previous pregnancies, diabetics and with

multifetal gestation. However, it is less powerful in the population at low risk **(Zimmermann et al., 2002).**

Informations regarding placental hormones have dramatically increased over the last few years, which had a great impact on their use as early biochemical markers for diseases complicating pregnancy as placental function derangement. Human chorionic gonadotrophin (hCG) is predominantly produced by the placenta. This encouraged several clinical studies to demonstrate that early placental vascular damage leading to decreased oxygen supply might result in increased maternal serum hCG by hyperplasic trophoblastic cells **(Fernando et al., 2002).**

Many authors found that serum beta- human chorionic gonadotrophin (β-hCG) levels in the second trimester can predict pregnancies that subsequently develop preeclampsia and associated fetal IUGR. **(Ramzi et al., 2000; Spencer et al., 2005).**

First trimester uterine artery Doppler can identify over half of women who will develop preeclampsia and fetal IUGR. Recent studies have documented that detection rates may be increased by a combination of uterine artery Doppler with first-trimester maternal serum markers **(Campbell and Papageorghiou., 2006).** In addition, the identification of uterine artery notching by means of Doppler ultrasound as a component of the surveillance of women with unexplained elevated serum β-hCG levels significantly improves the prediction of preeclampsia and/or severe fetal IUGR **(Thomas et al., 2005).**