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RESEARCH ARTICLE

PERINATAL OUTCOME OF MOTHER AND FETUS ON THE BASIS OF SCREENING AND PREVENTION OF PREECLAMPSIA BETWEEN FIRST AND SECOND TRIMESTER

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ABSTRACT

Background and Objective*:** Preeclampsia (PE) is one of the leading causes of maternal and perinatal morbidity and mortality worldwide. This disorder has profound short-term and long-term impacts on both the affected woman's and her child's health. Early preeclampsia prediction will reduce this associated morbidity and mortality as it will give the chance for frequent maternal and fetal surveillance and application of prophylactic procedures. The aim of this study to compare Perinatal Outcome of Mother and Fetus on the basis of screening and prevention of Preeclampsia between first and second trimester. ***Material and Methods*:** A retrospective cohort study conducted in M.L.B. Medical College, Jhansi. The study was included 1200 pregnant women who were screened either on first visit of their 1st trimester of pregnancy or either first visit of their 2nd trimester of pregnancy. The pregnant women divided into two groups according to their timing of first ANC visit in centre. They were monitored at every routine visit until pregnancy. At perinatal outcome in both groups were recorded and compared. ***Result*:** A total of 1,200 pregnant women enrolled in the study. There was no difference in both the groups with regards to maternal age. The mean uterine PI in group A was 1.85±0.3 while in group A it was 1.65±0.2 in group B, there was significant difference in both the groups with $p<0.0001$. There was statistically significant difference in both group when compared for preeclampsia, birth weight, rate of cesarean delivery. ***Conclusion: First-trimester screening of PE, which combines maternal factors, obstetric and medical history, biochemical and biophysical markers, is useful to predict early-onset PE in a routine care setting. Early prediction could potentially improve the outcome by close surveillance of the patient and timely intervention of prophylactic medications.

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INTRODUCTION

The early assessment of patient specific risks of pregnancy complications has the purpose to improve pregnancy outcome and to individualize the patient- and disease specific approach. From 11–13 weeks onwards, pregnancies may be classified as being low-risk for pregnancy complications, with a substantially reduced number of medical visits, and high-risk, with close surveillance in specialists' clinics. Other benefits of the 11–13+6 weeks scan include confirmation that the fetus is alive, accurate dating of the pregnancy, early diagnosis of major fetal abnormalities, and the detection of multiple pregnancies. The early scan also provides reliable identification of chorionicity, which is the main determinant of outcome in multiple pregnancies. With the advancement of new technology into routine clinical practice, it is essential to screen all the pregnant women during 11–13+6 weeks by serum free ß-human chorionic gonadotropin, pregnancy-associated plasma protein-A and ultrasonography for nuchal translucency, prediction of preeclampsia and IUGR by uterine artery PI. The risk for many of the birth defects increases with increase in maternal age. Fetuses with chromosomal defects are more likely to die in utero than normal fetuses, the risk decreases with increase in gestational age. Screening by ultrasonography and colour Doppler may be necessary when patient presents in second trimester to rule out placenta previa or FGR. Low-risk pregnancy includes not only a low chance for a chromosomal abnormalities ratio after the first trimester combined screening test, that includes maternal history, fetal ultrasound assessment and serum biochemistry assessment of beta-hCG and PAPP-A, but also a low chance of maternal pregnancy complications considered after assessing the chance for developing preeclampsia, fetal growth restriction and preterm delivery, by using maternal history characteristics, ultrasound aspects and the serum biochemistry of PAPP-A (1). Preeclampsia is a major cause of maternal and perinatal morbidity and mortality. Early-onset disease requiring preterm delivery is associated with a higher risk of complications in both mothers and babies. Evidence suggests that the

administration of low-dose aspirin initiated before 16 weeks' gestation significantly reduces the rate of preterm preeclampsia. Therefore, it is important to identify pregnant women at risk of developing preeclampsia during the first trimester of pregnancy, thus allowing timely therapeutic intervention. American College of Obstetricians and Gynecologists (ACOG) and National Institute for Health and Care Excellence (NICE) have suggests screening for preeclampsia at first trimester based on maternal risk factors. Accurate comparison of the performance of different screening tests conducted at different times during pregnancy remains complex because of the bias that can arise from spontaneous pregnancy losses that may occur between the first-trimester and the second-trimester screenings (2). This study was conducted to compare outcome (perinatal) of mother and fetus on the basis of screening and prevention of preeclampsia between 1st and 2nd trimester.

MATERIALS AND METHODS

A retrospective study conducted in Obstetrics & Gynecology Department of M.L.B. Medical College, Jhansi which is also a tertiary care centre for bundelkhand region.

Sample size: The study was conducted on 1200 pregnant women over a period of Jan 2019 to Dec 2023. The pregnant women were screened either on first visit of their 1st trimester of pregnancy or either first visit of their 2nd trimester of pregnancy.

The 1200 study cases were divided into two groups on the basis of their first antenatal visit.

Group A (n=600): The cases who were screened during their first visit of first trimester.

Group B (n=600): The cases who were screened during their first antenatal visit of second trimester.

After taking approval from institutional ethical committee, the study design was conducted. The case records of all institutional deliveries were assessed to find out the perinatal outcome. All the relevant details relative to our study were noted in the predesigned proforma. Risk factors were derived from maternal characteristics, past medical history, pregnancy complications, intrapartum details and fetal characteristics. The information regarding age, parity, body mass index (BMI), booking status, preexisting diabetes, hypertension, renal, cardiac, connective tissue disease and epilepsy were noted in predesigned proforma. Pregnancy related complications such as hypertensive disorders of pregnancy, gestational diabetes, maternal infections, antepartum haemorrhage or acute fatty liver of pregnancy were also noted. Fetal characteristics that were collected were gender, gestational age, birth weight and birth defect.

METHODS

All the women attending a first-trimester routine visit in our hospital were offered uterine artery Doppler for PE, in addition to the routine screening. At that first visit, between 9 and 11 weeks of gestation, blood pressure was taken by validated automated devices, following a standardized protocol. Mean arterial pressure was measured twice in each arm and registered. In the same visit, maternal blood was taken to determine plasma levels of human chorionic gonadotrophin (HCG) and PAPP-A. At the first trimester ultrasound, between 11 weeks and 13 weeks and 6 days, gestational age was determined according to the fetal crown-rump length and NT calculated. Transabdominal color Doppler was used to measure the left and right UtA PI, and the average value was recorded. Women diagnosed with a multiple pregnancy were excluded. From all theses parameters birth defect and the risk of preeclampsia was calculated. In this study, high-risk was defined as a risk of early-onset PE $\geq$ 1:50. High-risk women were advised on their individual risk and offered low-dose ecospirin 150 mg every night, starting immediately after screening until 36 weeks of gestation and advised high quality balanced diet. Women classified as high-risk were monitored.
Pregnant women attending the first prenatal visit at second trimester were also screened by routine investigations along with ultrasonography, colour Doppler to rule out preeclampsia (PE), placenta previa and intrauterine growth retardation (IUGR) and followed up without any intervention. They were monitored at every routine visit until pregnancy. The main outcome of the study was to establish the incidence of preeclampsia/ eclampsia defined according to the International Society for the Study of Hypertension in both groups. All collected data were inserted into an Excel database to perform a statistical analysis of maternal and pregnancy characteristics. In each pregnant woman, the mean UtA PI, MAP, and PAPP-A serum levels were converted to multiples of the median (MoM), corrected for maternal and pregnancy characteristics. The incidence of eclampsia and preeclampsia were calculated, also in Excel. A Fisher exact test was used to compare the variables. Statistical significance was accepted at the level of $p < 0.05$.

RESULTS

During the study's duration, a total of 1,200 pregnant women enrolled in the study. They were grouped into two groups according to their timing of first ANC visit in centre. In group A and group B maximum no. of cases were belonged to the age group of 25-30 yrs (i.e. 52.5% in group A while 48.33% in group B).

Table No. 1. Maternal characteristics in different group

Maternal parameters	Group A (n=600)	Group B (n=600)	P value
Maternal age			
<25 yrs	102 (17.0%)	115 (19.17%)	2.1928 (NS)
25-30	315 (52.5%)	290 (48.33%)	
>30	183 (30.5%)	195 (32.5%)	
Mean±SD	27.6±3.5	29.50±4.5	
BMI			
Normal (18.5-25)	282 (47.0%)	304 (50.67)	1.7966 (NS)
High BMI (≥25)	259 (43.17%)	245 (40.83%)	
Low BMI (<18.5)	59 (9.83%)	51 (8.5%)	
Mean	25.06±5.31	26.05±5.69	
Parity			
Nulliparous	264 (44.0%)	284 (47.33%)	0.2708 (NS)
Multiparous	336 (66.0%)	316 (52.67%)	
Medical history			
Chronic hypertension	22 (3.67%)	18 (3.0%)	0.6303 (NS)

The mean maternal age of group A was 30.05±5.9yrs and in group B it was 30.50±4.6 yrs. There was no difference in both the groups with regards to maternal age. The maximum cases in both the groups were having normal BMI levels, 47.0% and 50.67% in group A and group B respectively.

Table 2. Mean PI of the uterine arteries and serum PAPP-A and PIGF levels

Diagnostic variables	Group A	Group B	P value
Uterine PI (mean±SD)	1.85±0.3	1.65±0.2	< 0.0001 (S)
PAP (MOM)	0.98±0.2	1.0±0.3	0.1745 (NS)

Table 3. Outcome of cases

Outcome	Group A (n=600))	Group B (n=600)	P value
Term	580 (96.67%)	450 (75.0%)	< 0.0001 (S)
Preterm	20 (3.33%)	150 (25.0%)	
IUGR	15 (2.5%)	36 (6.0%)	< 0.004 (S)
Eclampsia	2 (0.33%)	10 (1.67%)	0.0377 (S)
Preeclampsia	12 (2.0%)	48 (8.0%)	<0.0001 (S)
Gestational age at delivery (mean±SD)	38.5±2.0	37.4±3.2	0.0001 (S)
Vaginal delivery	398 (66.33%)	335 (55.83%)	0.0002 (S)
Cesarean delivery	202 (33.67%)	265 (44.17%)	
Birth weight (mean±SD)	3.07±0.455	2.68±0.545	< 0.0001 (S)

Maximum cases were multiparas in both the group 66.00% and 52.67% respectively in group A and group B. there was no significant difference in maternal parameters among both the groups. Table 1 describes the detailed maternal characteristics in different group. There were 96.67% term deliveries in group A and 75.0% in group B and 3.33% preterm deliveries in group A and 25.% in group B. the difference between both the groups is statistically significant. There were only 2 cases of eclampsia in group A and 10 cases of eclampsia in group B and this difference was also statistically significant among the groups. 12 out of 600 (2.0%) of cases were preeclampsia in group A while 48/600 (8.0%) in group B, the difference in group was statistically significant. The mean gestational age at the time of delivery in group A cases was 38.5±2.0 wks while in group B it was 37.4±3.2 wks and the difference was statistically significant (p=0.0001). There were slightly increase in cesarean deliveries cases in group B 44.17% vs 33.67% in group A and the difference was statistically significant. The mean birth weight of cases in group A was 3.07±0.455 kg while in group B mean birth weight was 2.68±0.545 kgs. The difference in both the groups in terms of birth weight was statistically significant (p<0.0001) (Table 3).

DISCUSSION

The objective of first-trimester screening is to identify women at high risk for preterm pre-eclampsia as well as to provide reassurance to women identified as being at low risk of developing the disease. Identification of high-risk women allows focused and timely prophylactic prescription of low-dose aspirin with the intention of reducing the risk of disease. Administration of low-dose aspirin to high-risk women is supported by several international guidelines, although the recommended dose varies(3,4). Application of the National Institute for Health and Care Excellence (NICE) guidelines demonstrated only a 40% detection rate for preterm pre-eclampsia, leading to a significant underestimation of the number of women at risk of preterm pre-eclampsia who would benefit from aspirin prophylaxis (5). During the study's duration, a total of 1,200 pregnant women enrolled in the study. These cases were divided into two groups according to their first visit in tertiary care centre. The 600 cases were enrolled during their first trimester of pregnancy and 600 were enrolled during the second trimester of pregnancy. The cases who were enrolled during first trimester were screened routine examination along with ultrasonography and plasma levels of human chorionic gonadotrophin (HCG) and PAPP-A. Of the 600 pregnant women of group A that underwent PE screening, cases who were screened positive for early-onset PE, and all of them started low-dose aspirin, 150 mg once per day at night till delivery with advice of taking high calorie balanced diet. Poon *et al*.(6) initially proposed this algorithm based on the use of a combination of maternal demographics, medical and obstetric history, mean uterine artery PI, MAP and pregnancy-associated plasma protein-A (PAPP-A) between 11 and 13 weeks of gestation. There were only 2 cases of eclampsia in group A and 10 cases of eclampsia in group B and this difference was also statistically significant among the groups. 12 out of 600 (2.0%) of cases were preeclampsia in group A while 48/600 (8.0%) in group B, the difference in group was statistically significant. This showed less incidence of preeclampsia, eclampsia and IUGR in those cases who were screened during their first trimester in comparision to cases who were screened in their second trimester. The reduction in the incidence of early-onset PE was statistically significant and probably meaningful to clinical practice. The reduction observed in early-onset PE was more substantial than the reduction seen in total PE, corroborating previous evidence available (7-10). There is also decrease in percentage of cesarean delivery in group A in comparison to group B, 202 (33.67%) cases vs 265 (44.17%) cases.

There were significant improvement in birth weight in cases who were screened in first trimester in comparision to cases who screened in second trimester in their pregnancy (i.e. 3.07±0.455kg vs 2.68±0.545 kg). The combined screening model used in our study, with an algorithm that considered maternal demographic characteristics, biophysical and biochemical biomarkers, has proved to be the most effective method of screening, with a high detection rate for early-onset PE (11-16). The use of an early screening strategy allows the beginning of aspirin before the process of placentation is complete. This is in line with the results of several studies that suggest that the greater benefit of this prophylactic measure happens when it is started before 16 weeks (8,9,17). As for the dosage selected in our study, we opted to use 150 mg of aspirin per day due to a known dose-dependent benefit and to reduce the aspirin resistance effect shown by recent evidence.(17,18). We also recommended that aspirin should be taken at night, as it is associated with a superior reduction of PE when compared with daytime administration (17).

CONCLUSION

Our study showed that the first-trimester screening of PE, which combines maternal factors, obstetric and medical history, biochemical and biophysical markers, is useful to predict early-onset PE in a routine care setting. Moreover, our results evidence a statistical reduction in the incidence of PE, by timely screening and use of prophylaxis. The prophylactic use of low-dose aspirin in high-risk pregnancies is most likely responsible for this reduction. However, further studies are needed to corroborate these results.

Conflict of interest: Nil

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