

Microalbuminuria as a Predictor of Pregnancy Induced Hypertension

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Aims: This study was done to find out predictive value of microalbuminuria between 24-34 weeks of gestation in the development of pregnancy-induced hypertension, maternal and fetal complications.

Methods: Urinary microalbuminuria was measured by turbidometry in 200 normo-tensive women between 24-34 weeks of gestation. Microalbuminuria was defined as a value of ≥ 20 mg albumin per gram of creatinine in a spot sample of urine. The women were divided into two groups as microalbuminuria positive and microalbuminuria negative. They were followed up to delivery and were evaluated for the development of pregnancy-induced hypertension, maternal and fetal complications.

Results: Out of 200 women microalbuminuria was positive in 32 (16%) patients. Sixteen (50%) in the microalbuminuria group developed hypertension as compared to seven (4.1%) in the microalbuminuria negative group ($p < 0.0001$). Also 13 (40%) in the microalbuminuria positive group developed a maternal complication as compared to 11 (6.5%) in the microalbuminuria negative group ($p < 0.0001$). Nineteen women (59%) in the microalbuminuria group had a fetal complication as compared to 10 women (5.9%) in the microalbuminuria negative group ($p < 0.0001$).

Conclusions: Presence of urinary microalbuminuria between 24-34 weeks of gestation can predict development of pregnancy-induced hypertension, maternal and fetal complications.

Keywords: maternal complications; microalbuminuria; pregnancy-induced hypertension.

INTRODUCTION

Hypertensive disorders are one of the most common medical complications of pregnancy and a major cause of both maternal and fetal morbidity and mortality and are one of the leading causes of maternal deaths.¹⁻⁴ They can cause several dreaded complications such as eclampsia, disseminated intravascular coagulation, cerebral edema, liver failure and ante-partum hemorrhage. Maternal hypertension also contributes to fetal mortality and morbidity by causing intrauterine growth retardation, preterm delivery, hypoxemia and perinatal death.⁵⁻⁷

Proteinuria is an important sign of preeclampsia.^{8,9} The excretion of albumin is a well established marker of glomerular disease. With the advent

of immunochemical methods of detection of microalbuminuria (20-200 $\mu\text{g/ml}$) it is now possible to detect minimal elevation in albumin excretion that would have gone unnoticed.¹⁰ We conducted this study to find out the predictive value of microalbuminuria in predicting the development of pregnancy induced hypertension (PIH), preeclampsia, or eclampsia.

METHODS

The study was conducted in the Department of Obstetrics and Gynaecology, Government Medical College Srinagar. The patients were enrolled from June 2006 to December 2007. Two hundred women with a gestational age of 24-34 weeks according to last menstrual period or according to ultrasonography with normal blood pressure were enrolled in the study. Microalbuminuria was estimated between 24-34 weeks of gestation. Patients with history of chronic hypertension, renal disease, diabetes, heart

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disease, thyroid disorders, multiple pregnancy, polyhydramnios, known case of systemic lupus erythematosus, pheochromocytoma or patients with ultrasonographically documented congenitally malformed fetus were excluded from the study. After a detailed history, clinical examination and baseline investigations including complete blood count, renal and hepatic function tests, routine urine examination, fasting blood glucose, ABO and Rh grouping were done. Microalbuminuria was estimated in spot urine in a morning sample by immunoturbidimetric method on Hitachi 912 machine. Microalbuminuria was defined as a value of ≥ 20 mg albumin/gram of creatinine in a spot sample of urine. Pregnancy induced hypertension was defined as a blood pressure reading of $\geq 140/90$ mmHg. Patients were followed in the outpatient department and a note was made of any development of pregnancy induced hypertension and associated symptoms of edema, puffiness of face, headache and decreased urine output. At the time of delivery maternal complications like eclampsia, abruption placenta, preterm labor, postpartum hemorrhage and fetal complications such as low APGAR score at five minutes, intrauterine growth retardation, prematurity, intrauterine death or stillbirth were noted. All women provided informed consent. The Institutional Ethics Committee approved the study.

Data were analyzed using the computer software Openstat. Fisher's exact test was used to test association between categorical variables. P value of < 0.05 was considered significant.

RESULTS

The mean age of the women was 25.6 ± 5 (17-40) years. Ninety-six women (48%) were nulliparous and 43 (21%) had a history of one or more abortions in the past. Thirty-two patients (16%) developed microalbuminuria. Microalbuminuria concentration

ranged from 0.6-76 mg albumin/gm creatinine with a mean of 11.7 ± 14.3 mg albumin/gm creatinine (Table 1).

Table 1. Baseline characteristics of the patients (n=200).	
Characteristics	Number
Age	25.6 ± 5 (17-40) years
Nullipara	96 (48%)
Para 1	59 (29%)
Para 2	24 (12%)
Para 3 or more	21 (21%)
History of abortions	43 (21%)
Patients with microalbuminuria	32 (16%)
Microalbuminuria (mg albumin/gm creatinine)	11.7 ± 14.3 (0.6-76)

Patients with microalbuminuria found to have significantly more chances of developing pregnancy induced hypertension (50% vs. 4%) on the follow up. Microalbuminuria positive patients were also significantly more likely to get maternal complications like eclampsia, abruption placenta, preterm labor, postpartum hemorrhage as compared to microalbuminuria- negative group (40% vs. 6.5%). Fetal complications like intrauterine growth retardation, prematurity, intrauterine deaths were seen significantly more in microalbuminuria group (59% vs. 5.9%). More newborns in the microalbuminuria group had APGAR score ≤ 6 as compared to microalbuminuria negative group (Table 2).

Table 2. Comparison of microalbuminuria positive and negative patients (n=200).

Characteristics	Microalbuminuria Positive (n=32)	Microalbuminuria Negative (n=168)
PIH	16 (50%)	7 (4%)*
Maternal complications	13 (40%)	11 (6.5%)*
Fetal complications	19 (59%)	10 (5.9%)*
APGAR score ≤ 6	13 (40%)	20 (11.9)**

PIH: Pregnancy Induced Hypertension * $p < 0.0001$, ** $p < .001$ by Fisher's Exact test

DISCUSSION

Hypertensive disorders of pregnancy are important causes of maternal and fetal morbidity and mortality.¹⁻⁷ At present the termination of pregnancy is the only definitive treatment available for hypertensive disorders of pregnancy.¹¹ Pregnancy induced hypertension usually occurs in third trimester of pregnancy but the underlying mechanisms start working as early as 8-18 weeks of pregnancy.^{12,13} For many years the researchers have been looking for a reliable marker which would warn the clinicians about the impending pregnancy induced hypertension early in the course of pregnancy so that special care be given to these patients. Studies have shown albuminuria to be a good predictor of the onset of pregnancy-induced hypertension in antenatal patients. A study from China showed that patients who developed pregnancy-induced hypertension had an increase in the level of microalbuminuria as compared to patients who remained normotensive. This increase in proteinuria occurred 4-8 weeks before the onset of pregnancy induced hypertension.¹⁴

We decided to use spot urine albumin/creatinine ratio for the estimation of microalbuminuria as a number of studies have shown that spot urine albumin / creatinine ratio is comparable and less cumbersome to a microalbuminuria estimation in a 24 hour urinary collected specimen.^{15,16}

Our patients with microalbuminuria had significantly more chances of developing pregnancy-induced hypertension on subsequent follow up. This has been seen in a number of previous studies where patients were evaluated for proteinuria and were followed for the development of proteinuria. A study from Australia showed that women who developed pre-eclampsia had a higher albumin creatinine ratio (ACR) (median 50 mg/mmol) as compared to women who were unaffected (median 28 mg/mmol). A value

of ACR ≥ 35.5 mg/mmol in midstream sample of urine between 17-20 weeks predicted pre-eclampsia well before the onset of clinical symptoms. The urinary albumin was measured by high-performance liquid chromatography (HPLC). HPLC may not be available to the clinicians in the resource poor countries.¹⁷ Another study from Africa revealed that a single sample of urine for microalbuminuria at booking shows good prediction for the subsequent development of preeclampsia or eclampsia. There was increase in incidence of preeclampsia with increasing levels of proteinuria. Microalbuminuria and macroalbuminuria was seen in 24% and 15% of patients respectively which appears to be more than what we found in our study i.e. 16%. The reason for this difference could be genetic.¹⁸ These studies showed that proteinuria in early trimester were a predictor of development of pregnancy induced hypertension on follow up.^{14,17,18}

Additionally we tried to look for the maternal and fetal outcome in patients. Patients with microalbuminuria had significantly more maternal and fetal complications and the APGAR score in this group of patients was low as compared to patients who were negative for microalbuminuria. This however could be related to the fact that patients in the microalbuminuria group were more likely to be having pregnancy-induced hypertension. Thus in our study microalbuminuria detected by a spot albumin/creatinine estimation at 24 – 34 weeks of gestation was a good predictor of subsequent pregnancy induced hypertension and can be used in the outpatient screening to identify such patients and give them special care.

CONCLUSIONS

Presence of urinary microalbuminuria between 24-34 weeks of gestation can predict development of pregnancy-induced hypertension, maternal and fetal complications.

DISCLOSURE

The authors report no conflicts of interest in this work.

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