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CLINICAL ARTICLE

Human chorionic gonadotropin levels between 16 and 21 weeks of pregnancy and prediction of pre-eclampsia

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Abstract

Objective: To determine whether levels of beta human choriogonadotropin (β-hCG) during the second trimester are a predictor of pre-eclampsia. *Methods:* A prospective study of 784 women was conducted between their 16th and 20th week of pregnancy. Primigravidas and multigravidas were analyzed separately, and the cutoff point was determined using a receiver operating characteristic curve. The accuracy of β-hCG levels in the prediction of pre-eclampsia was evaluated. The likelihood ratios were calculated for different levels of β-hCG in both groups. *Results:* Pre-eclampsia prevalence was 7.1% among primigravidas and 4.6% among multigravidas. The cutoff concentration was 2.0 MoM in both groups. For primigravidas and multigravidas, respectively, the area below the curve was 0.96 and 0.95; sensitivity was 88.5% and 100%; specificity was 92.0% and 85.6%; positive predictive value was 0.46 and 0.25; and negative predictive value was 0.99 and 1.0. With a cutoff concentration of 2.0 MoM of β-hCG, the positive likelihood ratio was 11.1 in primigravidas and 6.9 in multigravidas. *Conclusion:* This study shows that measuring levels of β-hCG during the second trimester of pregnancy is useful in clinical practice to identify pregnant women who will develop pre-eclampsia.

1. Introduction

Despite improvements in prenatal care, pre-eclampsia continues to be one of the main causes of maternal and neonatal morbidity and mortality

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[1]. Its etiology remains unclear, and none of the laboratory tests developed to predict its occurrence have been generally accepted because of their low specificity or sensitivity, complexity, time needed, and cost. Thus, better screening tests are needed.

Today, most prenatal screening programs use multiple markers, including beta human choriogonadotropin (β-hCG) levels, to identify women at high risk for fetal aneuploidy, and high β-hCG levels have also been found to associated with disorders such as pre-eclampsia and fetal growth restriction as well as preterm delivery [2,3]. Studies have examined the usefulness of measuring β-hCG levels in genetic screening programs, but the usefulness of measuring β-hCG levels to predict whether pre-eclampsia will develop is controversial.

This study was conducted in the outpatient setting on a population at low risk for pre-eclampsia. Its goal was to prospectively evaluate β-hCG levels in pregnant women as a predictor of pre-eclampsia.

2. Materials and methods

The institutional human research committee approved the study, and written informed consent was obtained from every patient.

In 1998 and 1999, β-hCG concentration was measured for 827 Hispanic women with a pregnancy duration of 16th to 21th week at Medicina Familiar clinics No. 16, 66, and 80 of the Instituto Mexicano del Seguro Social, Torreón, Coahuila, México.

Women with a single live fetus, no chronic hypertension or diabetes mellitus, a blood pressure less than 140/90 mm Hg, and no proteinuria were recruited consecutively. Those delivered of a newborn with congenital malformations or with incomplete data (43 women [5.2%]) were excluded. Pregnancy duration was estimated by first-trimester ultrasonographic examination or date of last menstrual period, and β-hCG measurement was done using the Abbott IMX β-hCG system (Abbott Laboratories, Abbott Park, Illinois, USA).

All women were followed up to the end of pregnancy and newborn data were recorded until hospital discharge.

Hypertensive disorders of pregnancy were classified according to the International Society for the Study of Hypertension in Pregnancy [4]. These criteria require 2 diastolic pressure recordings of 90 mm Hg or higher at least 4 h apart in previously normotensive women, plus a proteinuria of 300 mg or higher within 24 h or 2 readings of at least ++ on dipstick analysis of midstream or catheter urine specimens, if no 24-h collection was available. The HELLP syndrome was defined as the simultaneous occurrence of hemolysis (defined by peripheral blood smear); increased levels of serum aspartate aminotransferase and serum alanine aminotransferase (>30 UI-1); and a platelet count less than

Table 1 General characteristics of patients

	Primigravidas		*p**	Multigravidas		*p***
	Normotensive, *n* (%)	Preeclamptic, *n* (%)		Normotensive, *n* (%)	Preeclamptic, *n* (%)	
Woman age (years)						
<19	55 (15)	7 (2)	*p* = 0.4	10 (2.4)	1 (0.2)	*p* = 0.3
20–35	283 (77)	20 (5)		361 (87)	23 (6)	
>35	2 (0.5)	0 (0)		19 (5)	3 (0.7)	
BMI (kg/m²)[a]						
<19	6 (2)	1 (0.3)	*p* = 0.47	4 (1)	0 (0)	*p* = 0.62
20–26	179 (49)	17 (4.6)		128 (31)	6 (1.4)	
26.1–29	109 (30)	5 (1.4)		152 (36)	13 (3)	
>29	46 (12)	4 (1.1)		106 (25)	8 (1.9)	
MAP (mm Hg)						
>83	98 (27)	6 (2)	*p* = 0.4	131 (31)	4 (1)	*p* = 0.04
<83	241 (66)	21 (6)		259 (62)	23 (6)	
Gestational age at entry (weeks)						
<16	1 (0.3)	0 (0)	*p* = 0.38	3 (0.7)	0 (0)	*p* = 0.1
16–18	141 (38)	15 (4)		185 (44)	11 (3)	
18–20	155 (42)	11 (3)		155 (37)	16 (4)	
20>	43 (12)	1 (0.3)		47 (11)	0 (0)	

[a] Body mass index according to Institute of Medicine (1990).
* *p* value after comparing normotensive and hypertensive in primigravida group of patients.
** *p* value after comparing normotensive and hypertensive in multigravida group of patients.