

The effect of Preeclampsia on some biochemical parameter

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الخلاصة

دراسة ميدانية تهدف إلى التعرف على تسمم الحمل وعلاقته في وظائف الكلى والايض للماء والأملاح **والهدف من الدراسة:** الاستفادة من نسبة الكالسيوم والفسفور كعلاقة في تحديد شدة تسمم الدم، تم إجراء الدراسة في مستشفى الولادة والأطفال في مدينة الديوانية للفترة من 1/1 ولغاية 2011/6/30. كان عدد الحالات 96 حالة وقد كانت 20 حالة حمل طبيعي و25 حالة بوجود ارتفاع ضغط الدم و20 حالة بوجود تسمم دم بسيط و31 حالة بوجود تسمم دم شديد وقد تم اخذ عينات من إدرار كل مريضة لغرض إيجاد الكالسيوم والفسفور في الإدرار. وبعد إجراء العمليات الإحصائية وجد ما يلي: قلة في إفراز الكالسيوم والفسفور في الحالات الشديدة مع عدم وجود تغييرات ملموسة في الحالات البسيطة وارتفاع ضغط الدم اي يمكن الاعتماد على نسبة الكالسيوم والفسفور في تحديد شدة تسمم الدم في الحوامل. **ونستنتج من ذلك** إن انخفاض مستوى الكالسيوم والفسفور بالإدرار يمكن أن يستخدم كعلامة لتسمم الحمل.

Abstract

This survey research to identify the effect of preeclampsia, alterations in renal function, electrolyte and water metabolism are common findings.

To evaluate the usefulness of urine calcium and phosphorus levels as a marker of severity in preeclampsia.

Our study was carried at the Hospital of Maternity and pediatrics in Al-diwaneya city from 1/1-30/6 -2011 .

The total number of all cases 96, among them 20 women with normal pregnancy , 25 cases with hypertension , 20 cases with mild preeclampsia , 31 cases with sever preeclampsia .Every patient was send for urinary calcium and phosphate were determined by the Kramer-Tisdall and phosphomolibidic acid method, respectively.

In the Results There was significant decrease in excretion of calcium and phosphorus in sever preeclampsia [$p < 0.001, p < 0.01$] respectively as a result of decrease glomerular filtration rate. While in mild cases and pregnancy induced hypertension cases there's no significant change.

Conclusion: Urine calcium and phosphorus level is significant determinant of severity of preeclampsia and may be considered as usefulness marker for predicting the level of renal impairment.

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Introduction

Preeclampsia (toxemia of pregnancy) is a multisystem disorder of unknown cause that is unique to human pregnancy. The incidence is reported to be between 2% and 7%, depending on the population [1]. Preeclampsia occurs more frequently in primigravidas. The reported rate ranges from 6% to 7% in primigravidas and from 3% to 4% in multiparous patients [2].

Criteria for the Diagnosis of Preeclampsia

SBP >140 mm Hg and/or DBP >90 mm Hg on two occasions at least 6 hours apart, typically occurring after 20 weeks gestation and proteinuria of 300 mg in a 24-hours urine collection or >1+ on two random sample urine dipsticks at least 6 hours apart (no more than 1 week apart) [3].

Preeclampsia affects approximately 3% of all pregnancies worldwide, with onset of symptoms in the late second or third trimester most commonly after the 32nd week. Some women will experience preeclampsia as early as 20 weeks, preeclampsia may also occur in the immediate post-partum period. This is referred to as postpartum preeclampsia [4]. The most dangerous time for the mother is the 24–48 hours postpartum and careful attention should be paid to preeclampsia signs and symptoms [5].

Risk Factors for Preeclampsia

Null parity, Family history of preeclampsia and eclampsia, Extremes of maternal age, Prior pregnancy complicated by preeclampsia, - Chronic or vascular disease [pregestational diabetes, renal disease chronic hypertension, rheumatic disease, connective tissue disease] [6], Molar pregnancy, Fetal hydrops, Multifetal gestation, Obesity and insulin resistance, Antiphospholipid antibody syndrome and thrombophilia [7], Fetal aneuploidy, Maternal infection, Maternal susceptibility genes, Partner related factor [limited sperm exposure, donor insemination [Oocyte and embryo donation] [8].

Classification of preeclampsia [9&10]

Preeclampsia can be classified as mild and severe. * Severe preeclampsia can be characterized:

- 1-Asystolic blood pressure greater than 160mmHg or diastolic blood pressure of 110 mmHg on bed rest.
- 2-The presence of significant proteinuria. Marked proteinuria is defined as 5g or more of protein in 24 hours urine collection.
- 3-Severe preeclampsia may be associated with oliguria.
- 4-Cerebral or visual disturbance.
- 5-Pulmonary oedema or cyanosis.
- 6-Epigastria or right upper quadrant abdominal pain.
- 7-Impaired liver function.
- 8-Thrombocytopenia.
- 9-Intrauterine growth retardation.

*Mild preeclampsia the hypertension and protein urea are present but not to that extreme levels and the patient has no evidence of other organ dysfunction. shallowly implanted placenta which becomes hypoxic leading to an immune reaction characterized by secretion of unregulated inflammatory mediators from the placenta, and acting on the vascular endothelium[11].. In many cases of the preeclampsia syndrome, however, the maternal response to the placenta appears to have allowed for normal implantation. It is possible that women with higher baseline levels of inflammation stemming from underlying conditions such as chronic hypertension or autoimmune disease may have less tolerance for the inflammatory burden of pregnancy[12].

Material and method

This prospective study was carried at the Hospital of Maternity and Pediatrics in AL-diwanyia city from 1/1- 30/6 -2011.

The 100 cases were divided into four groups: 21 of normal pregnancy, 26 with hypertension and 20 with mild preeclampsia and 33 pregnant women with severe preeclampsia.

The following inclusion criterias were followed

1-preeclampsia was diagnosed by blood pressure elevation equal or more than 140/90 ml in combination with proteinuria++ and /or oedma after 20 weeks gestation in previously normotensive non protein uric patient.

2-Age group from 14-44 years . 3-Parity less than 10.

4-Gesstation from 27 -40 week. 5- Singleton pregnancy .

Blood pressure was recorded in the study in the sitting position with cuff that is large enough for the subjects arm on at least two occasions 6 hours apart korotkoff phase 5[k5] disappearance of sound was used to detect the diastolic blood pressure. Protein urea was diagnosed by collecting clean catch mid-stream urine sampled in clean dry container then urine protein was determined using the reagent strip [Albustix] reading at 2+[1 gm./l] or more was considered to be positive result for protein urea [significant protein urea] or equal to 1+[0.3gm/l] if the specific gravity is less than 10.30

Results

Table (1) Comparison of Age, GA, Blood Pressure.

- No significant differences were observed in the age of different groups.
- Lower gestational age (P<0.01) was recorded in the sever preeclamptic patients.
- Systolic and diastolic blood related significantly (P<0.01) with severity of preeclampsia.

Patient groups	PARAMETERS			
	AGE Mean ±SD	GA Mean ±SD	SYS. P Mean ±SD	DIST. P Mean ±SD
NORMAL (20)	27.28±6.14	37.93±1.18	117.4±9.95	76.7±9.13
HYPERTENSIVE (25)	27.93±6.387	37.09±1.94	155.0±15.56	96.9±9.70
MILD PRECLAMPSIA (20)	26.20±6.67	35.45±2.71	160.2±11.71	103.5±6.71
SEVER PRECLAMPSIA (31)	24.64±5.968	33.42±3.01	179.7±16.29	114.5±7.65
P value	0.067NS	0.000**	0.000**	0.000**

Table (2) Renal function test.

All studied biochemical parameters showed significant relation with severity of preeclampsia. Blood urea , Serum creatinine and Serum uric acid were higher (P<0.01) in the sever preeclamptic women in comparison with other groups.

Patient groups	BLOOD UREA Mean ±SD	S. CREAT Mean ±SD	S.URIC Acid Mean ±SD
NORMAL (20)	27.238 (3.419)	0.695 (0.172)	4.774 (0.812)
HYPERTENSIVE (25)	31.375 (4.282)	0.873 (0.295)	4.442 (1.203)
MILD PRECLAMPSIA (20)	32.000 (6.410)	0.868 (0.293)	5.409 (1.441)
SEVER PRECLAMPSIA (31)	39.929 (7.468)	1.111 (0.499)	6.474 (1.445)
P value	0.000**	0.001**	0.000**

Table (3) Liver function test of studied groups.

Sever preclampsia women showed a higher value of GPT and GOT than other studied groups (P<0.01) and(P<0.05) respectively . The higher value GPT and GOT strongly significant in sever preeclampsia and Serum Alkaline Phosphatase (S.A.P.) showed significant differences between studied groups.

Patient groups	Liver function Test		
	GPT	GOT	S.A.P.
NORMAL (20)	5.762±1.972	14.333±9.947	175.143±23.277
HYPERTENSIVE (25)	7.346±3.249	15.462±8.363	186.192±15.998
MILD PRECLAMPSIA (20)	9.200±3.764	23.400±11.325	187.200±23.896
SEVER PRECLAMPSIA (31)	9.945±3.152	33.009±13.610	205.091±92.503
P value	0.000**	0.000**	0.014*

*significant at P≤0.05, **significant at P≤0.01, using ANOVA, values are presented as mean ±SD ; NS, not significant.

Table (4) Urine analysis of studied groups.

- ❖ Significant differences were observed in the urine calcium of different studied groups.
- ❖ Urine phosphorus and creatinine showed significant differences between studied groups . Mild and sever preclamptic womens showed lower value ($P<0.01$) of urine phosphorus and creatinine than other groups .

Patient groups		U. calcium mg/day	U. phosphor g/day	U. creatinine mg/day
NORMAL (20)	MEAN	218.20	1.03	1.705
	SD	32.045	0.152	0.784
HYPERTENSIVE (25)	MEAN	198.92	0.892	1.431
	SD	39.912	0.256	0.178
MILD PRECLAMPSIA (20)	MEAN	110.28	0.439	0.972
	SD	20.625	0.109	0.113
SEVER PRECLAMPSIA (31)	MEAN	98.35	0.394	0.906
	SD	15.597	0.147	0.125
P value		0.000**	0.00**	0.000**

Discussion

Preeclampsia is often referred to as the disease of theories, and there is more questions than answers. Preeclampsia, avascular disorder of pregnancy is a leading cause of maternal morbidity as well as perinatal morbidity and mortality. In our study we found lower gestational age was recorded in the sever preeclamptic patients these finding similar to study done by Gerther et al [13]. In normal pregnancy renal blood flow and filtration rate increase[8] while in Preeclampsia the renal blood flow and glomerular filtration rate decrease with development of toxemia [2],in our study the blood urea, serum creatinine and serum uric acid were higher in sever preeclamptic women in comparison with other group which result in the decrease of urea and creatinine excretion .These finding similar to study done by Hayachi T[5] he found the serum level of urea,creatinine and uric acid are elevated with sever preeclampsia [$p<0.001$, $p< 0.01$, $p<0.01$] respectively.

In our study the sever preeclamptic women showed a higher value of GPT and GOT than other group [$p<0.01$] and [$p<0.05$] respectively. The higher value of GPT and GOT are strongly significant with the severity of preeclampsia, also serum Alkaline phosphatase [S.A.P.] showed significant differences between studied groups. these finding similar to study done by Taylor et al [3].

Renal excretion of calcium and phosphate increases during pregnancy due to increase in renal filtration rate[6].Excretion usually increases during each trimester, with maximum level reached during the third trimester. Alteration

of phosphate and most notably calcium excretion are common findings of hypertension and some renal disorder in general. There is a decrease in urinary calcium in preeclampsia [7]. Our findings in preeclampsia confirm the results of other studies [7&14] they found a decrease in levels of calcium and phosphorus [$p < 0.001$, $p < 0.01$] respectively. The reason for hypercalciuria in pregnancy is probably the increased glomerular filtration rate [14]. Pedersen et al. reported that fractional excretion of calcium in preeclamptic pregnant women was lower in the third trimester than it was in normotensive pregnant women [15]. Because parathyroid hormone and calcitonin levels were not altered in the patient with preeclampsia. It was concluded that decreased renal filtration rate and increased tubular reabsorption of calcium and phosphate may result in hypocalciuria and hypophosphaturia in toxemia. In conclusion, a strong relation was observed between decreasing of urine calcium and severity of preeclampsia.

Lower calcium excretion may result from dietary variation. All participants in our study were on a free range diet. Because we did not advise any of our patients to alter their diets, however, we believe it is unlikely that dietary calcium intake played an important role in our findings. As a conclusion, hypocalciuria and hypophosphaturia are important features of severe preeclampsia and probably are indirectly related to the altered renal function seen in toxemia of pregnancy.

Conclusion

Urine calcium and phosphorus levels are significant determinants of severity of preeclampsia and may be considered as usefulness markers for predicting the level of renal impairment and time of delivery.

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