

Evaluation of carotid-intima media thickness (CIMT) in pre-eclampsia

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Abstract

Objective: CIMT used to assess cardiovascular disease risk in pre-eclampsia women. Many studies have established that CIMT in a non-invasive marker of subclinical atherosclerosis.

Methods: The study enrolled 30 pre-eclamptic women and 30 normotensive pregnant women without any other comorbidity. Intima media thickness of common carotid artery in lower segment proximal to bifurcation by using B-mode doppler ultrasound was measured.

Results: Carotid intima media thickness was significantly higher as compared to normotensive pregnant women in early pre-eclampsia. Mean IMT was 0.457 ± 0.124 and late pre-eclampsia IMT was 0.416 pre-eclampsia 0.121 .

Conclusion: To detect early atherosclerotic changes by measuring intima-media thickness in pregnant women complicated with pre-eclampsia and the aim of reducing their subsequent cardiovascular morbidity and mortality.

Introduction

Pregnancy complicated such as gestational hypertension, pre-eclampsia are associated with maternal cardiovascular disease morbidity and mortality later in life.¹⁻³ The primary cause of the impaired circulatory homeostasis in pre-eclampsia is endothelial dysfunction which is the key factor in pathogenesis of atherosclerosis.⁴ Atherosclerosis play central role in pathogenesis of cardiovascular disease.⁵⁻⁸ Early atherosclerotic changes can be identified by thickening of arterial wall assessed by ultrasound measurement of intima and media thickness (IMT). IMT can be early non-invasive marker of the subclinical changes of arterial wall in early stage of atherosclerosis.⁹⁻¹¹

Previous studies have supported that classifying PE into early and late-onset disease differentiates two distinct clinical forms with pathophysiological specific features. Thus, early PE is commonly associated with placental insufficiency, intrauterine growth restriction and adverse maternal and perinatal outcomes and late-onset PE is associated with minor placental involvement and milder clinical disease. Intrinsic placental factors are

more frequently altered in early PE, while late PE is usually associated with predisposing maternal factors.¹²⁻¹⁵

Methods

This was hospital based prospective case-control study carried out in Department of Obstetrics & Gynaecology in SMS Medical College, Jaipur during the period from June 2018 to August 2019. 30 women with pre-eclampsia were recruited as cases and 30 normotensive pregnant women without any cardiovascular comorbidities as controls. All participants recruited from routine antenatal clinic. After apply inclusion and exclusion criteria and informed written consent was obtained by women willing to participate in this study. Pre-eclampsia defined according to International Society for the Study of Hypertension in Pregnancy (ISSHP) guidelines.

Inclusion criteria included normotensive pregnant women, after 20 wks of gestation period, pre-eclamptic women. Exclusion criteria included diabetes, congenital heart disease, hyper lipidemia, smoking, obesity, RA. Detailed history and examination done. High resolution B-mode carotid ultrasound was performed on all participants. CIMT was measured and results obtained and compared.

Results

Table 1: Baseline characteristics of study group

S. No.	Variables	PIH Group (Mean Values)	Controls (Mean Values)	P-value
1.	Age (yrs)	26.87 ± 4.80	24.5 ± 4.4	0.051
2.	Weight (kg)	77.27 ± 10.07	68.86 ± 7.75	0.006
3.	BMI (kg/m ²)	22.76 ± 3.87	22.20 ± 2.76	0.516
4.	MAP (mm of Hg)	109 ± 13	83 ± 11	0.001

Table 1 shows the baseline characteristics of two groups. Mean age in pre-eclampsia was 26.87 ± 4.80 yrs v/s 24.5 ± 4.4 yrs as compare to control and mean weight in study group was higher compare to normotensive women (77.27 ± 10.07 v/s 68.86 ± 7.75 kg). Mean BMI in pre-eclamptic group was 22.76 ± 3.87 kg/m² and in control group was 22.20 ± 2.76 kg/m². Different in mean arterial pressure was statistically significant between both groups in pre-eclamptics was 109 ± 13 (mm of Hg) and control group was 83 ± 13 (mm of Hg).

Table 2: Distribution of Subjects According to Carotid Artery Intima Media Thickness (CIMT)

CIMT (in mm)	Cases		Controls	
	No.	%	No.	%
≤0.4	11	36.67	23	76.67
>0.4	19	63.33	7	23.33
Total	30	100.00	30	100.00

In pre-eclamptic group majority i.e. 19 (63.33%) patients had IMT >0.4 mm whereas the control group majority i.e. 23 (76.67%) patients had IMT ≤0.4 mm. The difference was statistically significant.

Table 3 : Distribution of Subjects According to Gestational Age and IMT

Gestational Age (in wks)	N	Mean	SD	p-value
<34	11	0.457	0.124	0.38 (NS)
≥34	19	0.416	0.124	

Table-3 shows the distribution of pre-eclamptic patients according to gestational age and IMT. In women <34 wks gestation mean IMT was 0.457 ± 0.124 and ≥34 wks gestational age the mean IMT was 0.416 ± 0.124. The difference was not statistically significant.

Figure 1(A): Linear Association of IMT with SBP

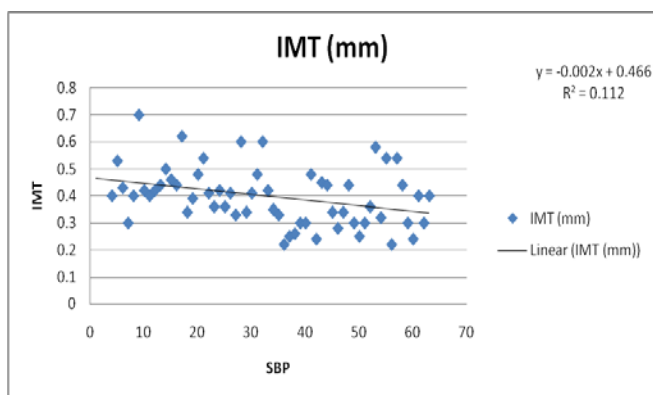


Figure-1(B) : Linear Association of IMT with DBP

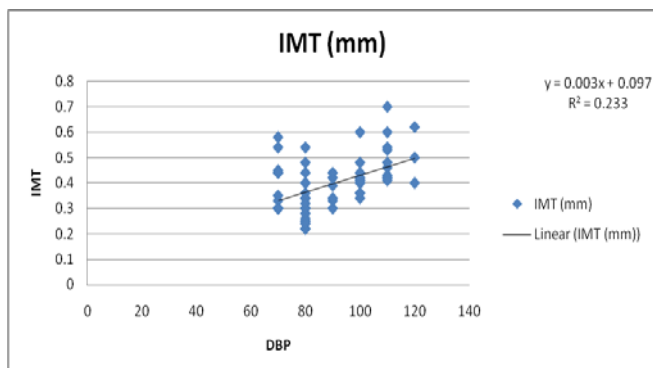
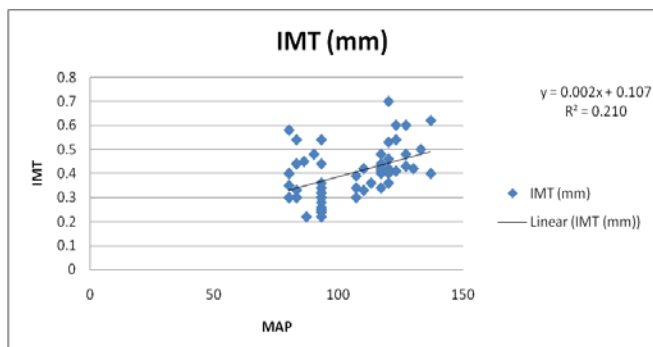


Figure-1(C) : Linear Association of IMT with MAP



Scatter plots diagram show with regression line IMT with SBP ($Y = -0.002 \pm 0.466$, $r^2 = 0.122$) and with diastolic BP ($Y = 0.003 \pm 0.099$, $r^2 = 0.233$) and with mean arterial pressure ($Y = 0.002 \pm 0.107$, $r^2 = 0.210$)

Discussion

Pre-eclampsia is an independent risk for developing cardiovascular disease later in life.^{16,17} Atherosclerosis is main pathological cause of cardiovascular and cerebrovascular morbidity and mortality. Carotid B-

mode high frequency ultrasonography is reliable method for diagnosis of sub clinical atherosclerosis.^{18,19}

Carotid intima media thickness is a surrogate marker of CVD.^{18,19} In this study, we found that CIMT in pregnant women with pre-eclampsia was significantly increase as compare to healthy pregnant women.

Lorenz MW et al (2007)²⁰ studied systemic review and meta-analysis and verified the CIMT has strong predictor of cardiovascular disease later in life.

Our results were comparable to the study done by Yuan LJ et al (2013)²¹ in which they studied the carotic arterial intima media thickness and arterial stiffness in women with pre-eclampsia. The included 22 late onset pre-eclamptic pregnant women and 28 normotensive pregnant women. Carotid arterial intima media thickness was 459 ± 95 v/s $351 \pm 8 \mu\text{m}$ ($p=0.0001$) in pre-eclampsia and controls respectively.

Our results were comparable to study done by Stergiotou I et al (2013)²² who studied the pattern of maternal vascular remodelling and responsiveness in early versus late onset pre-eclampsia. In early onset pre-eclampsia the IMT was 0.439 ± 0.08 mm and late onset pre-eclampsia the IMT was 0.425 ± 0.09 mm.

Our results also similar to study done by Milic NM et al (2017)²³ performed a study to determine whether women with pre-eclampsia have increase atherosclerotic burden as determined by CIMT compared with women without pre-eclampsia.

Our results were also comparable to Verissimo C (2010)²⁴ conducted a controlled, descriptive and prospective study to evaluate intima-media thickness in hypertensive pregnant women and to ascertain if an increase IMT correlated with development of pre-eclampsia (mean IMT in pre-eclampsia - 0.52 ± 0.11 and IMT in normotensive was 0.43 ± 0.09). They

concluded that carotid IMT a validated endothelial dysfunction.

Conclusion

Carotid IMT measurement during pregnancy may provide knowledge about cardiovascular and metabolic profile of women. IMT measurement is an important non-invasive technique could help to identifying asymptomatic women who are at high risk to develop cardiovascular diseases in later life. Give these women an opportunity to modify their risk factor, life style and improve timely intervention with the aim of reducing their subsequent cardiovascular morbidity and mortality.

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