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PREDICTIVE VALUE OF FETAL MIDDLE CEREBRAL ARTERY TO UTERINE ARTERY PULSATILITY INDEX RATIO IN PREECLAMPSIA

By

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ABSTRACT

Background: Complicating 2–8% of pregnancies, pre-eclampsia (PE) is a major cause of maternal and perinatal morbidity and mortality worldwide, especially in developing countries. The middle cerebral artery (MCA) to uterine artery (UTA) pulsatility index (PI) ratio and MCA to umbilical artery (UA) PI ratio have been described to be good predictors of perinatal outcome in pre-eclamptic patients in the third trimester, and have been proposed to identify fetuses at risk of morbidity and mortality.

Objective: To demonstrate the predictive value of middle cerebral artery (MCA) / uterine artery (UTA) pulsatility index (PI) ratio compared with that of the MCA/umbilical artery (UA) PI ratio in the assessment of fetal well-being in pregnant women with preeclampsia.

Patients and methods: This case control study included 200 pregnant females attended the outpatient clinic at the Maternity Hospital of Al-Azhar University (Bab Elshaariya Hospital) during the period of one year, starting from January 2020 till December 2020, Cairo, Egypt. There were divided into two equal groups; Control group (100 females with normal pregnancy) and Preeclampsia group (100 pregnant females with preeclampsia). Transabdominal ultrasonography was conducted for the assessment of the pulsatility indices of MCA, UA and UTA followed by estimation of the previous ratios.

Results: The duration of pregnancy was shorter in the preeclampsia group compared to controls. Cesarean section rates were higher in cases with preeclampsia with a significant difference between the two groups. The incidence of perinatal death, preterm birth, NICU admission and IUGR was significantly higher in preeclampsia cases. The mean MCA PI, mean MCA/UA ratio and MCA/UTA ratio were statistically significantly higher, while the mean UA PI and mean UTA PI were significantly lower in the control group as compared with preeclampsia group. MCA/UTA ratio revealed better ability in prediction of all the adverse effects of preeclampsia when compared to MCA/UA ratio.

Conclusion: Low middle cerebral artery/ uterine artery pulsatility index ratio in cases with preeclampsia is significantly associated with adverse perinatal outcomes. Middle cerebral artery/ uterine artery pulsatility index ratio had significantly higher predictive value for adverse outcomes compared to middle cerebral artery/umbilical artery pulsatility index ratio.

Keywords: Preeclampsia, Doppler, Middle cerebral artery, Neonatal outcomes.

INTRODUCTION

Hypertension in pregnancy is diagnosed when the pregnant lady has a systolic blood pressure > 140 mmHg and a diastolic blood pressure > 90 mmHg on at least two time points, six hours apart. The term “hypertension in pregnancy” encompasses three clinical entities;

gestational hypertension, preeclampsia, and eclampsia. A previous Egyptian study reported that the prevalence of pregnancy induced hypertension was 4.2, whereas the prevalence of preeclampsia and eclampsia was 3.8 and 0.3% respectively *(Amaral et al., 2017)*.

Preeclampsia is strongly associated with adverse obstetric and neonatal outcomes including intrauterine growth restriction (IUGR), abruptio placenta, and still birth *(Dymara-Konopka et al., 2018)*. The pathogenesis of preeclampsia is mediated through vascular endothelial damage and vasospasm which have a negative impact on fetal hemodynamics *(Dhariwal and Lynde, 2017)*. Kramer reported that these adverse outcomes are more encountered in developing countries compared to developed ones. Therefore, it is crucial for obstetricians to consider appropriate antenatal surveillance and to choose the optimum therapeutic intervention *(Snead et al., 2020)*.

Recently, the great development in medical technology has made doppler velocity study of critical importance in clinical obstetric practice as it can provide information about both placental and fetal circulations. Various doppler indices have been developed to assess the status of uteroplacental flow *(Raj et al., 2017)*.

Multiple studies have reported that middle cerebral artery (MCA) to umbilical artery (UA) ratio is more beneficial than MCA indices alone in the detection of placental abnormality in females with high-risk pregnancy *(Eser et al., 2011)*. As placental insufficiency develops, compensatory mechanisms occur to the fetal circulation to keep blood supply to the more important organs like brain and heart and thus, maximizing the brain sparing effect *(Stefopoulou et al., 2020)*.

Others have found that uterine artery (UTA) doppler indices are good indicators for both placental perfusion and fetal status in in the 3rd trimester of high-risk pregnancies, making it more beneficial more than UA doppler that can only assess the placental pathology *(Ukah et al., 2017)*.

The current study was conducted to calculate third trimester MCA/UTA PI ratio and to compare its predictive value with that of the MCA/UA PI ratio regarding perinatal adverse effects in pregnant ladies presented with preeclampsia.

PATIENTS AND METHODS

This prospective case control study was conducted at Maternity Hospital of Al-Azhar University (Bab Elshaariya Hospital) during the period of one year, starting from January 2020 till December 2020, after gaining approval from the local ethical committee of Al-Azhar University. We included a total of 200 pregnant ladies who were classified into two groups; Group A included 100 females with normal pregnancy, and Group B that included the remaining 100 ladies diagnosed with preeclampsia. Preeclampsia was defined according to the "National Blood High Pressure Education Program Working Group" on high blood pressure in pregnancy *(Lucero et al., 2019)*.

All of the included subjects had singleton pregnancy with gestational age ≥ 28 weeks. Conversely, females with history of preexisting hypertension, uncontrolled systemic comorbidities (like

diabetes), receiving medications during pregnancy rather than iron therapy, in active labor, or with membrane rupture were excluded.

Before evaluation, an informed consent was obtained from all ladies after explaining the benefits, steps and drawbacks of each intervention. Then, all of the included participants were subjected to detailed history taking, general examination (including blood pressure measurement and lower limb examination for edema), and complete obstetric examination. In addition, pelviabdominal ultrasound examination was performed using GE (voluson E6) ultrasound machine equipped with color doppler options (a 3.5 MHz curved transducer).

US examination was performed when the lady was at the semi recumbent position to avoid caval compression. The pulsatility index of the UA was estimated on a free-floating umbilical cord loop in the absence of breathing and movement. To estimate the MCA PI, the circle of Willis was identified after obtaining an axial view of the fetal head. The MCA was identified as a major anterolateral branch that runs towards the lateral orbital edge. The doppler sample volume was estimated about 1 cm distal to its origin. Besides, the mean PI of the right and left uterine arteries was estimated as well.

MCA to UTA PI ratio together with MCA to UA were estimated. The former was plotted on a specific chart, and any value less than the 5th percentile was considered abnormal, while the latter was considered as abnormal or to have brain sparing effect, when the ratio was less than 1.08 *(Simanaviciute and Gudmundsson, 2010)*. All cases had regular follow up till delivery and the perinatal outcome was evaluated and recorded. Our outcomes included mode of delivery, birth weight, gestational age at delivery, APGAR score, incidence of small for gestational age newborn (SGA), and need for neonatal intensive care unit admission (NICU). With the follow up, 23 females dropped out (lack of follow up), so the final number included was 89 females in the normal pregnancy group and 88 females in the PE group.

Statistical analysis:

Collection and analysis of the data was conducted using statistical package of social science (SPSS, IBM Chicago-USA) version 24. Data were either expressed in the form of number and percentage (with categorical data) while the quantitative data were expressed as mean ± SD with parametric data or median and range for non-parametric data. We used chi-square or Fischer's exact tests to compare two independent groups of categorical data. While comparing the quantitative data within two independent groups, independent samples t-test was used for parametric data and Mann-Whitney U test for non-parametric data. Diagnostic ability of predictors variable in relation to categorical outcome were expressed in terms of sensitivity, specificity, negative predictive value and post predictive value. Odd's ratio was also used to express diagnostic ability of predictive variables. For all used statistical tests, the cut-off point below 0.05 for probability (P value) was considered to be a statistically significant.

RESULTS

The mean age of the females in the control group was 26.89 years while in females with preeclampsia was 30.27 years. The age of the participants was significantly older in the preeclampsia group. Nevertheless, BMI was not significantly different between the two groups as it had mean values of 28.35 and 27.83 kg/m2 in control and preeclampsia groups respectively. Both gravidity and parity did not constitute a significant difference between the study groups **(Table 1)**.

Table (1): Demographic and clinical parameters in the study groups

Groups / Variables	Control (N=100)	Preeclampsia (N=100)	P value
Age (years) Mean ± SD	26.89 ± 4.88	30.27 ± 5.86	0.001
BMI (kg/m^2) Mean ± SD	28.35± 6.59	27.83±5.77	0.375
Gravidity Median (min-max)	3 (1 – 5)	2 (1 – 5)	0.322
Parity Median (min-max)	1 (0 – 3)	2 (0 – 4)	0.274
SBP (mmHg) Mean ± SD	121.33 ± 10.14	151.66 ± 7.94	< 0.001
DBP (mmHg) Mean ± SD	81.51 ± 8.12	93.66 ± 7.18	< 0.001
GA (weeks) Median (min-max)	30 (27 – 32)	31 (27 – 32)	0.216

BMI: Body mass index. DBP: Diastolic blood pressure. GA: Gestational age. SBP: Systolic blood pressure.

The mean MCA PI in the control group was 1.65 ± 0.39 which was statistically significant higher as compared with the preeclampsia group (1.31 ± 0.27) (p = 0.035). the mean UA PI in the control group was 0.98 ± 0.17 which was statistically significant lower as compared with the preeclampsia group (1.22 ± 0.25) (p = 0.021). the mean UTA PI in the control group was 0.81 ± 0.11 which was statistically significant lower as compared with the preeclampsia group (1.25 ± 0.22) (p = 0.009). The mean MCA/UA ratio in the control group was 1.68 ± 2.29 which was statistically significant higher as compared with the preeclampsia group (1.07 ± 1.08) (p = 0.001). The mean MCA/UTA ratio in the control group was 2.02 ± 2.69 which was statistically significant higher as compared with the preeclampsia group (1.08 ± 1.14) (p < 0.001) **(Table 2)**.

Table (2): Doppler indices in the study groups

Groups / Variables	Control (N=100)	Preeclampsia (N=100)	P value
MCA PI Mean ± SD	1.65 ± 0.39	1.31 ± 0.27	0.035
UA PI Mean ± SD	0.98 ± 0.17	1.22 ± 0.25	0.021
UTA PI Mean ± SD	0.81 ± 0.11	1.25 ± 0.22	0.009
MCA/UA ratio Mean ± SD	1.68 ± 2.29	1.07 ± 1.08	0.001
MCA/UTA ratio Mean ± SD	2.02 ± 2.69	1.08 ± 1.14	< 0.001

MCA: Middle cerebral artery. UA: umbilical artery. UTA: Uterine artery. PI: Pulsatility index.

In the control group, vaginal delivery was conducted in 27 females (30.3%) and CS in 62 females (69.7%), the percentage of the CS was higher in cases with preeclampsia (79.6%) (p = 0.009). The duration of pregnancy was shorter in the preeclampsia group as compared with controls (p = 0.018). Additionally, the birth weight was significantly lower in the preeclampsia cases compared to controls (P < 0.001). the median 5-min APGAR score was statistically significantly lower in the preeclampsia group as compared with the control group (p= 0.024). The incidence of IUGR, preterm birth, perinatal death, and NICU admission was statistically significant higher in the preeclampsia group as compared to controls (P < 0.001) **(Table 3)**.

Table (3): Pregnancy and neonatal outcomes of the study groups

Groups / Variables	Control (N=89)	Preeclampsia (N=88)	P value
Mode of delivery			
-Vaginal	27 (30.3%)	18 (20.4%)	0.009
-CS	62 (69.7%)	70 (79.6%)	
GA at delivery (weeks) Median (min-max)	38 (36 – 40)	34 (31 – 38)	0.018
Birth weight (gm) Mean ± SD	2906.22 ± 419.42	1938.84 ± 368.23	< 0.001
5 min APGAR score Median (min-max)	9 (6 – 10)	7 (4 – 9)	0.024
Perinatal death	1 (1.1%)	14 (15.9%)	0.009
Preterm birth	5 (5.6%)	42 (47.7%)	< 0.001
NICU admission	7 (7.8%)	32 (36.4%)	< 0.001
IUGR	4 (4.4%)	22 (25%)	0.001

CS: Cesarean section. IUGR: Intrauterine growth retardation. NICU: Neonatal intensive care unit.

Normal and abnormal MCA/UA ratios and MCA/UTA ratio in relation to adverse outcomes in preeclampsia were compared. The odds ratio (OR) for abnormal MCA/UTA ratio was higher compared to the OR of MCA/UA ratio in prediction of the adverse neonatal outcomes including decreased 5-min APGAR score (< 6), preterm infants, NICU, IUGR and perinatal death **(Table 4)**.

Table (4): Normal and abnormal MCA/UA ratio and MCA/UTA ratio in relation to adverse outcomes in preeclampsia

Outcome	MCA/UA ratio			MCA/UTA ratio			Total (n=44)
	Normal (n=58)	Abnormal (n=30)	OR	Normal (n=52)	Abnormal (n=36)	OR	
Decreased 5-min APGAR score (<6)	24 (41.4%)	20 (66.7%)	0.83	18 (34.6%)	26 (72.2%)	1.44	44 (50%)
Preterm	22(37.9%)	20 (66.7%)	0.91	16 (30.8%)	26 (72.2%)	1.63	42 (47.7%)
NICU	16 (27.6%)	16 (53.3%)	1	12 (23.1%)	20 (55.6%)	1.67	32 (36.4%)
IUGR	8 (13.8%)	14 (46.7%)	1.75	4 (7.6%)	18 (50%)	4.5	22 (25%)
Perinatal death	6 (10.3%)	8 (26.7%)	1.33	2 (3.8%)	12 (33.3%)	6	14 (15.9%)

IUGR: Intrauterine growth retardation. MCA: Middle cerebral artery. NICU: Neonatal intensive care unit. UA: Umbilical artery. UTA: Uterine artery.

The predictive ability of MCA/UA ratio and MCA/UTA ratio in relation to adverse outcomes in preeclampsia. The MCA/UTA ratio revealed better ability in prediction of all the adverse effects of preeclampsia when compared to MCA/UA ratio **(Table 5)**.

Table (5): Predictive ability of MCA/UA ratio and MCA/UTA ratio in relation to adverse outcomes in preeclampsia

	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
MCA/UA ratio				
Decreased 5-min APGAR score (<6)	45.4	77.3	66.7	58.6
Preterm	47.6	56.3	66.7	62.1
NICU	50	75	53.3	72.4
IUGR	63.6	75.7	46.7	86.2
Perinatal death	57.1	70.3	26.7	89.7
MCA/UTA ratio				
Decreased 5-min APGAR score (<6)	59.1	77.3	72.2	65.4
Preterm	61.9	78.2	72.2	69.2
NICU	62.5	62.5	55.6	71.4
IUGR	81.8	72.7	50	92.3
Perinatal death	85.7	67.6	33.3	96.2

IUGR: Intrauterine growth retardation. MCA: Middle cerebral artery. NICU: Neonatal intensive care unit. UA: Umbilical artery. UTA: uterine artery.

DISCUSSION

In the recent era, doppler US is a very useful tool for monitoring high-risk pregnancy. Multiple studies have established the relationship between abnormal doppler findings and adverse pregnancy outcomes in cases with preeclampsia *(Eser et al., 2011* and *Adiga et al., 2015)*. Both MCA PI/UA PI and MCA PI/UTA PI ratio have been proposed as predictors for adverse obstetric and perinatal outcomes in such cases *(Shahinaj et al., 2010* and *Eser et al., 2011)*.

This study was conducted to calculate third trimester MCA/UTA PI ratio and to compare its predictive value with that of the MCA/UA PI ratio regarding perinatal adverse effects in pregnant ladies presented with preeclampsia. This case control study included 200 pregnant females who were classified into two groups; group A that included 100 pregnant females with normal pregnancy and group B that included 100 pregnant females with preeclampsia. In this study, age was significantly older in cases with preeclampsia compared to controls (30.27 vs. 26.86 years respectively – $p < 0.05$).

This came in accordance with *Gabal et al. (2017)* who reported that there was a significant positive correlation between age and blood pressure of the pregnant participants. The included cases had mean ages of 29.1 and 25.4 years in the preeclampsia and control groups respectively. Also, Eldeeb and his associates reported, in their epidemiological study, that the highest incidence of preeclampsia was noted in ladies older than 40 years *(El Deeb et al., 2015)*.

In this study, no significant difference was detected between the two groups regarding either parity or gravidity. This came in accordance with *Gabal et al. (2010)* who showed no significant relation between parity and preeclampsia. Nevertheless, another study conducted in Sweden reported that primiparous females were more prone to develop preeclampsia compared to multiparous women (≥ 3 deliveries). Another study reported that both nulliparous and high multiparous women were at increased risk of developing that condition *(Al-Shaikh et al., 2017)*. The disparity between different studies could be attributed to different patient criteria, sample size and statistical tests between different studies. Also, the economic status of the included cases could play a role as a previous study has confirmed that low socioeconomic status is a risk factor for preeclampsia during pregnancy *(Ganesh et al., 2010)*.

In this study, the mean values of SBP and DBP were statistically significant higher in the preeclampsia group as compared with the control group ($p < 0.001$). This came in line with the results published by *Simanaviciute and Gudmundsson (2010)*, *Eser et al. (2011)* and *Orabona et al. (2015)*.

In this study, the duration of pregnancy was shorter in the preeclampsia group as compared with the control group indicating early termination of pregnancy ($p = 0.018$). This came in accordance with *Eser et al. (2011)* who showed that cases with preeclampsia had significantly lower GA compared to controls.

In this study, in the control group, vaginal delivery occurred in 27 females (30.3%) and CS in 62 females (69.7%),

the percentage of the CS was higher in cases with preeclampsia (79.6%). Statistical analysis showed a significant difference between the two groups (p = 0.009). The higher prevalence of CS could be explained by the unavailability of facilities required for maternal and fetal monitoring during delivery, along with the increased rates of on-demand CS. Of note, previous studies have reported an increased complication rates on performing CS in cases with preeclampsia *(Mahran et al., 2017)*.

In this study, the birth weight was statistically significant lower in cases with preeclampsia compared to controls (P < 0.001). The median 5-min APGAR score had significantly lower values in cases compared to controls (p= 0.024). Moreover, the incidence of perinatal death, preterm birth, NICU and IUGR was statistically significant higher in cases versus controls (P < 0.001). This came in accordance with *Mayrink et al. (2019)* who reported that cases with preeclampsia had a 3.97-fold increased risk for preterm delivery compared to controls. Also, neonates showed higher incidence of low birth weight, small for gestational age, and NICU admission compared to controls. In addition, the same group had significantly lower APGAR score after 5 minutes of delivery. This also agreed with *Hoffman et al. (2018)* who showed that mothers with preeclampsia had significantly increased incidence of preterm delivery, low birth weight, and post-partum complications (p < 0.001).

Furthermore, *Akinlade et al. (2015)* reported that birth weight, infant length, Apgar score, and head circumference were significantly lower in neonates of women with preeclampsia when compared with the controls. The observed low birth weight, low gestational age, small infant length, low ponderal index, and small head circumference in infants of women with preeclampsia is in line with the report of *Onyiriuka and Okolo (2010)*.

This was attributed to the degree of hypoxia, which accompanies preeclampsia, especially when there is placental abruption which deprives the fetus of oxygen and nourishment and as a consequence, the fetus dies *(Armaly et al., 2018)*.

In this study, the mean MCA PI, mean MCA/UA ratio and MCA/UTA ratio had significantly higher values in controls compared to the preeclampsia group while the mean UA PI and mean UTA PI had significantly lower values. *Eser et al. (2011)* confirmed our findings.

In this study, the odds ratio (OR) for abnormal MCA/UTA ratio was higher as compared with the OR of MCA/UA ratio in prediction of the adverse neonatal outcomes including decreased 5-min APGAR score (<6) (1.44 vs 0.83), preterm infants (1.63 vs 0.91), NICU (1.67 vs 1), IUGR (4.5 vs 1.75) and perinatal death (6 vs 1.33).

This came in agreement with *Simanaviciute and Gudmundsson (2010)* who reported that the low MCA/UTA PI ratio was associated with a higher incidence of SGA newborns (57.8% vs. 25.7%), preterm labor (100% vs. 81.8%) and CS rates (90.7% vs. 66.7%) compared to cases who had higher values of the same ratio. This also came in accordance with *Eser et al. (2011)* who reported that 42.3% of cases with preeclampsia had their MCA/UTA ratio below the 5th

percentile. Cases who expressed MCA/UTA PI ratio showed higher rates of preterm delivery, CS, and NICU admission. However, cases with low MCA/UA PI ratio, only higher rates of CS and NICU admission were noted.

In this study, the MCA/UTA ratio revealed better ability in prediction of all the adverse effects of preeclampsia when compared to MCA/UA ratio PI. This came in agreement with *Orabona et al. (2015)* who showed that the MCA/UTA PI ratio had a higher predictive value for perinatal outcome when compared to MCA PI/UA PI. Multiple studies also confirmed the previous findings (*Arduini and Rizzo, 2010, Arbeille et al., 2010* and *Arias, 2010),* and the predictive value of MCA/UTA PI ratio has been found to be more accurate before 34 weeks of gestation *(McCowan and Naden, 2010* and *Arias, 2011)*. The superiority of uterine artery to umbilical artery could be explained by the fact that UA doppler indices basically reflect placental abnormalities, while being deficient in evaluating patient status. On the other hand, UTA doppler indices could reflect both placental as well as fetal abnormalities *(Hernandez-Andrade et al., 2012)*.

In contrast to our results, *Simanaviciute and Gudmundsson (2010)* reported that both ratios had comparable predictive value regarding the same parameter.

Our study has some limitations, first of all, it is a single center study that included a relatively sample size. Also, the long-term neonatal outcomes should have been assessed as well. These cons should be covered in the upcoming studies.

CONCLUSION

All in all, abnormally low MCA/UTA PI ratio in preeclamptic patients is significantly related to adverse perinatal outcomes. MCA/UTA PI ratio has significantly higher predictive value for adverse outcomes compared to MCA/UA PI ratio.

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القيمه التنبؤيه للشريان الدماغي الأوسط الجنيني إلي نسبه مؤشر نبضات الشريان الرحمي في حالات تسمم الحمل

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خلفيـــة البحـــث: تســمم الحمــل مســؤولا عــن حــدوث مضــاعفات فــي 2-8% مــن حــالات الحمــل، تســمم الحمــل يعــد ســببًا رئيســيًا لإصــابة ووفيــات الأمهــات فــي فتــرة الخصــوبة فــي جميــع أنحــاء العــالم، خاصــة فــي البلــدان الناميــة. يــرتبط إجهــاد الجنــين بــنقص التأكســد بمؤشــرات دوبلــر غيــر طبيعيــة للشــريان الســري، ويــؤدي توســع الأوعيــة الدماغيــة التعويضــيه إلــى الانخفــاض فــي نــبض الشــريان الــدماغي الأوســط. تــم وصــف نســبة مؤشــر النــبض للشــريان الــدماغي الأوســط إلــى الشــريان الرحمــي ونســبة الشــريان الــدماغي الأوســط إلــى الشــريان الســري علــى أنهــا تنبــئ جيــدًا بنتــائج الــولادة فــي مرضى تسمم الحمل في الفترة الأخيرة من الحمل.

الهــدف مــن البحــث: هــو حســاب نســبة مؤشــر النــبض للشــريان الــدماغي الأوســط إلــى الشــريان الرحمــي فــي الثلــث الثالــث مــن الحمــل وإثبــات قيمتهــا التنبؤيــة للمخرجــات الخاصــة بــالجنين مقارنــة مــع نســبة نســبة مؤشــر النــبض للشــريان الــدماغي الأوســط إلــي الشريان السري في حالات الحمل المعقدة مع تسمم الحمل.

المريضــات وطــرق البحــث: تضــمنت دراســة الحالــة هــذه 200 امــرأة حامــل حضــرن إلــى العيــادة الخارجيــة بمستشــفى الــولادة بجامعــة الأزهــر (مستشــفى بــاب الشــعرية) خــلال فتــرة عــام واحــد، بــدءًا مــن ينــاير 2020 حتــى ديســمبر 2020، القــاهرة، مصــر. تــم تقســيمهم إلــى مجمــوعتين متســاويتين. وتــم تصــنيفها إلــى مجمــوعتين، المجموعــة (أ) التــي ضــمت الإنــاث الحوامــل بحمــل طبيعــي، والمجموعــة (ب) والتــي ضــمت الإنــاث الحوامــل مصــابات بتســمم الحمــل. فــي الزيــارة الأولــى، خضــعت الحــالات لأخــذ التــاريخ المرضــي الكامــل، وفحــص عــام وفحــص مفصــل للــبطن مــع التركيــز علــى فحــص الــرحم للكشــف عــن مســتوى الــرحم. تــم إجــراء التصــوير بالموجــات فــوق

الصوتية عبر البطن لتأكيد وجود الحمل وللتأكد من عمر الحمل. تبع ذلك تقييم لمؤشرات النبض للشريان السري والشريان الرحمي والشريان الدماغي الأوسط.

نتائج البحث: كانت مدة الحمل أقصر في مجموعة تسمم الحمل مقارنة مع مجموعة التحكم التي تشير إلى الإنهاء المبكر للحمل. وكانت النسبة المئوية للولادة القيصرية أعلى في مجموعة تسمم الحمل (79.6٪) مع اختلاف معتد به إحصائياً بين المجموعتين. وكان معدل حدوث وفيات الفترة المحيطة بالولادة والولادة قبل الموعد ودخول وحدة العناية المركزة لحديثي الولادة وتأخر النمو داخل الرحم أعلى بشكل معتد به إحصائياً في مجموعة السيدات المصابات بتسمم الحمل مقارنة بالمجموعة الضابطة. وكان متوسط نسبة مؤشر النبض للشريان الدماغي الأوسط، ونسبة الشريان الدماغي الأوسط إلى الشريان السري ونسبة للشريان الدماغي الأوسط إلى الشريان الرحمي أعلى بفرق ذو دلالة إحصائية في المجموعة الضابطة مقارنة بمجموعة تسمم الحمل. وكان متوسط مؤشر النبض إلي الشريان السري ومتوسط مؤشر النبض إلي نسبة الشريان الدماغي الأوسط أقل بفرق ذو دلالة إحصائية في المجموعة الضابطة. وكشفت نسبة الشريان الدماغي الأوسط إلي الشريان الرحمي عن قدرة أفضل في التنبؤ بجميع الآثار الضارة لمقدمات تسمم الحمل (الإرتعاج) بالمقارنة مع نسبة الشريان السري إلي الشريان الدماغي الأوسط.

الإستنتاج: إنخفاض نسبة مؤشر نبض الشريان الدماغي الأوسط/ الشريان الرحمي في حالات مقدمات الارتعاج يرتبط بشكل كبير بنتائج الفترة المحيطة بالولادة الضائرة. كان لنسبة مؤشر نبض الشريان الدماغي الأوسط/ الشريان الرحمي قيمة تنبؤية أعلى بشكل ملحوظ للنتائج الضائرة مقارنة بنسبة مؤشر نبض الشريان الدماغي الأوسط/ الشريان السري.

الكلمات الدالة: تسمم الحمل، دوبلر، الشريان الدماغي الأوسط، نتائج حديثي الولادة.