MISJ-International Journal of Medical Research and Allied Sciences
Online ISSN: **2584-1432**
Available Online at http://ijmraas.misj.net **Volume 02|Issue 03** (September to December)|2024 Page: 129-135

Original Research Paper

Effects of Hypertension during Pregnancy on Maternal and Fetal Health

Authors:
Babita Shah[1], Vijay Kumar Shah[2], Saharoj Siddiqui[3], Vivek Kumar Sah[4]
[1]*Consultant Gynecologist and Obstetrician, Department of obstetrics and gynecology, Paropkar Maternity and Womens Hospital Thapathali, Kathmandu, Nepal*
[2]*Consultant General Surgeon, Department of General Surgery, National Academy of Medical Sciences, Kathmandu, Nepal*
[3]*Intern Doctor, Nepalgunj Medical College and teaching hospital, Banke, Nepal*
[4]*Intern Doctor, Universal College of Medical Sciences and Teaching Hospital, Bhairahawa, Rupandehi, Nepal*
Corresponding Author:
Babita Shah, Consultant Gynecologist and Obstetrician, Department of obstetrics and gynecology, Paropkar Maternity and Womens Hospital Thapathali, Kathmandu, Nepal

Article Received: 23-September-2024 Revised: 13-October-2024 Accepted: 02-November-2024

ABSTRACT:
Introduction: Pregnancy-induced hypertension is the general classification for hypertension diseases during pregnancy, which include pregnancy-induced hypertension (without proteinuria), pre-eclampsia (with proteinuria), and eclampsia (pre-eclampsia with convulsions). This disease is responsible for high maternal and perinatal morbidity and mortality rates, and is one of the main public health problems. The aim of our study is to assess maternal and fetal outcome in pregnancy induced hypertension. **Methods**: This is a hospital based prospective comparative study of maternal and perinatal outcome in pregnancy induced hypertension and preeclampsia. **Results**: Maternal complications were significant more in preeclampsia group compared to pregnancy induced hypertension group. Preterm deliveries, fetal growth restriction and still birth were more common in preeclampsia group. The rate of vaginal deliveries was more frequent in the group with pregnancy induced hypertension than preeclampsia. **Conclusion**: Presence of proteinuria is a predictor for poor maternal and perinatal outcome in hypertensive disorders of pregnancy.

Keywords: Pregnancy, Hypertensive, Preeclampsia, Preterm deliveries, vaginal deliveries.

INTRODUCTION:

Pregnancy-induced hypertension which may also be called pre-eclampsia, toxemia, or toxemia of pregnancy is a pregnancy complication characterized by high blood pressure, swelling due to fluid retention, and urine. Hypertension is common medical problem encountered during pregnancy, complicating up to 10% of pregnancies. [1]Hypertensive disorders during pregnancy are classified into 4 categories, Chronic hypertension, Preeclampsia-eclampsia, Preeclampsia superimposed on chronic hypertension and Gestational hypertension (transient hypertension of pregnancy or chronic hypertension identified in the latter half of pregnancy).[2] This terminology is preferred over the older but widely used term "pregnancy-induced hypertension" (PIH) because it is more precise. In 2014, the Society of Obstetricians and Gynecologists of Canada (SOGC) released revised guidelines that simplified the classification of hypertension in pregnancy into four categories, pre-existing hypertension, gestational hypertension, preeclampsia, or "other hypertensive effects" on the basis of different diagnostic considerations.[3]

Preeclampsia is more common at the extremes of maternal age (< 18 year or >35 year). The risk factor includes First pregnancy, new partner/paternity, history of preeclampsia, family history of preeclampsia in a first-degree relative, Black race, obesity (BMI ≥300), etc[4] Diagnosis of hypertension in pregnancy involves pre-existing hypertension and preeclampsia involving several investigations together with patient history and physical examination because preeclampsia usually presents after the third trimester. Thus, identifying severe hypertension early requires excluding such disorders as gestational trophoblastic disease. Nondependent oedema, which can involve rapid weight gain or persisting or increasing oedema, is still an early indication of preeclampsia, however, oedema is no longer a criterion for the diagnosis. Seizures occurring in eclampsia should be evaluated for primary neurologic etiology. Common laboratory investigations for preeclampsia and hypertension include complete blood

count, electrolyte, renal function tests, liver enzymes and proteinuria. Baseline labs in first trimester help identify superimposed preeclampsia at a later time. Higher protein/creatinine ratios and serum lipids, which are also recommended to be performed later in the postpartum period, can also help confirm the diagnosis.[5,6]

In 2015 and 2017, for managing acute severe hypertension in pregnancy, American College of Obstetricians and Gynecologists recommends that persistent severe hypertension which is severe hypertension that lasts 15 minutes or more be considered an emergency. Labetalol given through intravenous route, hydralazine and oral nifedipine are also common first line management options. Nonetheless, IV labetalol should not be used in patients with asthma, heart disease or CHF, and in emergent situations requiring treatment prior to IV, oral nifedipine or oral labetalol 200mg can be given. Prophylactic anticonvulsant of choice in eclampsia is magnesium sulfate, but it is not used as an antihypertensive agent since it is not effective; sodium nitroprusside is used in emergencies because of its toxicity. There is particular focus on the deference to set best evidence-based practice protocols for the time treatment of hypertensive emergencies.[7-9]. The aim of our study is to assess maternal and fetal outcome in pregnancy induced hypertension.

MATERIALS AND METHODS:

Study Design and Setting:

It is a hospital based prospective, comparative study which is carried out in the Obstetrics and Gynecology Department in the Third Affiliated Hospital of Xinxiang Medical University/Xinxiang, Henan Province/China. The study design is observational and descriptive conducted between October 2018 and March 2019

Sample Size: The study includes a total of 220 cases, with two groups: 100 cases with pregnancy-induced hypertension (PIH) and 120 cases with preeclampsia.

Inclusion and Exclusion Criteria:

The inclusion criteria therefore include all women admitted with a diagnosis of PIH or preeclampsia, gestation more than twenty weeks, systolic or diastolic blood pressure above 140 and 90 respectively, albuminuria greater than thirty milligrams in a 6-hour interval, proteinuria more than 0.3 grams in 24 hours, and weekly weight gain above 0.9 kilogram. Exclusion criteria include patients with antecedent history of chronic hypertension, advanced renal or hepatic diseases, malignancies, pronounced cardiac diseases or heart failure, acute-box scheme toxemia, sustained systolic blood pressure above 160 OR diastolic above 110 mmHg, pulmonary edema, oliguria less than 500 mL in 24 hours, disc or scotometric persistent headaches, platelet count below 100,000 mm3, RUO or IUGR.

Method of Selection and Classification:

Classification of the participants was made on the basis of International Society for the Study of Hypertension in Pregnancy (ISSHP) criteria. PIH was considered as a systolic blood pressure was 140 mmHg or more and/or diastolic blood pressure was 90 mmHg or more on two occasions at least six hours apart, occurring after the 20th week of gestation in women who were previously normotensive and blood pressure returned to normal after delivery. Preeclampsia was described as hypertension occurring at or after 20 weeks of pregnancy accompanied with proteinuria of more than 300 mg a day or with oedema.

Ethics and Data Collection:

The research was approved by he Maternity's Ethics Committee. Since this study used patient records as the source for the data, the main researcher signed a Responsibility Term to ensure the patients' anonymity would be preserved.

Data Collection and Observation Indices:

Demographic details were obtained, and supine blood pressure was taken. Dipstick method was used to access the urinary proteins (1+ ≥300 mg/L and <1 g/L; 2+ ≥1 g/L and <5 g/L; 3+ ≥5 g/L). The following investigations were conducted for all patients: Hb%, PCV, blood group & Rh, VDRL, HIV, HBsAg, PIH Profile (Serum creatinine, blood urea, serum uric acid, Liver profile, Retinal examination, NST, and USG). Potential ante-, intra-, and postpartum and related factors were measured, and patient satisfaction with regard to blood pressure/heart rate, incidence of eclampsia/preeclampsia, dystocia, Apgar scores/weight, and satisfaction were considered. Where Apgar scores ranged from 4 to 7, the newborn was regarded to have only mild asphyxia and scores below 4 were taken to mean severe asphyxia. Patient satisfaction was measured with likert scale that ranged between 0 to 3.

Data Analysis:

The comparison of statistics between two groups were done using Pearson's Chi-square test and Student's t-test, with a p-value <0.05 considered statistically significant. Statistical package for social science (SPPS v.20) was used to analyze the data.

RESULTS:

Sample Characteristics:

.

Table1: Comparison of baseline data.

Parameter	Pregnancy included hypertension(N=100) group	Preeclampsia(N=120) group	P Value
Maternal age in years	23.29±4.45	24.59±3.68	<0.05
Systolic BP (mmHg)	149.68± 13.05	156.97± 17.83	<0.01
Diastolic BP (mmHg)	98.57 ±8.58	102.84 ±14.01	<0.05
Gravida	1.63± 0.81	1.69± 1.03	>0.05
Para	0.56± 2.52	0.57± 1.90	>0.05
Multiple Pregnancies (%)	0.02	0.00	>0.05
Gestrational age at diagnosis in weeks	33.88 ±4.59	32.98± 4.80	>0.05
Gastrational age at delivery in weeks	35.23± 2.62	33.70± 3.88	>0.05
Caesarean section (%)	16.05	26.37±	>0.05
Mean birth weight	2.56± 0.79	1.96± 0.89	>0.05
Low APGAR score (%)	8.64	26.37	>0.05
Perinatal mortality (%)	2.47	21.9	>0.05
Maternal complications (%)	1.00	17.50	>0.01

Age and Blood Pressure distribution:

Table 1 Shows that a total of 220 pregnant women were studied during this period, of which 100 women had pregnancy induced hypertension and 120 women had preeclampsia. The average age of women with pregnancy induced hypertension was 23.29 years whereas those with preeclampsia was 24.59 years ($p<0.05$). Diastolic blood pressure was significantly ($p<0.05$) greater in preeclampsia group compared to pregnancy induced hypertension group.

Table 2: Comparing maternal outcome.

Maternal outcome/complications	Pregnancy induced hypertension(N=100) group	Pre-eclampsia (N=120) GROUP	P value
Eclampsia	Nil	11	<0.01
HELLP/partial HELLP	Nil	03	<0.05
Abruptio Placenta	01	02	<0.05
DIC	Nil	Nil	-
Acute renal failure	Nil	Nil	-
Intracerebral haemorrhage	Nil	Nil	-
Pulmonary oedema	Nil	01	<0.05
Others	Nil	10	<0.01
No complications	99	93	<0.05

Maternal Complication:
Table 2 Shows that maternal complications like eclampsia, abruption, pulmonary oedema were significant ($p<0.05$, $p<0.01$) more in preeclampsia group compared to pregnancy induced hypertension group.

Table 3: Comparing obstetric outcomes.

Obstetric outcome	Pregnancy induced hypertension(N=100)	Pre-eclampsia(N=120)	P value
Vaginal delivery	81	83	<0.05
Operative vaginal delivery	01	06	>0.05
Caesarean section	18	31	>0.05

Obstetrics Outcomes:
Table 3 shows that as for obstetric outcome, the rate of vaginal delivery was more frequent in the group with pregnancy induced hypertension group compared to those with preeclampsia. 21 women with preeclampsia had perinatal complications whereas only 1 woman with pregnancy induced hypertension had complication associated with delivery ($p<0.05$).

Table 4: Comparing perinatal outcomes.

Perinatal outcome	Pregnancy induced hypertension(N=100)	Pre-eclampsia (N=100)	P value
Preterm	44	74	<0.01
FGR	02	13	<0.01
5 min APGAR less than 5	12	33	<0.01
5 min APGAR LESS THAN 7	12	32	<0.01
Still birth	02	22	<0.001
Meconium aspiration	13	15	>0.05
Neonatal death	01	03	>0.05

Perinatal Outcomes:
Table 4 Shows that considering fetal outcome, pre term deliveries, fetal growth retardation (FGR) and still birth was significantly more frequent in women with preeclampsia as compared to those with pregnancy induced hypertension.

DISCUSSION:

A retrospective study conducted by Liu CM et al had showed that incidence of maternal complications was higher in women with preeclampsia as compared to those with pregnancy induced hypertension (without proteinuria).[10] They also found that maternal age was a significant predictor of preeclampsia. This study done to evaluate the role of proteinuria in the maternal and perinatal outcome in PIH and preeclampsia has found that maternal complications are more common in the group with preeclampsia as compared to those with pregnancy induced hypertension.[11,12]. The results of this study are also on similar lines maternal complication in terms of eclampsia was found to be significantly higher in the group with proteinuria ($p<0.01$).

This study has shown a significantly high incidences of maternal complications and poor perinatal and fetal outcomes in women who had proteinuria (preeclampsia) compared to those without proteinuria calling for development of precautionary strategies, well prepared protocols and timely diagnosis of preeclampsia at the earliest possible stage which might improve the pregnancy outcome.[13] The fact that proteinuria as an independent factor could be responsible for the disease

progression, as indicated by this study might aid in clinical management by identifying the highest risk women who may need aggressive management.[14] PIH has numerous risking factors, thus its exact pathogenesis is not fully elucidated. In clinic, PIH is a common and severe obstetric complication that brings serious impairment on maternal and infant. It is a main cause of maternal and infant death that can occur in all age groups. Therefore, as one of the obstetric medical problems, it causes extreme focus by obstetrics and gynecology [15,16]

Apart from the environmental factors, individual background in genetics and medical history are factors that influence the development of HDP. The risk of HDP was 1.75 times in alcohol consumers comparing with no alcohol consumers. Epidemiological studies have demonstrated a close association between alcohol use and an increased risk of hypertension [17,18] but few studies have directly addressed the role of drinking pattern. In our study, hypertension has no obvious relationship with cigarette smoking. Paradoxically, Studies have shown that smoking during pregnancy has been associated with a reduced risk of preeclampsia.[19] For example, smoking during pregnancy reduces the risk of preeclampsia by up to 50% with a dose-response pattern.[20] Numerous studies have shown that twin pregnancy is an important risk factor for HDP. Our study suggested that 16.29% of 2001 women with a twin pregnancy developed HDP as compared with 5.02% of 110,385 women with a single pregnancy. This result strongly supports previous reports indicating that the risk of HDP in women with a twin pregnancy was 2 or 3 times higher than those with a single pregnancy.[21-23] Numbers of studies indicate that the prevalence of HDP increases with maternal age. [22,24,25] For an example, the risk of preeclampsia has been shown to increase by 30% with every year above the age of 34 years. [26,27] In the current study, we have shown similar results: compared with women aged 20–24 years, the risk of HDP was 1.8 times higher in those aged 35–39 years and 2.4 times higher in those aged 40 years and older. It has been frequently reported that HDP commonly occurs in the first delivery.[28,29]

There is a close relationship between HDP and pre-pregnancy BMI, including the increased risk of HDP in women with obesity during pregnancy. [22, 29-31] Some studies suggest that each increase of 5 to 7 kg/m^2 in BMI doubles the risk of developing preeclampsia.[32-33] Obese women were at a higher risk of preeclampsia compared to those with a normal BMI. [34] Our work confirms the association of body weight with risk of HDP: obese women had the highest risk of HDP. In recent years, attention has been paid to the relationship between the morbidity in HDP and the levels of maternal education. Convincing evidence suggests that women with a low level of education are more likely to develop HDP than those who have received a higher level of education.[35-36] The present study provides weak evidence in support of the impact of education levels on the risk of HDP. Epidemiological data indicate that HDP shows a trend towards familial aggregation.[29-38] The prevalence of HDP in women who had two or more family members with HDP was 2 to 3 times higher than that the general female population. [22,39] High blood pressure was an independent risk factor for preeclampsia.[40] SBP at first antenatal visit was positively associated with the risk of preeclampsia; Women with SBP of ≥130 mmHg had a relative risk of 3.6 compared to those with pre-pregnancy SBP of <110 mmHg.[41] In a retrospective cohort study, Stamilio et al found that a mean arterial pressure of >90 mmHg measured in the first prenatal visit was associated with a high risk of severe preeclampsia. [42] It has been suggested that blood pressure is an indicator of the degree of HDP.[43-44] Our work also suggests that GDM is a risk factor for HDP. Similar findings have been reported in several previous studies [44-45]

CONCLUSION:

The study shows that incidence of maternal complications as well as fetal morbidity and mortality is significantly higher in the group with proteinuria (preeclampsia) as compared to that without proteinuria (pregnancy induced hypertension). The presence of proteinuria is an important predictor for adverse maternal and perinatal outcome. Women with PIH were at higher risk of adverse pregnancy outcomes than those without. Poor knowledge of management of PIH and inadequate resources are a threat to the proper management of PIH. This underscores the need for human resource capacity building and resource mobilization for proper management of women accessing maternity services in Harare. Resources for routine urinalysis must be made available by hospital authorities.

Identification of these risk factors for HDP would be useful for early diagnosis of HDP in a particular patient group that requires clinical monitoring and appropriate treatment. In future studies, it is critical to find effective interventions and preventions of HDP which are particularly important to reduce maternal and perinatal complications, and ensure both pregnant women and infants to be healthy and safe.

REFERENCES:

1. The task force on hypertension in pregnancy. Hypertension in Pregnancy ACOG;2013

2. Report of the national high BP education program working group on high BP in pregnancy AM J Obstet. Gynecol. 2000jul.183(1):51-522(medline)
3. Magee LA, Pels A,Helewa M,Rey E,VON DadelszenP,Canadian Hypertension Disorders of pregnancy working group.Diagnosis,evaluation,and management of the hypertensive disorders of pregnancy;executive summary J Obstet Gynecol Can.2014 May 36(5);416-41(medline)
4. English FA, Kenny LC, McCarthy FP. Risk factors and effective management of preeclampsia. Integr Blood Press Control. 2015 Mar 3; 8:7-12. doi: 10.2147/IBPC.S50641. PMID: 25767405; PMCID: PMC4354613.
5. Overton E, Tobes D, Lee A. Preeclampsia diagnosis and management. Best Pract Res Clin Anaesthesiol. 2022 May;36(1):107-121. doi: 10.1016/j.bpa.2022.02.003. Epub 2022 Feb 10. PMID: 35659948.
6. Wagner LK. Diagnosis and management of preeclampsia. Am Fam Physician. 2004 Dec 15;70(12):2317-24. PMID: 15617295.
7. (Guideline) Committee on Obstetrics Practice.Committe Openion No.623; Emergent therapy for acute onset severe hypertension during pregnancy and the Postpartum period. Obstet Gynecol.2015feb 125(2):521-5.
8. Philips D. Pregnancy Hypertensive Emergency Recommendations updated. Medscape Medical news January 28 2015.
9. Committe on obtetric Practice Committee opinion No.692; emergent Therapy foe Acute. Onset, Severe Hypertension During pregnancy and the postpartum period obstet Gynecol.2017April.129(4): e90.e95.
10. Liu CM, Cheng P, Chang SD. Maternal complications and perinatal outcomes associated with gestational hypertension and severe preeclampsia in Taiwanese women. J Formos Med Assoc. 2008; 107:129-35
11. Ferrazzani S, Caruso A, Carolis SD, Martino IV, Mancuso S. Proteinuria and outcome of 444 pregnancies complicated by hypertension. AJOG. 2006; 162:366-71
12. Maynard SE, Min JY, Merchan J, Lim KH. Excess placental soluble fms-like tyrosine kinase 1 (sFlt1) may contribute to endothelial dysfunction, hypertension, and proteinuria in preeclampsia. Clin Invest. 2003;11(5):649-58.
13. Gaugler-Senden IP, Huijssoon AG, Visser W, Steegers EA, de Groot CJ. Maternal and perinatal outcome of preeclampsia with an onset before 24 weeks' gestation. Audit in a tertiary referral centre. Eur J Obstet Gynecol Reprod Biol. 2006;128(1-2):216-21.
14. Chan P, Brown M, Simpson J, Davis G. Proteinuria in pre-eclampsia: how much matters? BJOG. 2005; 112:280-5. Cite this article as: Pairu J, Bharathi KN, George
15. Moraes D, Munhoz TP, Pinheiro da Costa BE, Hentschke MR, Sontag F, Silveira Lucas L, Gadonski G, Antonello IC, Poli-de-Figueiredo CE. Immature platelet fraction in hypertensive pregnancy. Platelets 2016; 27: 333-7.
16. Litwinska E, Litwinska M, Oszukowski P, Szaflik K, Litwinski W, Korcz M, Kaczmarek P. Biochemical markers in screening for preeclampsia and intrauterine growth restriction. Ginekol Pol 2015; 86: 611-615.
17. Kotchen JM,McKean HE, Kotchen T. Blood pressure of young mothers and their children after hypertension in adolescent pregnancy: six to nine year follow-up. *Am J Epidemiol* 1982*;* 115*:* 861–867
18. Smith GCS,Pell JP,Walsh D. Pregnancy complications and maternal risk of ischaemic heart disease: a retrospective cohort study of 129,290 births. *Lancet* 2001*;* 357*:* 2002–2006.
19. Selvaggi L,Loverro G,Manno SC, Cagnazzo G. Long-term follow-up of women with hypertension in pregnancy. *Int J Gynaecol Obstet* 1988*;* 27*:* 45–49.
20. Hannaford P, Ferry S, Hirsch S. Cardiovascular sequelae of toxaemia of pregnancy. *Heart* 1997*;* 77*:* 154–158.
21. England L, Zhang J (2007) Smoking and risk of preeclampsia: a systematic review. Front Biosci 12: 2471–2483.
22. Lee CJ, Hsieh TT, Chiu TH, Chen KC, Lo LM, et al. (2000) Risk factors for preeclampsia in an Asian population. Int J Gynecol Obstet 70: 327–333.
23. Duckitt K, Harrington D (2005) Risk factors for pre-eclampsia at antenatal booking: systematic review of controlled studies. BMJ 330: 565–567.

24. Obiechina NJ, Okolie V, Eleje G, Okechukwu Z, Anemeje O (2011) Twin versus singleton pregnancies: the incidence, pregnancy complications, and obstetric outcomes, in a Nigerian tertiary hospital. Int J Women's Health 3: 227–230.
25. Walker RL, Hemmelgarn B, Qua It (2009) Incidence of gestational hypertension in the Calgary Health Region from 1995 to 2004. Can J Cardiol 25: 284–287
26. Lamminpää R, Vehviläinen-Julkunen K, Gissler M, Heinonen S (2012) Preeclampsia complicated by advanced maternal age: a registry-based study on primiparous women in Finland 1997–2008. BMC Pregnancy and Childbirth12: 47.
27. Saftlas AF, Olson DR, Franks Al, Atrash HK, Pokras R (1990) Epidemiology of preeclampsia and eclampsia in the United States, 1979–1986. Am J Obstet Gynecol 163: 460–465.
28. Douglas KA, Redman CW (1994) Eclampsia in the United Kingdom. BMJ 309: 1395–1400.
29. Morikawa M, Cho K, Yamada T, Yamada T, Sato S, et al. (2012) Risk factors for eclampsia in Japan between 2005 and 2009. Int J Gynecol Obstet 117: 66–68.
30. Cnossen JS, Leeflang MMG, de Haan EEM, Mol BWJ, van der Post JAM, et al. (2007) Accuracy of body mass index in predicting preeclampsia: bivariate meta-analysis. Int J Obstet Gynecol 114: 1477–1485.
31. Liu YY, Dai W, Dai XQ, Li Z (2012) Prepregnancy body mass index and gestational weight gain with the outcome of pregnancy: a 13-year study of 292,568 cases in China. Gynecol Obstet 286: 905–911.
32. Dinatale A, Ermito S, Fonti I, Giordano R, Cacciatore A, et al. (2010) Obesity and fetal-maternal outcomes. J Prenat Med 4: 5–8.
33. Weiss JL, Malone FD, Emig D, Ball RH, Nyberg DA, et al. (2004) FASTER Research Consortium. Obesity, obstetric complications and cesarean delivery rate–a population-based screening study. Am J Obstet Gynecol 190: 1091–1097.
34. O'Brien TE, Ray JG, Chan WS (2003) Maternal body mass index and the risk of preeclampsia: a systematic overview. Epidemiology 14: 368–374.
35. Athukorala C, Rumbold AR, Willson KJ, Crowther CA (2010) The risk of adverse pregnancy outcomes in women who are overweight or obese. BMC Pregnancy Childbirth 10: 56.
36. Karlsen S, Say L, Souza JP, Hogue CJ, Calles DL, et al. (2011) The relationship between maternal education and mortality among women giving birth in health care institutions: Analysis of the cross sectional WHO Global Survey on Maternal and Perinatal Health. BMC Public Health 11: 606–616.
37. McAlister C, Baskett TF (2006) Female education and maternal mortality: a worldwide survey. *J* Obstet Gynaecol Can 28: 983–990.
38. Carr DB, Epplein M, Johnson CO, Easterling TR, Critchlow CW (2005) A sister's risk: family history as a predictor of preeclampsia. Am J Obstet Gynecol 193: 965–72.
39. Esplin MS, Fausett MB, Alison Fraser A, Rich Kerber R, Geri Mineau G, et al. (2001) Paternal and maternal components of the predisposition to preeclampsia. N Engl J Med 344: 867–872.
40. Ness RB, Markovic N, Bass D, Harger G, Roberts JM (2003) Family history of hypertension, heart disease, and stroke among women who develop hypertension in pregnancy. Obstet Gynecol 102: 1366–1371
41. Duley L, Gülmezoglu AM, Chou D (2010) Magnesium sulphate versus lytic cocktail for eclampsia. Cochrane Database Syst Rev CD002960.
42. Stamilio DM, Sehdev HM, Morgan MA, Propert K, Macones GA (2000) Can antenatal clinical and biochemical markers predict the development of severe preeclampsia? Am J Obstet Gynecol 182: 589–594.
43. 43.Kvetny J, Poulsen HF (2003) Incidence of gestational hypertension in gestational diabetes mellitus. Arch Gynecol Obstet 267: 153–157.
44. Montoro MN, Kjos SL, Chandler M, Peters RK, Xiang AH (2005) etal (2005) Insulin resistance and preeclampsia in gestational diabetes mellitus. Diabetes care 28: 1995–2000.
45. Cnossen JS, Vollebregt KC, de Vrieze N, ter Riet G, Mol BW, et al. (2008) Accuracy of mean arterial pressure and blood pressure measurements in predicting pre-eclampsia: systematic review and meta-analysis. BMJ 336: 1117–1120