

# Evaluation of seasonal variations in Uterine artery Pulsatility Index at Second Trimester

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## ABSTRACT

**Introduction:** Uterine Artery Pulsatility Index (UtA PI) measurement is a non-invasive method for screening of preeclampsia. Seasonal variations changes in UtA PI were not evaluated earlier, which may affect interpretation. Aim of our study is to evaluate seasonal variations in UtA PI in antenatal cases presenting at second trimester anomaly scan from 18 to 22 weeks period of gestation between peak summer and winter in western India.

**Material and methods:** In this cross sectional study doppler ultrasound examination of the UtA to calculate UtA PI following routine second trimester anomaly scan over a period of one year between 1st July 2020 to 30<sup>th</sup> June 2021 was done.

**Results:** Total 708 antenatal cases were evaluated and as per exclusion criteria 686 patients were included in study. Mean age was 26.4 years. Maximum mean UtA PI value obtained during study was 2.42 while minimum PI value obtained was 0.52. Month wise mean UtA PI was measured with over all mean PI over period of one year from 1st July 2020 to 30<sup>th</sup> June 2021 was 1.08 (Table 1). The mean PI in peak summer months (May and June) was 0.982 (Table 2) while mean PI in peak winter months (December and January) was 1.265 (Table 3).

**Conclusion:** Seasonal variations affect UtA PI values with elevated values in winters and relatively lower values in summers and these should be considered while interpreting UtA PI results

**Keywords:** Seasonal Variations, Uterine artery Pulsatility Index, Second Trimester

## INTRODUCTION

Uterine artery (UtA) Doppler ultrasound examination at 1<sup>st</sup> and 2<sup>nd</sup> trimester is used for screening of pre-eclampsia as it provides indirect assessment of uteroplacental circulation.<sup>1,2,3</sup> The most important parameter for screening of Pre-eclampsia is Pulsatility Index (PI), reference values for PI measurements as per period of gestation are available.<sup>4</sup>

Western India witness extremes of weather with maximum and minimum temperature in summer is approximately 49 and 29.2 degree centigrade while in winter it is 26 and 6.8 degree centigrade respectively. The peak summer is observed in moth of May and June while peak winters is observed in December and January.<sup>5,6</sup>

The seasonal variations in UtA PI has not been described in literature as per our knowledge.

### Aim

Aim of our study is to evaluate seasonal variations in UtA PI in antenatal cases presenting at second trimester anomaly

scan from 18 to 22 weeks period of gestation between peak summer and winter in western India.

## MATERIAL AND METHODS

In our cross sectional study, 708 pregnant women underwent Doppler ultrasound examination of the UtA to calculate UtA PI following routine second trimester anomaly scan over a period of one year between 1st July 2020 to 30<sup>th</sup> June 2021.

All the women were provided with informed written consent. The study was carried out by two radiologists with post graduate degree in Radiodiagnosis and trained in antenatal USG/doppler.

All cases were distributed month wise for calculation of monthly mean UtA PI. Variation of UtA PI in months of summer (May and June) and Winter (Dec and Jan) were compared.

### Inclusion criteria

All antenatal cases between 18 to 22 weeks of period of gestation presenting for anomaly scan from 1st July 2020 to 30<sup>th</sup> June 2021 were included.

### Exclusion criteria

Multifetal pregnancies or pregnancies with non-viable fetus at time of scan were excluded.

### Equipment

Examinations were performed on the Wipro GE Vivid T8 USG/Echo Machine using 4C-RS curved array transducer with a frequency of 1.8 - 6 MHz.

### Examination technique

All examinations were done transabdominally with patient in supine position. The probe was placed on the lower quadrant of the abdomen, angled medially, and Color Doppler imaging was used to identify the UtA at the apparent crossover with the external iliac artery. Measurements were taken approximately 1 cm distal to the crossover point with Doppler angle less than 30 degrees. The PI of the left and right uterine arteries were measured, and the mean PI was calculated (Figure 1).

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**RESULT**

Total 708 antenatal cases were evaluated and as per exclusion criteria 686 patients were included in study. Mean age was 26.4 years. Maximum mean UtA PI value obtained during study was 2.42 while minimum PI value obtained was 0.52. Month wise mean PI was measured with over all mean PI over period of one year from 1st July 2020 to 30th June 2021 was 1.08 with standard deviation of 0.11 (Table 1). The mean PI in peak summer months (May and June) was 0.982 (Table 2) while mean PI in peak winter months (December and January) was 1.265 (Table 3) .

**DISCUSSION**

Preeclampsia is one of the commonest condition complicating nearly 5–10% of pregnancies.<sup>7</sup> The basic pathology behind preeclampsia is poor trophoblastic invasion of maternal decidua and myometrium leading to under perfusion of the placenta initiating cascades of events leading to pre-eclampsia.<sup>8</sup>

UtA doppler has been used as a non-invasive method for assessment of uteroplacental flow and associated outcome on pregnancy since early 1980s.<sup>1,2,3,9</sup> UtA PI has emerged as effective objective method of screening preeclampsia in first and second trimester.<sup>1,2,3,10,11,12</sup> The UtA PI values are

compared with exiting nomograms as per period of gestation and values > 95 centile are considered as pathological.<sup>4</sup> The patients with elevated UtA PI are advised antiplatelet drugs like Aspirin to lower the risk of developing preeclampsia.<sup>8,13</sup> The variation in UtA PI as per gestational age is a known entity and mean PI values declines as gestational age progresses.<sup>4,14,15</sup>

Experimental cold stimulus during studies have shown to increase the UtA PI.<sup>16</sup> However, seasonal variation in UtA PI have not been documented.

In our study conducted in western India where extreme of temperatures prevail<sup>5,6</sup>, we found that the mean UtA PI was on lower side in summer months with value of 0.982 while the values were on higher side in winter months with value of 1.265 as compared to average mean PI over one year of 1.08.

These findings are important in setting when during winters a borderline case may labelled as high risk for developing preeclampsia and placed on preventive Aspirin therapy, vice versa a positive case being labelled low risk in summers leading to non-initiation of therapy.

The possible explanation for elevated UtA PI in winters is constriction of the uterine artery due to extreme cold, leading to a decrease in placental blood flow.

Month wise distribution of mean UTA PI			
S No	Month	Number of cases	Mean Uterine A PI
1	July 2020	48	0.983
2	August 2020	54	0.988
3	September 2020	57	0.993
4	October 2020	59	1.082
5	November 2020	61	1.186
6	December 2020	64	1.244
7	January 2021	78	1.286
8	February 2021	73	1.143
9	March 2021	66	1.116
10	April 2021	36	1.046
11	May 2021	42	0.978
12	June 2021	48	0.985
		n = 686	Overall mean PI = 1.08

**Table-1:** Month wise distribution of mean UtA PI

Mean UTA PI summer			
S No	Month	Number of cases	Mean Uterine A PI
1.	May	42	0.978
2.	June	48	0.985
		Total- 90	Mean PI = 0.982

**Table-2:** Mean UtA PI: Summer

Mean UTA PI winter			
S No	Month	Number of cases	Mean Uterine API
1.	December 2020	64	1.244
2.	January 2021	78	1.286
		Total- 142	Mean PI = 1.265

**Table-3:** Mean UtA PI: Winter



**Figure-1:** Calculation of UtA PI by doppler ultrasound

Our study highlights the importance of careful examination during extremes of weather and interpretation of borderline results as high and low risk.

Keeping patient in comfortable environment for some time before ultrasound and doppler may resolve this issue and further studies on this aspect is required.

## CONCLUSION

Seasonal variations affect UtA PI values with elevated values in winters and relatively lower values in summers and these should be considered while interpreting UtA PI results.

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