

UTERINE ARTERY DIASTOLIC NOTCH AND UTERINE ARTERY PULSATILITY INDEX ROLE IN PREDICT EARLY ONSET PREECLAMPSIA

Muara Panusunan Lubis^{1*},

1Feto Maternal Division, Department of Obstetrics and Gynecology, Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia.

Abstract: This research is supposed to determine uterine artery diastolic notch and uterine artery pulsatility role in predict early onset preeclampsia. This research was analytical study with nested case-control design of 70 normal pregnant women with 22-24 weeks gestations which divided to two group namely 35 patients with uterine artery diastolic notch group and another 35 patients without uterine artery diastolic notch. The result of this research found that from ultrasound examinations, 27 patients (38.6%) had unilateral uterine artery diastolic notch, and 8 subjects (11.4%) had bilateral uterine artery diastolic notch. Five subjects (14.3%) had early onset preeclampsia, with no significant difference between uterine artery diastolic notch with early-onset preeclampsia. There is no significant differences in mean uterine artery pulsatility index between subjects with and without early-onset preeclampsia, and between the presence of uterine artery diastolic notch and the incidence of early onset preeclampsia. However, significant difference was found between urine artery index pulsatile value and the incidence of early-onset preeclampsia ($P=0.045$).

Keywords: Preeclampsia, uterine artery, diastolic notch, pulsatile index.

I. INTRODUCTION

Hypertension is the second highest cause of maternal mortality with a prevalence of 26%. The global target of the 3rd SDGs (Sustainable Development Goals) is to reduce the Maternal Mortality Rate (MMR) to 70 per 100,000 live births by 2030.^{1,2} In Indonesia's, the population growth rate in 2000-2010 was 1.49% per year, and the maternal mortality rate in Indonesia is still high at 305 per 100,000 live births.¹ Based on the Ministry of Health, preeclampsia occurs in around 10% of pregnancies in the world. Developing countries contribute to the incidence of preeclampsia greater than in developed countries.³

Many theories suggest that the pathogenesis of preeclampsia is related to the placentation process, but the pathogenesis of preeclampsia is still unclear. Prevention and predictive methods are still unknown. One theory about pathogenesis of preeclampsia is thought to be related to failure of cytotrophoblast cells invade the maternal spiral arteries, thus causing vascular injury and placental ischemia.⁴ Preeclampsia is divided into two types namely early onset and late onset. Early onset preeclampsia which accounts for 5-20% of all severe preeclampsia, but often causes severe clinical cases.⁵

Doppler velocimetry examination has been widely used to predict the occurrence of preeclampsia.in examining the levels of pro angiogenic and anti angiogenic factors. In Doppler velocimetry, the blood flow can be seen clearly in the uterine artery, arcuate, radial and spiral around the trophoblast tissue, so that measurements can be made on the various indices needed. Uterine artery velocitometrydoppler examination to predict the incidence of preeclampsia is better done in the second trimester compared to the first trimester.^{6,7}

Because of that, the authors are interested in examining the role of uterine artery pulsatility index (PI) and uterine artery diastolic notch in predicting the occurrence of preeclampsia, so that preeclampsia can be predicted as early as possible and strived to prevent the occurrence of complications in preeclampsia.⁸

II. RESEARCH METHODOLOGY

This research was analytical study with nested case-control design at Bunda Thamrin Hospital, Tanjung Mulia Mitra Medika Hospital, Sundari Hospital and private clinic starts from March to November 2018 with 70 research subjects that met inclusion criteria which is pregnant women with 22-24 weeks gestations, and

agreed to participate. An abnormal Doppler velocimetry of uterine arteries defined by 3 consecutive consistent waves which found in uterine artery notch in either unilateral or bilateral uterine arteries and/or with pulsatility index average >1.45 . Data was analysed using bivariate analysis. The study was approved by the Ethics Committee of the Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia.

III. RESULTS AND DISCUSSIONS

From table 1, it can be seen the characteristics of 70 pregnant women with 22-24 weeks gestations which is majority was at 24 weeks (35 subjects, 50%) and primigravida (31 subjects, 44.3%).

Characteristics		N(%)
Gestational age	22 weeks	22 (31.4)
	23 weeks	13 (18.6)
	24 weeks	35 (50)
BMI, mean (SD), kg/m ²		24.5 (4.0)
Parity	Primigravida	31 (44.3)
	Secundigravida	23 (32.9)
	Multigravida	16 (22.9)

From ultrasonography examination, it was found as many as 50% of subjects without uterine artery diastolic notch. A total of 27 subjects (38.6%) had unilateral uterine artery diastolic notch and only 8 subjects (11.4%) had bilateral uterine artery diastolic notch.

Table 2: Result of uterine artery diastolic notch examination of right and left uterine artery

Uterine Artery Diastolic Notch	N(%)
Without Uterine Artery Diastolic Notch	35 (50.0)
Unilateral Uterine Artery Diastolic Notch	27 (38.6)
Bilateral Uterine Artery Diastolic Notch	8 (11.4)

After monitoring all subjects during the research, 65 subjects (92.9%) did not experience preeclampsia. With minority, 2 subjects (2.9%) had preeclampsia with proteinuria +3, and 3 people subject (4.3%) with preeclampsia (proteinuria +4). In 35 subjects who had uterine artery diastolic notch, there were only 5 subjects (14.3%) who had early onset preeclampsia. While a subject in subjects without uterine artery diastolic notch, we not found any preeclampsia cases. The results of the analysis using the Fischer's exact test showed that there is no significant relationship between uterine artery diastolic notch and the incidence of early onset preeclampsia ($P=0.054$). The average PI uterine artery in subjects with early onset preeclampsia was seen higher with a mean 1.4 (SD = 0.3) than in subjects who did not experience preeclampsia with a mean 1.1 (0.4).

Table 3: Relationship between age, parity, BMI, uterine artery diastolic notch uterine artery PI and the incidence of early onset preeclampsia

Characteristics	Outcome [n (%)]		P value
	Preeclampsia (n=5)	Without preeclampsia (n=65)	
Age,	>35 years	0 (0)	1.000 ^a
	≤35 years	5 (8.1)	
Parity	Primigravida	3 (9.6)	0.251 ^a
	Secundigravida	0 (0)	
	Multigravida	2 (12.5)	
BMI, n (%)	Overweight-obese	1 (3.1)	0.169 ^a
	Underweight-normoweight	4 (14.8)	

Uterine artery diastolic notch	Found	5 (14.3)	30 (85.7)	0.054 ^a
	Not found	0 (0)	35 (100)	
PI uterine artery, mean (SD)		1.4 (0.3)	1.1 (0.4)	0.045 ^b

^aFischer's Exact; ^bT Independent; ^cMann Whitney

From research By Uyar, et al, it was found that the mean pulsatility index of the right uterine artery is 1.09 and the left is 1.18, and the total pulsatility index of uterine arteries is 1.135. Further, 50% of subjects had a normal dichotomy, with 38.6% had unilateral uterine artery diastolic notch and 11.4% had bilateral uterine artery diastolic notch. However, this is not a predictor for the incidence of early onset preeclampsia. When we use the pulsatility index mean value, we found that mean value >1.4 is strongly associated with the incidence of preeclampsia. Although other study has reported a higher pulsatility index mean value >1.55 to predict this occurrence.⁹

In this research, 35 pregnant women who had a diastolic notch, it was found that five experiencing early-onset preeclampsia. Nevertheless, this association was not significant and maybe due to the small number of samples. However, other studies have shown this association where 23 patients with diastolic notch had preeclampsia compared to 4 patient who also had diastolic notch but did not develop preeclampsia.¹⁰

IV. CONCLUSIONS

There is no significant difference between maternal age, body mass index and the incidence of early onset preeclampsia and also significant difference between the presence or absence of uterine artery diastolic notch and the incidence of early onset preeclampsia. However, a significant association was seen between the pulsatility value of the uterine artery index and the incidence of early onset preeclampsia. Examination on uterine artery PI can be recommended as the early clinical sign to predict early onset preeclampsia,

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