Predicting Pre-Eclampsia: Comparison of Systolic B.P. with Calcium-Creatinine Ratio

Pankaj Desai, Sajid Malik, Malini Desai

Dept. of Obst. & Gyn., Medical College & S.S.G. Hospital, Vadodara – 390001

Summary

The devastating effects of pre-eclampsia are well known to the obstetric world. Many tests to predict pre-eclampsia are coming up on the horizon. In this study two of such tests have been critically analyzed. Those cases in whom BP did show a rise at least once, to 140 mm. or more systolic, at 16 to 20 weeks had a significant higher chance of developing pre-eclampsia. Amongst those 110 subjects in whom BP did not show a rise at 16-20 weeks, 92 (92.7%) did not develop pre-eclampsia. Thus the chances of not developing pre-eclampsia is much higher if a subject does not show a rise of BP at 16 to 20 weeks. In subjects with a Calcium-Creatinine Ratio (CCR) < 0.04, 70% developed pre-eclampsia and 30% did not. But amongst those 74 who had a CCR > 0.04, 97.3% did not develop pre-eclampsia. When BP rise and CCR were combined for analysis still further interesting results emerge. In subjects with CCR<0.04 and BP rise, a substantial 77.8% chance of developing pre-eclampsia is found. Thus the combination of the two parameters, further improves the positive predictive value of these tests. On the other hand, in whom CCR was > 0.04 and BP never registered a rise, there was only a 1.4% chance of developing a pre-eclampsia. For mass screening, excellent positive predictive value is required. Though these two tests in combination were satisfactory in identifying pre-eclampsia, they are not good enough for mass screening for pre-eclampsia.

Introduction

The devastating effects of pre-eclampsia are very known to the obstetric world. Many tests to predict pre-eclampsia are coming up on the horizon. So every new test is taken seriously and evaluated. Broughton et al (1998) used mid trimester high blood pressure to predict pre-eclampsia. They used a single recording of B.P. of more than 140 mm. of Hg systolic, as an effective tool for predicting pre-eclampsia. Many workers have used calcium creatinine ratio, in a spot sample of urine to predict pre-eclampsia (Izumi et al, 1997). More recently in 1998 July, Saudan et al showed that hypocalciuria has been associated with pre-eclampsia (gestational hypertension with proteinuria or other maternal organ dysfunction) but not usually with pure gestational hypertension or normal pregnancy. They hypothesized that hypocalciuria would be a marker of emerging pre-

eclampsia in women presenting with gestational hypertension who later developed pre-eclampsia. In their prospective study they proved that there is a primary or secondary disturbances of renal calcium handling even before pre-eclampsia is clinically apparent. They found Calcium-Creatinine ratio (CCR) to be a good test for identification but not good enough for screening.

In this prospective study, we have compared the efficacy of both these tests in predicting pre-eclampsia and their value as screening tests. During the course of this study we have repeatedly and continuously communicated with many groups who have been cited here and in their personal communications got our findings reviewed and discussed by them. This became necessary as critical analysis of the two tools were envisaged right from commencement of this study.

Subjects & Methods

This prospective study was carried out in Unit III of the dept. of Obstetrics and Gynecology, Medical College and S.S.G. Hospital, Baroda. This study has the following groups of subjects:

A) 194 subjects who recorded at least one systolic reading of 140 mm of Hg or more between 16 to 20 weeks of pregnancy.

B) 110 subjects in whom there was no rise in systolic B.P. between 16 to 20 weeks served as controls.

C) 84 subjects amongst the 194 former, in whom calcium-creatinine ratio in spot urine sample was evaluated. Urinary calcium was measured by cresolpthalein complexon method. Urinary creatinine measurement was done by alkaline picrate method. CCR was calculated in each spot sample so obtained. A ratio of 0.04 was considered as a cut out for evaluation.

110 subjects in whom there was no rise in B.P. between 16 to 20 weeks, served as controls for those who had rise in B.P. However, in the 84 subjects for CCR study those with CCR >0.04 served as controls for those with CCR <0.04.

It needs to be clarified that the 84 subjects were also those in whom a B.P. rise was recorded between 16 to 20 weeks. This helped us to compare the efficacy of the two parameters BP & CCR in same subjects. Standard tests of statistical evaluation were used for interpreting the validity of these results.

Results

In all 194 cases could be enrolled in the group of indexed cases who showed a rise in B.P. of 140 mm. of Hg Systolic on at least one count between 16 to 20 weeks. To these, there were 110 cases who did not show any such rise and therefore served as a control group, 84 cases were subjected to calcium-creatinine ratio (CCR) evaluation. These were cases in the last half of the study. As regards cases in whom CCR was done, those cases with CCR <0.04 served as controls to those with CCR >0.04 as laid down in subjects and methods.

Table I
[B.P. Rise and development of pre-eclampsia]

B.P. rise at 16-20 weeks.	P.E. developed	%
194	51	26.3
B.P. did not rise at 16-20 wks.	P.E. developed	%
110	08	7.3

P <0.001 statistically significant difference

This table requires to be understood very carefully. Those cases in whom BP did show a rise to 140 mm. or more at 16 to 20 weeks, at least once, had a significant higher chance of developing pre-eclampsia. However the reverse is equally important. Amongst those 110 subjects in whom BP did not show a rise at 16-20 weeks, 92 (92.7%) did not develop pre-eclampsia. Thus the chances of not developing pre-eclampsia is much higher if a subject does not show rise of BP at 16 to 20 weeks.

Table-II-A
[CCR and P.E.]

	No.	No P.E.	%	developed P.E.	%
<0.04	10	03	30	07	70
>0.04	74	72	97.3	02	2.7

Table-II-B
Statistical Indices

Sensitivity	70%
Specificity	97.3%
Positive Predictive Value	77%
Negative Predictive Value	96%

In subjects with a CCR < 0.04, 70% developed pre-eclampsia and 30% did not. But amongst those 74 who had a CCR > 0.04, 97.3% did not develop pre-eclampsia. So again the negative predictive value of this test is very high as shown in Table II-B.

Table-III
[B.P.CCR. and P.E.]

	Developed P.E.	%
CCR<0.04, BP>140		
09	07	77.8
CCR<0.04 B.P.<140		
01	00	-
CCR>0.04 BP<140		
69	01	1.4
CCR>0.04 BP>140		
05	01	20.0

When BP rise and CCR were combined for analysis still further interesting results emerge. It should be clearly understood at this point that there are 8 groups in this table in which these 84 subjects are divided for careful analysis. By the law of probability, number of subjects in each group will be around 10. This should not alarm those who want big numbers for drawing conclusions. This is because the statistical results will still hold valid as the analysis is detailed and variants increase in different combinations.

As shown in this table, in subjects with