



UTERINE ARTERY DOPPLER IN FIRST TRIMESTER (11-13+6WKS) IN PREDICTION OF ADVERSE PREGNANCY OUTCOME

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ABSTRACT

Background: Uterine artery Doppler waveform analysis has been extremely studied in the second trimester of pregnancy as a predictive marker for the late development of pre eclampsia and fetal growth restriction. The use of Doppler interrogation of this vessel in the first trimester has gained momentum in recent years. In normal pregnancy, the feto placental circulation acts as a low resistance system unit. Thus blood velocity waveforms in umbilical artery show continuous forward flow throughout the cardiac cycle. Impaired placental perfusion, one of the hallmarks of preeclampsia, can be assessed by measuring flow waveforms ratios or by detecting diastolic notching of the uterine and umbilical vessels. According to the National Institute for Clinical Excellence guidelines on routine prenatal care recommending that at the first prenatal visit a woman's level of risk for adverse pregnancy outcome should be evaluated so that a plan for her schedule of prenatal visits can be formulated. There is no proven effective method for the prevention of PE. **Aim:** The aim of the study is to evaluate the first trimester uterine artery Doppler in the prediction of the development of adverse pregnancy outcome. **Objectives:** Correlation of uterine artery Doppler in the first trimester with adverse pregnancy outcomes. **Material And Methods :** Study Design: Prospective longitudinal Observational study. **Sample Size:** 150 (Control – 75 and case group – 75) **Place:** Department of Obstetrics and Gynaecology – OPD, GREAT EASTERN MEDICAL SCHOOL AND HOSPITAL , Srikakulam , Andhra Pradesh **Duration:** 1 Year , 1st Jan 2023– 1st Jan 2024 **Conclusion:** To conclude from the present study, first trimester Doppler ultrasound is the best non- invasive investigation to assess changes in uteroplacental hemodynamics which helps in early prediction of development of hypertensive disorders in pregnancy along with maternal characteristics which helps in early prophylactic intervention.

KEYWORDS :

INTRODUCTION

Pregnancies are complicated by Hypertensive disorders of about 5-10% and along with hemorrhage, sepsis and fetal growth restriction constitutes a triad contributing to maternal morbidity and mortality^{1,2}. Hypertensive disorders in pregnancy vary from mildly elevated blood pressure to severe hypertension with multi organ dysfunction. Of these disorders the preeclampsia syndrome, either alone or superimposed on chronic hypertension and its associated maternal mortality is the most dangerous and it accounts for 16% and is preventable³.

In India, Incidence of hypertensive disorders in pregnancy is 5.38%, while preeclampsia and eclampsia accounted for 44% and 40% complications respectively. Maternal and perinatal deaths have been reported in 5.5% and 37.5% of deliveries⁴.

Impaired placentation with abnormal blood flow velocity and resistance in placental vessels is associated with pre-eclampsia and fetal growth restriction. Prediction of hypertensive disorders and associated adverse outcomes by Ultrasonography plays an important role.

Uterine artery Doppler waveform analysis has been extremely studied in the second trimester of pregnancy as a predictive marker for the late development of pre eclampsia and fetal growth restriction. The use of Doppler interrogation of this vessel in the first trimester has gained momentum in recent years. In normal pregnancy, the feto-placental circulation acts as a low resistance system unit. Thus blood velocity waveforms in umbilical artery show continuous forward flow throughout the cardiac cycle. Impaired placental perfusion, one of the hallmarks of preeclampsia, can be assessed by measuring flow waveforms ratios or by detecting diastolic notching of the uterine and umbilical vessels. According to the National Institute for Clinical Excellence guidelines on routine prenatal care recommending that at the first prenatal visit a woman's level of risk for adverse pregnancy outcome should be evaluated so that a plan for her schedule of prenatal visits

can be formulated. There is no proven effective method for the prevention of PE.

Currently there is no treatment which can prevent all cases of preeclampsia, there is evidence that low dose aspirin started early in pregnancy have some role in reducing the incidence of adverse pregnancy outcome in significant no of cases now. Prophylactic aspirin reduces early on PE and preterm delivery by 10%.⁵

Aim And Objective

Aim:

- The aim of the study is to evaluate the first trimester uterine artery Doppler in the prediction of the development of adverse pregnancy outcome.

Objectives:

- Correlation of uterine artery Doppler in the first trimester with adverse pregnancy outcome.

MATERIALS AND METHODS

Source Of Data

This is a prospective screening study for women attending antenatal clinic during 11-13 weeks + 6 days of gestation in GEMS and Hospital, Srikakulam. In this visit, women will have an ultrasonogram for the following reasons:

- (1) to confirm gestational age from the measurement of the fetal crown-rump length (CRL)
- (2) to diagnose any major fetal abnormalities
- (3) to measure fetal nuchal translucency thickness and nasal bone, as part of the screening for chromosomal abnormalities.
- (4) Along with this Informed consent will be obtained and Uterine artery Doppler Pulsatile Index (PI) will be measured by Transabdominal or Transvaginal colour Doppler.

Methodology Of The Study:

Study Design: Prospective longitudinal Observational study.

Sample size: 150 no[s (Control – 75 and case group – 75) All women meeting inclusion criteria during jan 2023 – jan 2024

Place: Department of Obstetrics and Gynaecology – OPD Great Eastern Medical School and Hospital , Srikakulam , Telangana.

Duration: 1 Year, 1st Jan 2023 – 1st Jan 2024

Method: Prospective study.

Inclusion Criteria

All pregnant women attending antenatal check up in GEMS & H Between 11 - <13wks + 6 days will be included.

Exclusion Criteria

Past history of preeclampsia Chronic hypertension Twins Missed abortion Major Fetal anomaly which are incompatible with life Not consenting.

OBSERVATION AND RESULTS

This is a prospective observational study conducted in 150 women at the Department of Obstetrics and Gynaecology, Great Eastern Medical School and Hospital. Based on the uterine Doppler value, my study population (n – 150) is divided equally (each 75) into control and case group. In the case group uterine artery Doppler value, both single uterine artery Doppler and average uterine Doppler > 2.3 is considered as abnormal. Both the control and case group were followed up throughout the gestation for the development of adverse pregnancy outcome such as PE, gestational hypertension, eclampsia, IUGR and oligohydramnios.

Table –5 Age Wise Distribution Of The Study

AGE	CONTROL	CASES	TOTAL	(%)
< 20	9	5	14	9%
21 - 25	32	32	64	43%
26 – 30	29	27	56	37%
31 – 35	5	9	14	9%
> 35	0	2	2	1%
Total	75	75		

Table –5 show that out of 150 patients studied, 43% were between 21 – 25 yrs of age in both the groups, 39% & 36% were between 26 and 30. There is no significant differences between the groups (p>0.05)

Table –6 Shows the mean age distribution in study group

Mean Age with study Groups								Sig
Age	Mean	SD	Std. Error	95% CI for Mean		Minimum	Maximum	
				Lower	Upper			
CONTROL	25.2	3.484	0.402	24.4	26	19	34	>0.05
CASES	26.13	3.905	0.451	25.23	27.03	18	39	

The distribution of ante natal mean age of both the groups had 25.2+/-3.48 & 26.13+/-

3.91. There is no significant difference between the groups (p>0.05)

Of the age group distribution the youngest one is 18 years and the eldest women is 39 years.

Table – 7 Parity status of the study population

Parity	Control	Cases	Total	(%)
PRIMI	38	43	81	54%
MULTI	37	32	69	46%
Total	75	75		

Table – 7 shows the parity status of the 150 women in the study. Maximum women i.e 54% are primigravida . Youngest primi being 18 years and eldest primi is 35 years old. 46% are multi,

youngest multi is 21 years and eldest multi is 39 years old.

Table –8 Family history of study population

Family History	Control	(%)	Cases	(%)
YES	5	7%	14	19%
NO	70	93%	61	81%
Total	75		75	

Table –8 shows the family history of study population. About 7% and 19% of women in control and cases group have significant family history. Family history of Diabetes Mellitus(DM), Hypertension(HTN), DM and HTN included in this. There is no significant family history of preeclampsia or eclampsia found in these groups. Family history is insignificant in my study group for adverse pregnancy outcome.

Table –9 Medical history of the population in the study

Other medical History in the Population of the Study Groups			
Medical Disorders	Case	Control	Total
Over Hypo Thyroid	3	2	5
Type II DM	1	0	1
GDM on Diet	4	6	10
GDM on Drugs	5	2	7
Chronic Hypertension	1	0	1
Total	14	10	24
(%)	19%	13%	16%
Unaffected	61	65	126
(%)	81%	87%	84%

Table –9 shows the medical history of the study population. History of other medical disorders such as overt hypothyroid, Type 2 DM, GDM on diet/OHA, Chronic hypertension are included. In case group ,1 patient with history of chronic hypertension present. There is no significant difference in the case and control group with the medical history.

Table -10 Previous obstetric history of the study population

Significant History	Study Group			
	Control	(%)	Case	(%)
BOH	1	1%	4	5%
PE	0	0%	1	1%
NIL	74	99%	70	93%
Total	75		75	

Table –10 shows previous obstetric history in the study population. In the study group 3% history of BOH present. In the case group 5% has BOH due to 2 Neonatal death and 2 term IUD.

Table – 11 Shows Uterine artery Doppler value ranges in both case and control group

Uterine Artery Doppler	Control	(%)	Cases	(%)
< 1.49 (<50th Percentile)	44	59%	0	0%
1.5 - 2.29 (>50th - 95th Percentile)	31	41%	0	0%
≥ 2.3 (≥95th Percentile)	0	0%	75	100%
Total	75		75	

Table –12 Shows the mean of clinical variables in the study group

		Mean	SD	Std. Error	95% CI for Mean		Minimum	Maximum	Sig
					Lower Bound	Upper Bound			
U/A L	Control	1.40	0.41	0.05	1.31	1.50	0.58	2.28	<0.001
	Cases	2.3	0.65	0.08	2.11	2.41	0.5	4	
	Total	1.83	0.69	0.06	1.72	1.94	0.5	4	
U/A R	Control	1.45	0.42	0.05	1.36	1.55	0.48	2.26	<0.001
	Cases	2.3	0.71	0.08	2.13	2.46	0.78	4.6	
	Total	1.87	0.72	0.06	1.76	1.99	0.48	4.6	

AVR	Control	1.42	0.33	0.04	1.35	1.50	0.64	2.02	<0.001
U/A	Cases	2.3	0.45	0.05	2.16	2.37	2.3	4.1	
	Total	1.84	0.58	0.05	1.75	1.94	0.64	4.1	

Table 11 shows Doppler clinical variables in the study group. The mean average of both right and left uterine Doppler in the control group is 1.42 with its minimum of 0.64 and maximum of 2.02. In the case group with mean average of 2.3 with its minimum of 2.3 and maximum of 4.1.

Table – 13 Number of women in case and control group started on prophylactic aspirin

Aspirin	Control	(%)	Cases	(%)
Started	1	1%	23	31%
Not Started	74	99%	52	69%
Total	75		75	

Table – 13 a shows that 1% in control group was started on aspirin in view of age > 30 years. In case group 31% were started on aspirin in view of average uterine artery PI more than 95th percentile (> 2.3).

Table –14 Association of 2nd trimester abnormality in both group

2 - Doppler	Control	(%)	Cases	(%)
NORMAL	71	95%	65	87%
RT-DN+	0	0%	3	4%
LT - D N +	0	0%	4	5%
B/L UA N+	1	1%	0	0%
QUIT	3	4%	3	4%
TOTAL	75		75	

Table -14 Shows association of 2nd trimester Doppler with study group. In the control group 71 of had normal dopplers and 1 had bilateral uterine artery Doppler notching. Remaining 3 was quit after 1st trimester scan. In the case group 65 of them had normal Doppler and 3 & 4 (total 7) had right and left uterine artery diastolic notching. Out of 7 / 5 were started on prophylactic aspirin in the first trimester and 3 of them ended up in having pre- eclampsia. As compared to control group, there are 2nd trimester Doppler abnormality in women who had their 1st trimester Doppler abnormality. Of which 50 % of them ending up in adverse pregnancy outcome.

Table – 15- Association of 3rd Trimester Doppler abnormality in both group

3 - Doppler	Control	(%)	Cases	(%)
NORMAL	68	91%	67	89%
ABNORMAL	1	1%	2	3%
QUIT	6	8%	6	8%
Total	75		75	

Table –15 Shows Third trimester Doppler abnormality was about 1% in control and 3% in the case group. There is no significant difference in both the groups.

Table - 16 Shows association of IUGR with study group

IUGR	Control	(%)	Cases	(%)
PRESENT	4	5%	21	28%
ABSENT	71	95%	54	72%
Total	75		75	

Table -16 Shows association of IUGR in the study group. In the control group 5% of them had IUGR and in the case group 28% of them had IUGR . This shows that there is significant outcome in the case group than control group. There are significant cases of IUGR in case group for both average and single uterine artery PI ≥ 2.3 .

Table – 17 Shows association of Oligohydramnios in the study group

OLIGO	Control	(%)	Cases	(%)
PRESENT	5	7%	8	11%

ABSENT	70	93%	67	89%
Total	75		75	

Table –17 shows association of Oligohydramnios in the study groups .In the control group 7% of them had oligohydramnios and in the case group 11% of them had oligohydramnios. There is no significant outcome between these groups.

Table –18 Shows association of Gestational Hypertension with the study group

G.HTN	Control	(%)	Cases	(%)
PRESENT	1	1%	4	5%
ABSENT	74	99%	71	95%
Total	75		75	

Table –18 shows association of Gestational Hypertension in the study groups. In the control group 1% and in the case group 5% of them had Gestational Hypertension.. Out of 4, 3 had average uterine artery Doppler more than 2.3(maximum of 2.7) and 1 had single uterine artery Doppler abnormality. None of the 4 were started on prophylactic aspirin.

Table –19 Shows association of Pre-eclampsia in the study groups

PRE -ECL	CONTROL	(%)	CASES	(%)
PRESENT	0	0%	6	8%
ABSENT	75	100%	69	92%
Total	75		75	

Table –19 shows association of Pre – eclampsia in the study group. In the control group none of them had pre – eclampsia. In the case group 8% of them had preeclampsia and none in the control group had PE. Out of 6 , 5 were started on prophylactic aspirin in the first trimester for abnormal Doppler and 1 was not started on aspirin. There is significant outcome in the case group as compared to the control group. Role of aspirin in the prevention of preeclampsia was not much effective. Out of 6, 4 had average uterine artery PI > 2.3 and 2 had single uterine artery PI > 2.3.

Table – 20 Shows the Abnormal uterine Doppler in the case group and adverse pregnancy outcome

Clinical Variables	Total	IUG R	OLI GO	G+H TN	PE	Eclam psia
Single Uterine Artery Doppler [Right/Left] with its PI ≥ 2.3	42	10	3	1	2	0
Average of Right and Left Uterine Artery Doppler with its PI ≥ 2.3	33	11	5	3	4	0
Total	75	21	8	4	6	0
(%)	100%	28%	11%	5%	8%	0%

Table – 20 Shows the abnormal uterine artery Doppler in the study group and adverse pregnancy outcome. Out of 75 in the case group, Single uterine artery Doppler abnormality was found in 42 and 33 are with average uterine artery Doppler >2.3. Both of them are associated with adverse pregnancy outcome (average PI >2.3 is slightly more than single PI >2.3).

In the case group the maximum % of adverse pregnancy outcome is with IUGR – 28% and least % for G.HTN – 5% and 0% outcome with eclampsia.

Table – 21 Shows various adverse pregnancy outcome in both control and case group

Clinical Variables	Control	Cases	Sig
IUGR	6%	28%	<0.001
OLIGO	7%	11%	>0.05
G.HTN	1%	5%	>0.05
PRE ECL	0%	8%	>0.05



Figure -26 Shows overall prevalence of adverse pregnancy outcome in the case group

Table -21 the prevalence of adverse pregnancy outcome in the case group. In the case group the adverse pregnancy outcome was associated with 52 % and 48% is normal .Adverse pregnancy outcomes such as IUGR, Oligohydramnios, G.HTN and Preeclampsia are included in the study.

In the case group 52% are associated with adverse pregnancy outcome , but in the control group only 19% were associated with adverse pregnancy outcome. Adverse pregnancy outcome which were included are IUGR, Oligohydramnios , G.HTN, preeclampsia and Eclampsia. So there is significant outcome in the case group as compared to control group. The P value is highly significant.

Table - 22 Shows gestational age at which the pregnancies were terminated in both the groups

GA (weeks)	Control	(%)	Cases	(%)
<37 weeks	3	4%	12	16%
> 37 weeks	62	83%	49	65%
QUIT	10	13%	14	19%
Total	75		75	

Table -22 shows the gestational age at which the pregnancies were terminated. In the control group 3 had their delivery < 37weeks in view of preterm labour(2) and PPRM(1) ,remaining are > 37weeks. In the case group 12 of them had their deliveries <37 weeks

Table -23 Pregnancy terminated in case & control gp <37weeks

Pregnacy Terminated	Case	(%)	Control	(%)
S.PRE ECLAMPSIA	4	5%	0	0%
G.HTN	3	4%	0	0%
G.HTN+IUGR	1	1%	0	0%
S.OLIGO DRAMNIOVS	1	1%	2	3%
S.IUGR	3	4%	1	1%

3 had preterm labour. The lowest gestational age in the case group at which the pregnancy terminated was 33 weeks for severe preeclampsia.

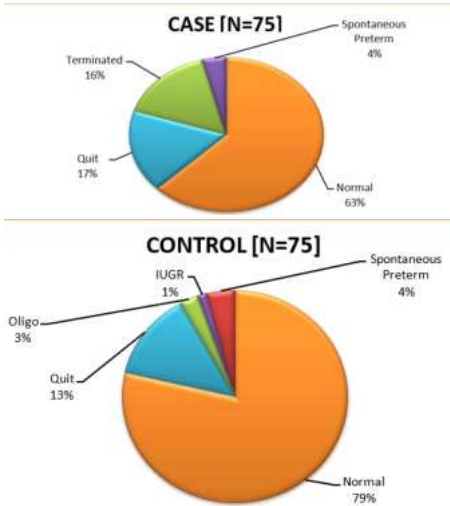


Figure - 29 Pregnancy terminated in case and control group

Patients in the case group has been more induced than in the control group.

Table - 24 Shows the range of birth weight in both control and case group

Birth weight(kg)	Control	(%)	Cases	(%)
< 2.0	0	0%	5	7%
2.01 - 2.50	4	5%	16	21%
2.51 - 3.50	50	67%	38	51%
> 3.50	11	15%	2	3%
Quit	10	13%	14	19%
Total	75		75	

Table - 25 Shows the mean birthweights(kgs) with the study groups

Birth weight [Kgs]	Mean	SD	Std. Error	95% CI for Mean		Min imu m	Max imu m	Sig
				Lower	Upper			
CONTROL	3.056	0.42591	0.05283	2.9505	3.1615	2.03	3.91	<0.001
CASES	2.7329	0.52075	0.06614	2.6007	2.8651	1.34	3.75	

Table 24 and 25 - shows the mean birth weight in the study group. The mean birth weight in the control group was 3.056kg with minimum birth weight of 2.03kg and maximum weight of 3.9kg. In the case group the mean birthweight was 2.7kg with minimum birthweight of 1.34kg and maximum weight of 3.75kg.

Table -26 Association of mode of deliveries with the study groups

Mode of Deliveies	Control	(%)	Cases	(%)
Elective LSCS	5	7%	6	8%
Emergency LSCS	16	21%	12	16%
NVD	33	44%	35	47%
VAVD	11	15%	8	11%
Quit	10	13%	14	19%
Total	75		75	

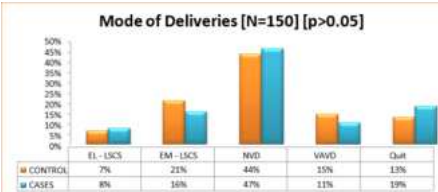


Figure -30 Shows association of mode of deliveries with the study groups.

Table- 26 and Figure -30 shows association of mode of deliveries with the study groups. Of the total study group 9% of them have undergone elective c- section for primigravida with breech presentation and repeat lscs with history of previous lscs, 23% of have undergone emergency lscs for obstetrical indications. 54% delivered normally and 15% by vaccum assisted delivery.

Table -27 Summary of all Clinical variables in the study group

Comparison of cases and control subjects			
Clinical Variables	Control	Cases	Sig
AGE			
Mean +/-SD	25.2+/-3.5	26.1+/-3.9	>0.05
PARITY			
PRIMI	51%		>0.05
MULTI	49%		
FAMILY HISTORY	7%	19%	<0.05
PREVIOUS OBSTERTRIC HISTORY			
BOH	1%	5%	>0.05

PE	0%	1%	
NIL	99%	93%	
MEDICAL HISTORY	13%	19%	>0.05
U/A L			
Mean +/-SD	1.4+/-0.41	2.26+/-0.65	<0.001
U/A R			
Mean +/-SD	1.4+/-0.41	2.26+/-0.65	<0.001
AVR U/A			
Mean +/-SD	1.42+/-0.33	2.26+/-0.45	<0.001
Pregnancy Out come	19%	52%	<0.001
GA (weeks)			
< 37 weeks	5%	20%	<0.05
> 37 weeks	95%	80%	
PREGNANCY TERMINATED	4%	16%	>0.05
MODE OF DELIVEIES			
EL - LSCS	8%	10%	>0.05
EM - LSCS	25%	21%	
NVD	51%	56%	
VAVD	17%	13%	
BIRTH WEIGHT [kgs]			
Mean +/-SD	3.06+/-0.43	2.73+/-0.53	<0.001

Data Analysis - Methods:

The data are reported as the mean +/- SD or the median, depending on their distribution. The differences in quantitative variables between groups were assessed by means of the unpaired „t” test. Comparison between groups was made by the Non parameteric Mann - Whitney test.

The chi square test was used assess differences in categoric variables between groups. A p value of <0.05 using a two-tailed test was taken as being of significance for all statistical tests. All data were analysed with a statistical software package. (SPSS, version 16.0 for windows)

DISCUSSION

Hypertensive disorders of pregnancy are one of the most common complications of pregnancy with the incidence of 5 - 10%. The associated maternal morbidity, mortality and neonatal complications are very adverse indicating the need for early identification of the condition preferably before onset of clinical disease. Lot of research has been done and many screening options are identified for predicting development of hypertensive disorders in pregnancy. But no single screening test is useful.

Many studies done in second trimester investigated the value of uterine artery Doppler in prediction of development of hypertensive disorders of pregnancy, scientific interest is now focused on first trimester. This gives the opportunity of early intervention for modifying the severity of the disease and meticulous surveillance for early identification of the disease. This is a prospective study conducted at the Department of Obstetrics and Gynaecology at Great Eastern Medical School and Hospital , Srikakulam, Andhra Pradesh, between January 2023 – January 2024 with the aim to evaluate the predictive value of first trimester uterine Doppler for development of adverse pregnancy outcome..

In this study 150 women, representative of local pregnant population irrespective of parity are recruited with follow up rate of 100%.

All the antenatal mothers attending the OPD between 11 – 13weeks + 6days are chosen to perform uterine artery Doppler because a routine NT scan is scheduled in the study population at this time of gestation. Based on the uterine Doppler value, my study population (n – 150) is divided equally (each 75) into control and case group. In the case group uterine artery Doppler value, both single uterine artery Doppler and average uterine Doppler > 2.3 is considered as abnormal and Doppler < 2.2 is considered as control

group(normal). Abnormal dopplers in the case and normal dopplers in the control group was followed up for development of adverse pregnancy outcome till delivery. All pregnant women were screened for risk factors such as previous obstetric history of preeclampsia, family history of hypertension / diabetes, h/o chronic hypertension.

Uterine artery Doppler indices – Pulsality Index in the first trimester is considered abnormal, when PI is >2.3 in both average and single uterine artery Doppler. The exclusion criteria were (1) Chronic hypertension (2) Twins (3)Missed abortion (4) Not consenting.

Once the abnormal dopplers were found, the patients were closely followed up during every antenatal visit for the development of G.HTN, PE , IUGR & Oligohydramnios. They have been monitored for the development of abnormality in the 2nd and 3rd trimester dopplers. Both case and control group had the same follow up irrespective of normal Doppler values in the control group.

In my study population out of 150 patients studied, 43% were between 21 – 25 yrs of age and 37% were between 26 – 30 yrs of age. There is no significant difference between both the groups.

In my study population (150 no's) maximum women i.e 54% are primigravida . Youngest primi being 18 years and eldest primi is 35 years old. 46% are multigravida, youngest multigravida is 21 years and eldest multigravida is 39 years old.

In the family history about 7% and 19% of women in control and cases group have significant family history. Family history of Diabetes Mellitus (DM), Hypertension (HTN), DM and HTN included in this. There is no significant family history of preeclampsia or eclampsia found in these groups. Family history is insignificant in my study group for adverse pregnancy outcome.

Medical history in the study population such as overt hypothyroid, Type 2 DM, GDM OHA. In case group ,1 patient with history of chronic hypertension present. There is no significant difference in the case and control group with the medical history.

In the study group ,1% in the control group and 5% in the case group has BOH due to 2 Neonatal death and 2 term IUD. Among them none of have developed hypertensive disorder of pregnancy. One of them was diagnosed to have APLA +ve preconceptionally, for which she was started prophylactically on aspirin and heparin.

Uterine artery Doppler variables in the study population is divided based on the abnormality as control and case group. Doppler value in the control group is considered when it is < 2.2 and Doppler value in the case group is considered when it is > 2.3 (abnormal) for both single and average uterine artery Doppler.

In the study population those who had abnormal uterine Doppler (> 2.3) was started prophylactically on aspirin.1% in control group was started on aspirin in view of age > 30years. In case group 31% were started on aspirin in view of average uterine artery PI more than 95th percentile (> 2.3).

Follow up of study group for Doppler abnormality in the 2nd and 3rd trimester were carried out. There was no significant finding in both control and case group.

My study population was followed up for the development of adverse pregnancy outcome till delivry such as G.HTN, PE, Oligohydramnios and IUGR. 52% in the case group and 19% in the control group were associated with adverse pregnancy

outcome. More % of adverse outcome in the case group is for IUGR as compared to other variables.

Gestational age at which pregnancies were terminated are analysed. In the control group 3 had their delivery < 37 weeks in view of preterm labour(2) and PPROM(1), remaining delivered > 37 weeks. In the case group 12 of them had their deliveries < 37 weeks in view of severe PE (4), G.HTN (3), G.HTN+IUGR (1), Severe IUGR (3), Severe Oligohydramnios (1).

Birth weight in the study was analysed in both groups. These groups were categorized as very low birthweight(<2kg), low birth weight(2-2.5kg) and normal(>2.5). In the control group 5% of them had low birth weight and 95% had normal birthweight. In the case group 7% had very low birth weight, 21% had low birth weight and 72% of them had normal birthweight.

Of the total study group 9% of them have undergone elective c-section for primigravida with breech presentation and repeat lscs with history of previous lscs, 23% of have undergone emergency lscs for obstetrical indications. 54% delivered normally and 15% by vacuum assisted delivery.

Age distribution and parity index were analysed for association of adverse pregnancy in the case group. It is evident from the observation that most of the adverse pregnancy outcome is for reproductive age group between 21-30 years and adverse outcome was more for the primigravida in my study population. It is consistent with the study done by Parra-codero M et al,¹⁰⁵ 51% of primigravida developed hypertensive disorders of pregnancy. This shows that nulliparous women who are exposed to paternal antigen for the first time are at increased risk of developing hypertensive disorders of pregnancy.

Other parameters such as family history, previous obstetric history, medical history was not significant in my study population. These parameters are considered in my study population as reference to the following study - Plasencia et al,⁷ investigated the performance of screening for PE using maternal characteristics such as body mass index, age, ethnic origin, smoking, medical and obstetric history and uterine artery PI in the first trimester. They concluded that in unaffected individuals log MoM PI was influenced by maternal ethnic origin, body mass index, previous history of PE and fetal crown-rump length. In the prediction of PE significant contributions were provided by log MoM PI, ethnic origin, body mass index and previous and family history of PE. They also added that for a false-positive rate of 10% the predicted detection rate of PE requiring delivery before 34 weeks was 82%, compared to 31% for late PE, 12% for gestational hypertension and 18% for small for gestational age. But this is contradictory to my study.

In the present study, abnormal uterine artery Doppler indices(> 95th percentile) noted in 11 - 13w+6days are compared for their predictive values in the development of adverse pregnancy outcome, such as development of gestational hypertension, PE, eclampsia, IUGR and oligohydramnios in the study population and with the available studies which are a few in first trimester.

Abnormal Doppler value > 2.3(>95th percentile) is taken as cut off as reference to this study. In the study conducted by Gomez et al,⁶ where 999 pregnant women were examined between 11 to 14 weeks during routine scan using transvaginal color and pulsed Doppler. The authors found a significant change in the 95th percentile of mean uterine artery PI with advancing gestation. They reported a progressive decrease in the prevalence of bilateral notching and PI with gestation. There were 22 cases of PE, and using a cut-off of PI above the 95th

percentile, the sensitivity, specificity, PPV and NPV were 245, 95.1%, 11.3% and 97.9% respectively. The authors of the study acknowledged the potential advantages of early screening for PE and associated complications, but concluded that there is a limited role for uterine Doppler velocimetry in identifying the pregnancies with increased risk of developing hypertensive disorders.

In the case group out of 75, 56% of them had single uterine artery Doppler(SUAD) PI > 2.3 and 44% with average uterine artery Doppler (AUAD) PI > 2.3. Out of 56% in the SUAD 38% had adverse pregnancy outcome and out of 44% with AUAD 69.6% had adverse pregnancy outcome. In both the groups the maximum adverse outcome was with IUGR.

Control group has 19% adverse pregnancy outcome, 6% for IUGR, 7% for oligohydramnios, 1% for G.HTN and 0% for PE. Case group has 52% of them had adverse pregnancy outcome, 28% for IUGR, 11% for oligohydramnios, 5% for G.HTN, 8% for PE. P value is highly significant (<0.001) with case group as compared to control group for adverse pregnancy outcome. Thus as compared to control group, case group has significant adverse pregnancy outcome.

On total of the case group 52% of the population has adverse pregnancy outcome in my study population. Both average and single uterine artery Doppler > 2.3 is significant from my study, but average is more significant than single uterine artery Doppler. There were no cases of Eclampsia noted in my study population.

There was no studies found which is consistent with single uterine Doppler abnormality and adverse pregnancy outcome. The results of which is from my study population. Thus I conclude from above that measuring single uterine artery Doppler is also found to be significant even if the average is < 2.3.

CONCLUSION

To conclude from the present study, first trimester Doppler ultrasound is the best non-invasive investigation to assess changes in uteroplacental hemodynamics which helps in early prediction of development of hypertensive disorders in pregnancy along with maternal characteristics which helps in early prophylactic intervention.

Further research is required to evaluate the generalizability of multiparametric models in different resource settings, in addition to assessing the impact of screening on clinical outcomes.

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