Obstetrics And Gynaecology

A PROSPECTIVE STUDY ON THE EFFECTIVENESS OF URINE CALCIUM CREATININE RATIO AND MICROALBUMINURIA IN PREGNANCY AS A PREDICTOR OF PREECLAMPSIA

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ABSTRACT
Aim: To analyse the role of urinary calcium creatinine ratio and microalbuminuria in prediction of preeclampsia.
Method:A prospective study was conducted in 200 pregnant mothers.Urine samples for estimation of calcium, creatinine and microalbumin were done and these mothers were followed up to term for analysis of association with preeclampsia.
Results : In this study 11.5% were diagnosed to have preeclampsia. Among 200 patients, 23 had elevated BP , proteinuria and HELLP syndrome.
Conclusion: This study demonstrates the strong association between urinary calcium creatinine ratio and microalbumin in prediction of preeclampsia.

KEYWORDS : preeclampsia, second trimester, calcium, creatinine, microalbuminuria.

INTRODUCTION

Hypertensive disorders complicate 5-10 % of all pregnancies that contribute greatly to maternal morbidity and mortality.16% of maternal mortality rate is due to Hypertensive disorders in pregnancy.[1]Preeclampsia is identified in 3.9 % of all pregnancies. Preeclampsia is not simply hypertension complicating pregnancy, but a disorder affecting almost every system in the body. Hypertension is one of the manifestation.The main pathology in the kidney is glomerular endotheliosis the manifestation of which is proteinuria and reduced creatinine clearance.Microalbuminuria and low calcium-creatinine ratio in urine (<0.04) is a significant predictor in preeclampsia.As secondary prevention can prevent dangerous complications effective screening method which should be selective, reliably cheap,easy to perform & with good predictive value is the need of hour.Hence in this study urinary calcium creatinine and microalbumin are analysed as predictors of preeclampsia in asymptomatic normotensive pregnant woman. The urinary calcium excretion in normal pregnancy is 350 - 620 mg /day which is higher when compared to non-pregnant women. Daily excretion of calcium has been markedly reduced in preeclampsia when compared to normotensive pregnant women. This is mainly due to increased tubular reabsorption of calcium and the oxidative stress resulting from ischaemia of the placenta which causes increased placental urate which again leads to low calcium excretion in pregnancy. Reduced urinary calcium excretion may be the result of dietary, renal and hormonal factors. Calcium supplementation has been reported to reduce the incidence of pre-eclampsia in high-risk women.Incidence of proteinuria is about 10 percent in all pregnant women. In pre-eclampsia the glomerular barrier is also significantly altered resulting in abnormal passage of proteins due to damage to the capillary wall. Microalbuminuria is defined as 30 to 300 mg /24 hours urine collection or 30 to 300 mg/l in spot urine samples. Significant proteinuria is always preceded by a small amount of leakage of albumin in urine because of increased permeability in the glomeruli.Usually the microalbuminuria is compared with creatinine and expressed as albumin creatinine ratio.Microalbuminuria is albumin creatinine ratio of more than or equal to 3.5 mg /mmol or 30 to 300 µg of albumin/mg of creatinine.

MATERIALS AND METHODS

200 pregnant women attending the outpatient department between 20 to 24 weeks of gestation were included in this study.Inclusion criteria include asymptomatic normotensive pregnant women, gestational age between 20 to 24 weeks, BP <140/90mmHg, urine albumin- nil by dipstick method, women with previous history and family history of pre-eclampsia and gestational hypertension. Women with chronic hypertension, diabetes mellitus, renal disease, BP >140/90 mmHg at first visit, women with chronic medical illness and positive urine culture were excluded. From each pregnant woman included in the study,a written informed consent was obtained. Detailed history was taken and general,systemic and obstetric examinations were done. BP was recorded in the sitting posture, phase v Korotkoff sound was taken as a diastolic component.Single voided urine sample was collected from all the patients in a calcium free container for estimation of urine calcium,creatinine, and microalbumin. Urinary calcium estimation was done using commercially available kits by Ortho-cresolphthalein complexone method using a semi auto analyser. Urinary creatinine estimation was done by modified Jaffe's method on a semi auto analyser. Microalbuminuria estimation was done by the Turbidimetric immunoassay method. Patients were followed with routine antenatal visits till delivery. Mode of delivery and fetal outcome were noted.

RESULTS

Table -1 *Relationship of urinary calcium creatinine ratio and development of pre-eclampsia*

Group	Developed preeclampsia	Not Developed preeclampsia	Total
UCCR<0.04 (n=22)	18 (81.81%)	4 (18.18%)	22
UCCR>0.04 (n=178)	5 (2.80%)	173 (97.19%)	178
Total			200

Table - 2 Relationship of microalbuminuria and preeclampsia

Preeclampsia	Microalbuminuria 30-300mg/l (n=36)	Microalbuminuria <30mg/l (n=164)
Developed PE	13 (36%)	10(6.09%)
Not Developed PE	23 (63.8%)	154 (93.9%)

Table - 3 Comparison of predictive values of UCCR and microalbuminuria in development of preeclampsia in this study

Value	UCCR	Microalbuminuria
Sensitivity	78%	56.5%
Specificity	97.7%	87%
Positive predictive value	81.81%	36%
Negative predictive value	97.19%	93.9%

Microalbuminuria has high specificity and negative predictive value.

All the parameters like sensitivity, specificity, positive predictive value, negative predictive value are higher for UCCR when compared to microalbuminuria in this study. In this study UCCR and microalbuminuria were tested as predictors. Among 200 pregnant women studied 63 % were primi, 37 % were multi gravida and most of them were in the age group of 23 to 28 years among which 23 developed preeclampsia with an incidence of 11 %.The incidence in this study is comparable to that of Rodriguez et al[2] and Mudaliar Menon study.[3] This study shows that low UCCR in nulliparous women is a very strong risk factor in development of pre-eclampsia in late pregnancy.On statistical analysis it was found that when UCCR is

taken as a predictor of preeclampsia it was highly significant. By using the chi-square test P value of <0.001 was arrived at, which is highly significant. The P value calculated for microalbuminuria using the Chi Square test was highly significant <0.001. When UCCR picked up 18 cases among 23 cases of pre-eclampsia, microalbuminuria picked up only 13 cases. These results show that UCCR is better than microalbuminuria in prediction of pre-eclampsia.

CONCLUSIONS

UCCR and microalbuminuria were done at 20 to 24 weeks gestation for 200 randomly selected normotensive pregnant women and they were followed up for development of pre-eclampsia. UCCR < 0.04 and microalbuminuria 30 to 300 mg/L are taken as cut-off. The analysis showed that the incidence of pre-eclampsia was 11.5 % in the tested population and most of them developed between 36 to 40 weeks of gestation. Nulliparity was found to be a significant risk factor. The sensitivity, specificity, positive predictive values and negative predictive values are very good for both the tests but when compared with microalbuminuria UCCR scores more. Both these tests are ideal as they are simple,easy to perform, inexpensive,less time-consuming and non-invasive. Microalbuminuria alone can be a good predictor of pre-eclampsia but UCCR is a better test for protection. Thus UCCR and microalbuminuria can be used as a routine screening test in early second trimester for the prediction of pre-eclampsia so that adverse outcomes can be reduced and standard of antenatal care can be improved. Its use can be better accomplished in developing countries where the incidence of pre-eclampsia is high. UCCR and microalbuminuria are excellent tests for prediction of pre-eclampsia.

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