First trimester metabolic profile: An independent predictor of pre-eclampsia

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INTRODUCTION:

Women with prior pre-eclampsia (PET) can have underlying cardiovascular, metabolic and thrombotic risk profiles. First trimester predictive algorithms typically incorporate cardiovascular risk markers.

The aim of this study was to determine if first trimester risk factors for gestational diabetes (GDM, as a surrogate marker for metabolic syndrome) also independently predict PET when incorporated into a multi marker algorithm.

METHODS:

A prospective, observational first trimester screening study for PET. Women were categorised as metabolic risk positive based on a previously developed algorithm incorporating age, ethnicity, history of prior GDM, body mass index, and systolic blood pressure. Positive metabolic risk was then entered as an independent variable with prior PET, chronic HTN, parity, mean arterial blood pressure, PAPP-A and mean uterine arteries PI's into a logistic regression model with PET as a dependent variable calculating the odds ratio for every component.

Table 1: Maternal characteristics and pregnancy outcome (n=2457)

Variable	Early pre-eclampsia (n=20)	Late pre-eclampsia (n=91)	All pre-eclampsia (n=111)	Unaffected women (n= 2346)
Maternal age mean, min-max (years)	30.9 (19-43)	29.7 (18-45)	29.6 (18-55)	29.5 (18-55)
Maternal race n (%)				
Caucasian	2 (10)	36 (39.6)	38 (34.2)	1023 (43.6)
African-American	14 (70)	51 (56)	65 (58.6)	1163 (49.6)
Asian	1 (5)	2 (2.2)	3 (2.7)	89 (3.8)
Hispanic	2 (10)	2 (2.2)	4 (3.6)	28 (1.2)
Others	1 (5)	0 (0)	1 (0.9)	43 (1.8)
Hx of Chronic HTN n (%)	9 (45)	17 (18.7)	26 (23.4)	135 (5.8)
Hx of DM n (%)	7 (35)	9 (9.9)	16 (14.4)	73 (3.1)
Hx of Renal Disease n (%)	0 (0)	2 (2.2)	2 (1.8)	1 (0.0)
Hx of Thrombophilia n (%)	0 (0)	0 (0)	0 (0)	9 (0.4)
Obstetric history n (%)				
Nulliparous	12 (60)	55 (60.4)	67 (60.4)	1003 (42.8)
Parous with previous PE	1 (5.3)	10 (11)	11 (9.9)	60 (2.6)
Previous preterm labor	0 (0)	1 (1.1)	1 (0.9)	33 (1.4)
BMI median, min-max	29.2 (22.7-61.1)	26.9 (15.5-73.1)	26.9(15.9-61.1)	26.6 (15.5-73.1)
MAP median, min-max	85 (82.7-111.0)	82.7 (52-138)	82.7(72-135.7)	82.3 (48.3-138.0)
UtA PI median, min-max	1.3 (0.5-2.8)	1.3 (0.3-3.7)	1.3(0.4-2.8)	1.3 (0.3-3.7)
PAPP-A (MoM) median, min-max	1(0.2-2.6)	1.1 (0.1-5.1)	1.1(0.2-4.3)	1.1 (0.1-5.1)

BMI, body mass index; MAP, mean arterial blood pressure; UtA PI, uterine artery pulsatility index; PAPP-A, pregnancy-associated protein-A; MoM, multiples of the median

RESULTS:

Among 2457 women, 4.5% (n=111) developed PET. Metabolic risk positivity alone predicted PET with sensitivity, specificity, +LR, -LR, PPV and NPV of 63.1% (95% CI 53.4-72.0), 58.6% (95% CI 56.5-60.6), 1.5 (1.3-1.8), 0.6 (0.5-0.8), 6.7% (95% CI 5.3-8.4) and 97.1% (95% CI 96.1-97.9), respectively. Logistic regression analysis confirmed metabolic risk as an independent contributor to development of PET along the other traditional risk factors with OR 2.228 (5.572 for early PET and 1.857 for late PET, all significant with $p<0.05$).

Table 2: Odds Ratios calculated from logistic regression for prediction of PET

Risk factor	aOR for prediction of PET	aOR for prediction of early PET	aOR for prediction of late PET
Metabolic profile (GDM algorithm)	2.228	5.572	1.857
Chronic HTN	3.756	9.602	2.458
Previous PET	5.451	2.834	6.097
Parity	0.289	0.217	0.320
Mean UtA PI	1.088	3.218	0.832
PAPP-A	0.594	0.658	0.583
MAP	1.186	1.002	1.203

OR, odds ratio; PET, pre-eclampsia; HTN, hypertension; UtA PI, uterine artery pulsatility index; PAPP-A, pregnancy-associated protein-A; MAP, mean arterial blood pressure

CONCLUSIONS:

A maternal metabolic risk profile identified in the first trimester is an independent predictor for PET.

Further research is needed to assess whether therapy that is aimed to reduce metabolic risk factors may also be beneficial for the prevention of PET.