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Original Article

Insulin resistance and uterine artery Doppler as predictors of pregnancy induced hypertension

Obstetrics and Gynecology

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ABSTRACT

Background: In second trimester, pregnant women with pregnancy induced hypertension (PIH) have different indices of uterine artery doppler and different value of insulin resistance (IR) than normal pregnant women.

Objective: To ascertain the role of uterine artery doppler ultrasound and insulin resistance ratio in prediction of PIH

Methodology: The present cohort study was done on 211 women during pregnancy in the period between 18-28wk, and the pregnant were followed until delivery. They were coming for antenatal care in the obstetric outpatient clinic at Al-Zahra University Hospital from January 2016 to December 2018.

Results: In the current study, the mean age, body mass index (BMI), gestational age, systolic blood pressure (SBP) and diastolic blood pressure (DBP) among the studied group were 30.24 years, 25.08 kg/m^2, 22.40 wks,106.7mmHg, 69.12mmHg, respectively. 9.5% of the studied group were hypertensive, 5.7% mild PIH and 3.4% severe PIH. There were statistically significant differences of uterine artery Doppler indices between normotensive and PIH groups and between IR and PIH groups. Cutoff value of IR as a predictor for PIH patients is 1.2 with 70% sensitivity and 70% specificity in the current study. Also, among the severe hypertensive patients 42.8% had a diastolic notch, 28.5% had a reversed diastolic flow and 28.5% had an absent diastolic flow.

Conclusion: IR was a good predictor for PIH. There was a statistically significant difference between IR and PIH groups. Abnormal uterine artery doppler had a higher rate of detection of maternal and fetal complications. Uterine artery doppler is a good diagnostic test for development of preeclampsia.

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Keywords: Pregnancy induced hypertension, uterine artery doppler, insulin resistance.

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INTRODUCTION

Hypertension with pregnancy is the most prevalent complication in pregnancies, and about 10-12% of pregnancies are affected. It is the major cause of maternal complication, death, and a cause of intra-uterine growth restriction (IUGR) and infants with low birth weight. In India PIH is 15.2% in a national way, moreover, in primigravida women the incidence is four times higher than in multiparas. The main cause of death is from preeclampsia and eclampsia which represent 13 percent of maternal deaths/ this means that prevention of PIH can have beneficial effects for both mother and child [1]. Hypertension and protein in urine are the landmarks of preeclampsia patients; affected by these must be evaluated for signs and symptoms of severe preeclampsia [2].

Doppler ultrasound studies demonstrate that the process of the invasion of trophoblast reduces impedances in uterine artery between 6-24 weeks of gestation result in remaining constant. The pulsatile index increases at the end of first trimester in high proportions of pregnancies intended for development of preeclampsia [3]. Doppler pulsed wave should be used to cover vessel and to make sure the insonation's angle is < 30 degrees. The pulsatile index is measured and the mean pulsatility index of both sides calculated when three similar consecutive waveforms are achieved. Thus, measurement of uterine artery indices can be used as a predictive test for its

severity before onset of clinical manifestations [4]. Insulin resistance (IR) means a physiologic condition that causes a high blood glucose, and the cells cannot use glucose, amino acids, and fatty acids. Then β cells in pancreas will increase insulin production to maintain stable blood sugar levels, which leads to hyperinsulinemia **[5]**. In the physiological condition insulin may be inflammatory and anti-inflammatory; it stimulates the production of endothelial Nitric Oxides (Nos) which has a vaso-relaxation and anti-inflammatory effect [6]. It is selectively impaired insulin resistance, leading to compensating hyperinsulinemia which activate mitogen-activated protein kinase (MAPK) pathways resulting in vasoconstriction, pro-inflammation, increased sodium, retention of the waters and higher blood pressure [7]. This work aims to ascertain the role of uterine artery Doppler ultrasound and insulin resistance ratio in prediction of PIH.

PATIENTS AND METHODS

Study design and setting

This cohort study was done on 211 women during pregnancy in the period between 18-28wk and followed up until delivery. They were coming for antenatal care in the obstetric outpatient clinic at Al-Zahra University Hospital from January 2016 to December 2018.

Inclusion criteria were singleton pregnancy, primi-gravida, gestational age from 18 to 28weeks.
Exclusion criteria were women with gestational diabetes and/or with 2 hours of glucose above 105 or 200 mg / dl, respectively, females with small gestational age, women with chronic maternal illness, chronic hypertension, placental abruption, or significant fetal abnormalities were excluded from the study.

The IRB committee of Faculty of Medicine "girls" Al-Azhar University, Cairo, Egypt approved the study protocol (FMG-IRB number 202009368). Written informed consent was taken from all women before their included into the study.

Sampling technique

- ***Sample type***

All pregnant women who met the inclusion criteria and agreed to participate in the study were included.

- ***Sample size***

Sample size was taken according to the number of women coming for antenatal care at the obstetric outpatient clinic on two fixed days chosen randomly during the two years of the study (as there was no documentation of patient flow rate at the clinic) at Al-Zahraa University Hospital from January 2016 to December 2018. They were 211patients who fulfilled the inclusion criteria and agreed to participate in the study and completed their attendance until delivery.

Study tools

History was taken as personal, obstetric, past, and family histories from all participants. Ultrasound was performed at 18-28weeks. Abdominal ultrasound was done using Sono Ace Medison X4 ultrasound machine (company: Samsung Medison, Origin Korea) in the ultrasound unit in the obstetric clinic at Al-Zahra University Hospital, Cairo, Egypt, to determine the gestational age amniotic fluid index, placental site, location, any congenital abnormalities. After they had evacuated their urinary bladder, transvaginal ultrasound was done by 2D transvaginal 7.5 MHz probe using Sono Ace Medison X4 ultrasound machine. All, women were placed in lithotomy position with a sagittal view of the uterine cervix obtained. Sweeping of the probe laterally until the paracervical vessels were visualized. Doppler Color was activated at the level of inner os with insinuating angel < 30 to determine the uterine artery, at this point uterine artery just before branching into arcuate arteries. The same has been done for the contralateral uterine artery to obtain three similar consecutive waves. In the Doppler study the following parameters were applied to assess; Pulsatility Index, Resistance Index and SD ratio. In presence of any abnormalities in Doppler as absence of the diastolic flow, inverted diastolic flow.

Lab investigations were done at 24-28 wks. Venous blood samples were collected from each pregnant woman in studied group for: fasting blood glucose (FBG) and fasting blood insulin (FBI). The following formulas was used to assess the level of insulin resistance through Homeostatic model assessment HOMA-IR [5]:

$$\left(\frac{\text{FINS}\left(\mu\frac{\text{IU}}{\text{mL}}\right)\text{x FBG}\left(\frac{\text{mmol}}{\text{L}}\right)}{22.5}\right)$$

Statistical analysis

Data were collected, coded, and used tin the Statistical Package for Social Science (IBM SPSS) version 23. The quantitative data analyzed as mean standard deviations and ranges. Also, qualitative variables were analyzed as numbers and percentages. The qualitative data was compared between groups by using Chi-square test and/or Fisher exact test when the expected count in any cell found to be less than 5. The quantitative data with parametric distribution was compared between two groups by using independent t-test. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, significance of p-value was considered as the following: P-value≥ 0.05: non-significant and P-value < 0.05: Significant. Receiver operating characteristic curve (ROC) is constructed by plotting the true positive rate (TPR) against the false positive rate (FPR). The true positive rate is the proportion of observations that were correctly predicted to be positive out of all positive observations (TP/(TP + FN)). Similarly, the false positive rate is the proportion of observations that are incorrectly predicted to be positive out of all negative observations (FP/ (TN + FP). It was used to assess the best cut off point of insulin resistance &uterine artery Doppler indices between the normotensive group and PIH group. The number of true-positive (TP), false-positive (FP), true-negative (TN), and false-negative (FN) test results was

calculated. According to the following equations, sensitivity (SN), specificity (SP), positive predictive value (PPV), and negative predictive value (NPV) was calculated: Sensitivity % = TP cases \ [TB cases + FN cases] X 100. Specificity %= TN cases \ [TN cases + FP cases] X 100. PPV %= TP cases \ [TP cases + FP cases] X 100. NPV % = TN cases \ [TN cases) + FN cases] X 100.

RESULTS

The mean age, body mass index (BMI), gestational age, systolic blood pressure (SBP)/ diastolic blood pressure (DBP) among the studied group were 30.24 years, 25.08 kg/m^2, 22.4wks, 106.7/ 69.12 mmHg, respectively. Additionally, 9.5%of the studied group were hypertensive, 5.7% from them were mild PIH and 3.4% severe PIH (Table 1). There was no significant difference between normotensive and mild PIH group regarding uterine artery doppler indices (p >0.05) (Table2), where there was a statistically significant difference between normotensive and severe PIH group as regard uterine artery doppler indices (P < 0.05) (Table (3). The mean IR among normotensive, mild PH, severe PIH patients was 1.15, 1.27 and1.87, respectively, with highly statistically significant difference between HOMA IR among all studied groups (Table (4). Cut-off value of IR as a predictor for PIH patients was 1.2 with sensitivity 70% and 22 specificity 70% (Table 5) (Figure 1). Additionally, 42.8% of the severe hypertensive patients had 23 diastolic notch, 28.5% with inverted diastolic flow and 28.5% with absent diastolic flow (Table 6). There was significant increase of Caesarian section delivery, NICU admission, and Preterm fetus (p = 0.001). Additionally, PIH group have 0.5% have fetal death, 45.0% have preeclampsia, 10.0% have eclampsia, 15.0% have HELP, 25.0% have maternal ICU admission and 2.6% have low birth weight infants. While no patient in the of the normotensive group have any of these complications (Table 7).

Table (1): Mean values of age, BMI, gestational age, blood pressure and blood pressure pattern among the total studied sample

Item	Mean ±SD	Range
Age (years)	30.24±4.14	18.0–39.0
BMI (kg/m^2)	25.08±2.55	19.0–30.0
Gestational age (wk)	22.40±2.74	18.0–28.0
Systolic BLP mmHg	106.7±10.52	89.0–134.0
Diastolic BLP mmHg	69.12±8.12	50.0–90.0
Blood pressure pattern:		
Normotensive	191 (90.5%)	
Mild hypertension	11 (5.7%)	
Severe hypertension	9 (3.4%)	

BMI =body mass index

Table (2): Comparison of uterine doppler indices between the normotensive and mild pregnancy induced hypertensive groups

Index	Normotensive group (n=9)	Mild PIH group (n=11)	Test of Significance	P value
Rt PI				
Mean± SD	0.98±0.16	1.06±0.06	-1.715	0.088
Range	0.82–1.55	1–1.2		
Lt PI				
Mean± SD	0.99±0.18	1.08±0.04	-1.720	0.087
Range	0.8–1.55	1–1.1		
Rt RI				
Mean± SD	0.53±0.08	0.57±0.06	-1.869	0.063
Range	0.4–0.6	0.5–0.7		
Lt RI				
Mean± SD	0.52±0.08	0.56±0.07	-1.856	0.065
Range	0.4–0.6	0.5–0.7		
Rt SD ratio				
Mean± SD	1.94±0.24	2.06±0.16	-1.731	0.085
Range	1.5–2.5	1.8–2.3		
Lt SD ratio				
Mean± SD	1.97±0.25	2.03±0.12	-0.789	0.431
Range	1.6–2.5	1.8–2.2		

*: Independent t-test, RI = Resistive index. PI = Pulsatility Index, SD Systolic /Diastolic ratio,

Table (3): Comparison of uterine doppler indices between the normotensive and severe pregnancy induced hypertensive groups.

Index	Normotensive group (n =9)	Severe PIH group (n=9)	Test of Significance	P value
Rt PI Mean± SD Range	 0.98±0.16 0.82–1.55	 1.53±0.10 1.3–1.63	-10.185	0.001*
Lt PI Mean± SD Range	 0.99±0.18 0.8–1.55	 1.51±0.12 1.22–1.6	-8.750	0.001*
Rt RI Mean± SD Range	 0.53±0.08 0.4–0.6	 0.66±0.03 0.6–0.7	-5.269	0.001*
Lt RI Mean± SD Range	 0.52±0.08 0.4–0.6	 0.67±0.02 0.6–0.7	-6.302	0.001*
Rt SD ratio Mean± SD Range	 1.94±0.24 1.5–2.5	 2.94±0.17 2.6–3.2	-12.394	0.001*
Lt SD ratio Mean± SD Range	 1.97±0.25 1.6–2.5	 2.68±0.56 1.3–3.1	-9.611	0.001*

*: Independent t-test, RI = Resistive index. PI = Pulsatility index, SD Systolic /Diastolic ratio, *: p value < 0/05

Table (4): Comparison of different levels of insulin resistance by use of the homair model among the different levels of blood pressure groups

	HOMAIR		Test of Significance*	P-value
	Range	Mean ±SD		
Normotensive (n = 191)	0.7–1.9	1.15±0.24	35.000	0.001*
Mild PIH (n = 11)	1–1.5	1.27±0.13		
Severe PIH (n = 9)	1.1–2.3	1.87±0.33		

*: One Way ANOVA, P <0.05: statistically significant, HOMAIR =Homeostatic model assessment insulin resistance, PIH=Pregnancy induced hypertension, *: p value < 0/05

Table (5): Cut off point of HOMA IR in prediction of PIH group by ROC curve.

Cutoff point	AUC	Sensitivity	Specificity	PPV	NPV
>1.2	0.801	70.00	70.68	20.0	95.7

HOMAIR: Homeostatic model assessment Insulin Resistance, PIH: PIH=Pregnancy Induced Hypertension., AUC = Area Under Curve.

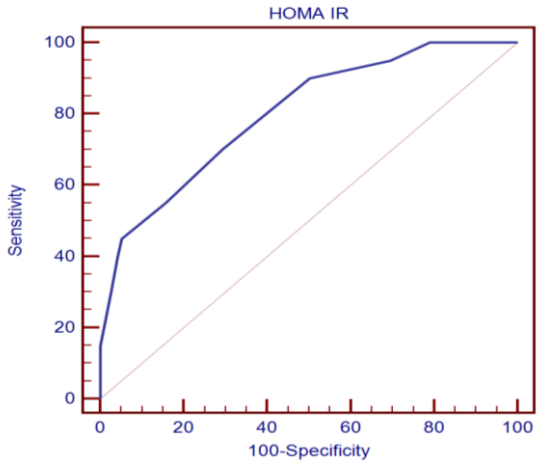

Figure (1): ROC curve of insulin resistance in prediction of hypertension.

Table (6): Frequency of uterine artery Doppler complications in the severe hypertensive group

Items	Severe hypertensive group (n= 9)	%
No uterine artery Doppler complication	2	22.2%
Diastolic Notch	3	33.3%
Reversed diastolic flow	2	22.2%
Absent diastolic flow	2	22.2%

Table (7): Comparison of maternal / fetal complications in normotensive and hypertensive groups

Maternal and fetal complications	Normotensive (n=191)	Hypertensive (n=20)	* Test of Significance	P-value
Caesarian section delivery	69 (36.1%)	15 (75.0%)	11.418*	0.0*01
Post-partum Hemorrhage	3(1.6%)	2(10.0%)	5.560*	0.180
NICU admission	2(1.0%)	3(1.6%)	15.235*	0.001*
Preterm fetus	1(0.5%)	3(1.6%)	20.400*	0.001*
Fetal death	0(0.0%)	1(0.5%)	-	-
Preeclampsia	0(0.0%)	9 (45.0%)	-	-
HELP	0(0.0%)	3(15.0%)	-	-
Eclampsia	0(0.0%)	2(10.0%)	-	-
Maternal ICU admission	0(0.0%)	5(25.0%)	-	-
Low birth weight	0(0.0%)	5(2.6%)	-	-

* Chi-square test, p ≤. 05=statistically significant, ICU = Intensive Care Unit, *: p value < 0/05

DISCUSSION

In relation to the mean age, mean BMI, mean gestational age, of studied group were 30.24ys; 25.08 ± 2.55, and 22.40 ± 2.74 weeks respectively, and the mean SBP, DBP were 106.7± 10.52, 69.12 ± 8.12 mm HG respectively (table1). Leelavath and Kaytri et al. [1] also reported that age among the women who developed PIH was>30 years (37%), and weight were between 61-70 kg (64%). However, Casmod et al. [8] found that age of most of their studied group (57%), was between 30 and 34 years and 1 (14%) was in their adolescence or twenties, while 2 (29%) were between 30 and 35 years of age.

The incidence of hypertension among our studied group was 9.5% (20 cases) of them 5.7% (11 cases) have mild hypertension and 3.4% (9 cases) have severe hypertensive (Table 1). The prevalence of PIH was 12–20% in the study done by Messawa et al. [9]. Also, Leelavath and Kaytrii et al. [1] supported this finding, they found that out of 54 women in the study, 27 (50%) of them were developed PIH as out of 27 gestational hypertensions pregnant women 7 had preeclampsia and two had eclampsia. The current study reveals that the normotensive and mild PIH group of doppler uterine artery indices has no difference relation (P > 0.05) (Table 2). This agrees with Mitsui et al. [10] who reported that measurement of uterine artery doppler may be a predictor for early onset hypertension only if high uterine artery (UA) resistance has been observed. OLOYEDE and Iketubosin [11] stated that measurement of doppler's uterine artery at mid trimester of pregnancy may have no value in screening of pregnancies that had complications of placental invasion and PIH. findings of Valensise et al. [12] clarified that screening of low-risk population using the uterine artery doppler at 22weeks does not give the correct identification of all the patients who will complicated by hypertension with pregnancy.

Leelavath and Kaytrii et al. [1] documented that there was strong relation between doppler of uterine artery findings and occurrence of PIH when compared to no doppler changes group. This agree with Jamal et al. [13] who reported that increased uterine artery pulsatility index is accompanied with an increased risk of pregnancy complication as gestational hypertension (2.3%).

Also, the current study found that there is a statistically significant difference between normotensive and severe PIH group as regard uterine artery doppler indices (P < 0.01) (Table 3). This is in accordance with Borna et al. [14] who found the results of uterine doppler artery ultrasound and its incidence on preeclampsia are closely linked. Also, Maged et al. [15] found that use of uterine artery doppler screening was helpful in determining preeclampsia and poor placentation. Also, Verma and Gupta [16] reported that high measurement of uterine artery doppler at second trimester have a high prediction of pregnancies at risk of preeclampsia as 40% of patients developed preeclampsia. While Thilaganathan et al. [17] reported that uterine artery doppler are the independent predictors of severe hypertension in the second half of pregnancy. This disagrees with those who Pedroso et al. [18] he found that uterine artery doppler only is bad

predictor for PE development. But Pedroso et al. [18] added a predictive model are promising and become good predictor for PE. The results of their study may be considered as it was on small number of cases. Also, disagree with Myatt et al. [19] found that utility of the doppler velocimetry uterine artery measurement in the low-risk population showed the poor sensitivity in prediction of preeclampsia IR is recognized through the metabolic consequences accompanied with insulin resistance as prescribed in metabolic syndrome and insulin resistance syndrome [20]. It is a physiological condition in which insulin can be inflammatory and anti-inflammatory; it stimulates the production of endothelial (Nitric Oxides) which has a vasorelaxation and anti-inflammatory effect [6].

The current study reported that the mean IR among normotensive, mild PIH, severe PIH patients was 1.15, 1.27& 1.87 respectively (Table 4). Also, Chen et al. [5] he found that insulin resistance can be a key factor and can provide new therapeutic approaches to PIH. This goes with the work of Hauth et al. [21] who reported that IR have a good association with occurrence of hypertension in women who complicated by PIH and who have a preeclampsia. Sierra-Laguado et al. [22], stated that high level of insulin resistance measured by log-HOMA in the start of pregnancy and before the onset of clinical symptoms of the disease. The HOMA is a useful method to predict women at risk of PIH.

The current study reported a statistically significant difference between IR and PIH ($p < 0.01$) cutoff value of IR as a predictor for PIH patients is 1.2 with sensitivity 70.0% and specificity 70.68% (Table 5, Figure1). This is in accordance with Hauth et al. [21] who found that insulin resistance is accompanied with severe hypertension, the sensitivity of HOMA-IR at or above the 75th percentile had specificity of 75% and a sensitivity of 40% for development of severe hypertension, with PPV of 19% and NPV of 90%. Also, Parretti et al. [23] assessed insulin sensitivity in 829 primigravida; their HOMA-IR had a sensitivity of 79-85% to subsequent development of preeclampsia with a specificity of 97%. This disagrees with Roberts and Gammill [24] who concluded that HOMA-IR is only a predictor for 20% of subsequent development of preeclampsia. In the current study, reported that42.8% of the severe Hypertensive patients had diastolic notch, 28.5% with inverted diastolic flow and 28.5% with absent diastolic flow (Table 6). This agree with Gadhavi et al. [25] who used umbilical and uterine Doppler flow for prediction of pregnancy induced hypertension, he found that 35 % were having absence of notch in uterine artery, while 65 % women were having persistent diastolic notch. Also, Abidoye et al. [26] showed that pre-diastolic notch is sensitive and specific than uterine artery indices in predicting fetuses at risk of IUGR in hypertensive patient with pregnancy. Nagar et al. [27] agree with the current study, he showed that the incidence of uterine artery notch in ultrasound doppler was 60% in women who developed PIH while it was not detected in any of the woman without PIH. While in Sharma et al. [28] found that UA doppler has been studied with a diastolic notch as a predictive for the development of PIH: sensitivity (15%), specificity (98.5%), PPV (83.33%), and NPV (71.28%). This disagree with Espinoza et al. [29], who reported that uterine notching in both sides between 23 and 25 weeks of pregnancy is not important for occurrence of early-onset severe hypertension and mild hypertension.

In the current study it was found that highly significance difference between normotensive and PIH group as regard mode of delivery and increase the incidence of CS range cases with hypertension (Table 7). Chaim et al. [30] reported that no statistical correlation was found between the type of delivery and diastolic pressure, but cesarean supplies prevailed at 64.0%.

Findings of the current study that in PIH group 0.5% have fetal death, 45.0% have preeclampsia, 10.0% have eclampsia, 15.0% have HELP, 25.0% have maternal ICU admission and 2.6% have low birth weight infants. While no patient in the of the normotensive group have any of these complications (Table 7). This agrees with Ratiu et al. [31] who reported that 1.1% of cases were severe hypertension and 0.3% cases developed HELLP syndrome. There were 46 cases of placental insufficiency. Moreover, highly significant difference between normotensive and PIH group as fetal complications were found. Neonatal complications included 1.6% hospitalized in the Neonatal Intensive Care Unit (NICU). Fetus with low birth weight (LBW) was found in 2.6%of patients with high UA doppler, 1.6% were preterm labor and one case with neonatal death) (Table7). This agrees with Garcia et al. [32] they found that using UA indices decrease maternal and perinatal complications. Neonatal mortality was 0.6%, IUGR 2.8%, small-for gestational age 6.4%, stillbirth 0.6%, days in NICU 12.4 While Pedroso et al. [18], found that there is an association of elevated mean PI and prediction of preeclampsia and FGR. If used only it revealed not good predictive value but if added to maternal risk factors and mean arterial pressure, with or without biomarkers, it will be a good predictor and decrease false-positive results in detection of high-risk group that can use aspirin to avoid complications and development of a premature delivery. Parry et al. [33] had another view as they found that UA doppler measurement not probably detect SGA babies, mild and severe hypertension, or spontaneous preterm birth.

This study has some limitation that should be mentioned: A small sample size and a small number of patients with abnormal second-trimester UA doppler.

CONCLUSION

Early trimester color doppler ultrasonography and detection of IR has an excellent role to play as a predictor of PIH. Abnormal UA doppler indices in the second trimester have a high detection rate of maternal complications. There is no significance difference between normotensive and mild PIH group of UA doppler indices. There is a statistically significant difference between the normotensive and severe PIH group as regard UA doppler indices. IR is a good predictor for PIH.

Future directions

- Further trials with large sample sizes are need be carried out to further evaluate the role of various screening 10 strategies in prediction of PIH.
- A large number of randomized controlled trials are required for second-trimester UA doppler for the extrapolation of the results to the whole population.

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الملخص العربي

مقاومه الانسولين ودوبلر الشريان الرحمي كمؤشرات لارتفاع ضغط الدم الناجم عن الحمل

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ملخص البحث

الخلفية: في الثلث الثاني من الحمل، النساء الحوامل المصابات بارتفاع ضغط الدم الناجم عن الحمل لديهن مؤشرات مختلفة لدوبلر الشريان الرحمي وقيمة مختلفة لمقاومة الأنسولين عن النساء الحوامل العاديات.

الهدف: يهدف هذا العمل إلى التأكد من دور دوبلر الموجات فوق الصوتية للشريان الرحمي ونسبة مقاومة الأنسولين في التنبؤ بارتفاع ضغط الدم الناجم عن الحمل

الطرق: أجريت هذه الدراسة الجماعية على ٢١١ امرأة حامل خلال الفترة ما بين ١٨-٢٨ أسبوعًا من الحمل، وتم متابعتهم حتى الولادة، اللائي كم يتابعن الحمل في عيادة النسا و التوليد الخارجية بمستشفى الزهراء الجامعي في الفترة من يناير ٢٠١٦ وحتى ديسمبر ٢٠١٨.

النتائج: كشفت نتائج الدراسة ان متوسط عمر السيدات (٢٧.٣٥ سنة) وكان متوسط مؤشر كتلة الجسم (٢٥.٠٨) ، متوسط عمر الحمل (٢٢ ، ٤٠ أسبوعًا). ووجد أن ٩.٥٪ من منهم كن يعانين من ارتفاع ضغط الدم منهم٥.٧٪ ارتفاع معتدل بضغط الدم المصاحب للحمل و ٣.٤٪ارتفاع شديد بضغط الدم المصاحب للحمل . في الدراسة الحالية، كان هناك فرق كبير في قياسات دوبلر الشريان الرحمي بين مجموعة الضغط الطبيعي ومجموعة الضغط المرتفع المصاحب للحمل، وكان هناك فرق ذو دلالة إحصائية بين مقاومة الأنسولين ومرضي الضغط المرتفع المصاحب للحمل. كما وجد ان قيمة مقاومة الانسولين كمتنبئ لمرضى الضغط المرتفع المصاحب للحمل هي ١.٢ مع حساسية ٧٠٪ ونوعية ٧٠٪، و بالنسبة لدوبلرالشريان الرحمي وجد أن ٤٢.٨٪ من مرضى ارتفاع ضغط الدم الحاد لديهم الشق الانبساطي للشريان الرحمي، ٢٨.٥٪ تدفق انبساطي معكوس للشريان الرحمي و ٢٨.٥٪ غياب التدفق الانبساطي للشريان الرحمي.

الاستنتاجات: كانت مقاومة الأنسولين مؤشراً جيداً لارتفاع ضغط الدم الناجم عن الحمل. كان هناك فرق ذو دلالة إحصائية بين مجموعة مقاومة الانسولين و ارتفاع ضغط الدم المصاحب للحمل. كان لارتفاع قياسات دوبلر الشريان الرحمي في الثلث الثاني من الحمل تنبؤ مرتفع لحدوث مضاعفات للأمهات والأجنة. اختبار دوبلر الشريان الرحمي هو اختبار تشخيصي جيد لتطور تسمم الحمل.

الكلمات المفتاحية: ارتفاع ضغط الدم في الحمل، دوبلر الشريان الرحمي، مقاومه الانسولين.

الباحث الرئيسي

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