Evaluation of Modified Biophysical Profile in Pre-Eclamptic Patients and Measure its Impact on Perinatal Outcome

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Abstract

Introduction: Hypertensive disorders in pregnancy are a major cause of maternal and perinatal morbidity and mortality worldwide. Modified biophysical profile (MBPP) combines Non stress test as a short term marker of fetal status and the amniotic fluid index as a marker of long term placental function which is easier to perform and less time consuming.

Aim: To study the antepartum fetal surveillance with modified biophysical profile and perinatal outcome in pre-eclamptic women.

Materials and Methods: Prospective descriptive study of perinatal outcome included 150 ANC patients gestational age between 34 to 40 weeks both primi gravida and multigravida with pre-eclampsia admitted in SMIMER hospital during January 2017 to June 2018.

Patients were treated in line with standard protocol and perinatal outcome were then studied.

Results: Of the 150 NST's in MBPP, 77% were reactive and 23% were non-reactive. When the MBPP was abnormal with respect to both parameters 60% of the cases had LSCS and 40% of them had vaginal delivery. When both parameters were normal there were only 3.63% cases were MSL. When NST was abnormal and AFI normal 45.45% cases were MSL and when NST was normal and AFI abnormal 42.8% cases were MSL. When both the parameters were abnormal 63.6% of the cases had APGAR <7 `whereas when NST was normal and AFI was abnormal 2(28.5%) the cases had APGAR <7. When AFI was normal and NST was abnormal 36.3% of the cases had APGAR <7.

Conclusions: Modified biophysical profile (MBPP) is easier, less time consuming, cost effective and patient compliant test.

Keywords: Non Stress test; Amniotic Fluid Index; Modified Biophysical profile.

Introduction

Hypertensive disorders in pregnancy are a major cause of maternal and perinatal morbidity and mortality worldwide.[1-4] They are among the most common medical problems in pregnancy with an incidence of 5–10%.[5-8] It is now well accepted that the proteinuria and hypertension of preeclampsia occur as a result of vasospasm and endothelial dysfunction.[1,10]

The International Society for the Study of Hypertension in Pregnancy (ISSHP) has adopted the classification as follows:[4,9,10,15]

- Gestational hypertension
- Preeclampsia-eclampsia
- Chronic hypertension (Essential or Chronic)
- Preeclampsia superimposed on Chronic hypertension

Pre-eclampsia is defined as new onset hypertension systolic blood pressure >=140 mm of Hg and diastolic blood pressure>=90 mm of Hg on two occasions at least four to six hours apart developing after 20 weeks of gestation with proteinuria more than 0.3g/L in a 24-hour urine collection in a previously normotensive, non–proteinuric women.[11-12] If 24-hour urine collection

is not available, then proteinuria is defined as a concentration of at least 30mg/dl or at least 1+ on urinary dipstick.[13]

The Modified biophysical profile (MBPP) suggested by Nageotte et al combines Non stress test as a short term marker of fetal status and the amniotic fluid index as a marker of long term placental function which is easier to perform and less time consuming.[13-15]

Materials and Methods

Place of study: The study was conducted in Department of Obstetrics and Gynecology at SMIMER Hospital, Surat, Gujarat (a tertiary care hospital) from January 2017 to June 2018.

Study Design: Prospective Descriptive Study.

Inclusion Criteria: Women willing to participate in study with gestational age between 34 to 40 weeks both primi gravida and multigravida with pre-eclampsia.

Exclusion Criteria: Multifetal Gestation/Women with gestational age less than 34 weeks/Pre-eclamptic women with medical disorder like diabetes , heart disease , thyroid disorders/Women not willing to participate in study.

Methodology: A detailed history of the pregnant women included in the study was taken. Thorough clinical examination including recording of vital parameters, Systemic and Obstetric examination was carried out on admission. All preliminary investigations including ultrasound were done.

The patients were evaluated with the Modified Biophysical Profile consisting of NST recording for 20mins, followed by amniotic fluid index measurement using four quadrant technique. The test was initiated at or beyond 34 weeks of gestational age.

The test was repeated weekly or bi-weekly depending on the findings of the previous tests and the risk factors.

Results

Out of 150 cases 25(16.67%) of them belonged to the age group between 18–20 years. Majority of the cases, 63 (42%) belonged to an age group of 21–25 years, 49 (32.67%) cases belonged to age group of 26–30 years of age and 13 (8.66%) cases were aged between 31–35 years.

Majority of the cases 108 (72%) were booked and 42(28%) were unbooked.

Majority of the cases 83 (55.3%) belonged to the gestational age between 38–40 weeks, 17(11.3%) cases were between the gestational age of 34–36 weeks. 50(33.3%) of the cases belonged to 36–38 weeks of gestational age.

Majority of cases were primi which constituted 67(44.6 %) cases, followed by second gravida 43(28.6%) cases, third gravida were 25 (16.6%) cases and fourth or more were 15 (10%) cases.

Table 1: Mode of delivery.

Mode of delivery		Number (n= 150)	Percentage
Vaginal Delivery	Full Term	82	54.66%
	Pre Term	20	13.33%
	Total	102	68%
LSCS		48	32%

Out of 150 patients, 102(68%) of them had vaginal delivery and 48 (32%) of them had caesarean section and out of the 102(68%) patients who had vaginal delivery; 82 (54.66%) had full term vaginal delivery and 20 (13.33%) had preterm vaginal delivery. (Table 1)

Out of the 48 cases who underwent caesarean section majority of them 23 (47.91%) had fetal distress as the indication for LSCS. Other indications were induction failure 8 (16.66%) cases, non-progress of labor and severe oligohydramnios 6 (12.5 %) cases each and breech was 5(10.4%) of cases.

Majority of the babies, 73 (48.6%) had birth weight more than 2.5 kg, followed by 72 (48%) of the babies whose birth weight was between 1.5–2.5 kg and those with <1.5 kg birth weight constituted 5(3.33%).

NST was reactive in 115(77%) cases while it was non -reactive in 35 (22 %) cases.

Table 2: AFI result.

AFI Test	Number (n=150)	Percentage
<5cm	25	16.6%
5–8cm	55	36.6%
>8cm	70	46.6%

The amniotic fluid index was >8 cm in 70 (46.6%) cases and in between 5–8 cm is 55 (36.6 %) cases and less than 5 cm was 25 (16.6%) cases. (Table 2)

Table 3: Modified Biophysical Profile Result.

MBPP	Number N=150	Percentage
Both parameters normal	110	73.3 %
Both parameters abnormal	22	14.6 %
NST normal AFI abnormal	11	7.3 %
NST abnormal AFI normal	7	4.8 %

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Among the Modified Biophysical Profiles done in 150 cases, both parameters (NST and AFI) were normal in 110 (73.3%) cases, both parameters were abnormal in 22 (14.6%) cases, NST was normal and AFI was abnormal in 11 (7.3%) cases, NST was abnormal and AFI was normal in 7 (4.8%) cases. (Table 3)

Table 4: Comparison of NST vs. Mode of Delivery.

NST Result (Cases)	LSCS (n=48)	Vaginal Delivery (n=102)	P value
Reactive (115)	20 (17.4%)	95 (82.6%)	P<0.001
Non-reactive (35)	28 (80%)	7 (20%)	

The present study shows that when NST was reactive, 95 (82.6%) cases had vaginal deliveries and 20 (17.4%) cases had delivery by caesarean section and when NST was non-reactive, 7 (20%) cases had vaginal deliveries and 28 (80%) cases had delivery by caesarean section which is found to be statistically significant (p<0.001). (Table 4)

Table 5: Comparison of AFI result and mode of delivery.

AFI result (No of cases)	LSCS (n=48)	Vaginal Delivery (n=102)	P- value
AFI <5 cm (25)	18(72%)	7 (28%)	<0.001
AFI 5–8 cm (55)	21(38%)	34 (62%)	
AFI >8 cm (70)	9 (13%)	61 (87 %)	

When AFI was <5 cm, 18(72%) cases had LSCS and 7(28%) cases had vaginal delivery; when AFI was 5–8 cm, 21(38%) cases had LSCS and 34(62%) cases had vaginal delivery; when AFI >8 cm, 9(13%) cases had LSCS and 61(87%) cases had vaginal delivery which is found to be statistically significant (p<0.001). (Table 5)

Table 6: Comparison between MBPP and APGAR score.

Test Results	APGAR < 7 (n=29)	APGAR >7 (n=121)
Both parameters normal (110)	4 (3.6%)	106 (96.4%)
Both parameters abnormal(22)	14 (63.6%)	8 (36.4%)
NST normal AFI abnormal (7)	2 (28.6%)	5 (71.4%)
NST abnormal AFI normal(11)	9 (81.8%)	2 (18.2%)

Among the 150 cases included in the study, APGAR score of <7 was observed among 29 cases, when both parameters (NST and AFI) were normal 4(3.6%) cases had APGAR score of <7, when both parameters were abnormal 14(63.6%) cases had APGAR score of <7, when NST was normal and AFI was abnormal 2(28.6%) cases had APGAR score of <7 and when NST was abnormal and AFI was normal 9(81.8%) cases had APGAR score of <7 which is found to be statistically significant (p <0.001). (Table 6)

Table 7: Comparison between MBPP and Meconium Stained Liquor:

MBPP	MSL(n=26)	Percentage
Both Normal (110)	4	3.63%
Both Abnormal (22)	14	63.63%
NST abnormal–AFI normal (11)	5	45.45%
NST normal – AFI abnormal (7)	3	42.8%

Out of 150 cases studied, 26 cases were having babies with meconium stained liquor. Maximum MSL cases were 14(63.63%) in which both parameters were abnormal, when both parameters were normal there was only 4 (3.63%) MSL, when NST was abnormal and AFI was normal 5(45.45%) MSL cases were present, and when NST was normal and AFI abnormal 3(42.8%) MSL cases were observed. (Table 7)

Table 8: Comparison between MBPP and NICU admission.

MBPP	NICU admission (n=29)	Percentage
Both Normal (110)	9	8.18%
Both Abnormal (22)	13	59.1%
NST abnormal – AFI normal (11)	4	36.36%
NST normal – AFI abnormal (7)	3	42.86%

Out of 150 cases, there were 29 NICU admissions. When both NST and AFI were abnormal maximum admissions were observed in 13(59.1%) of cases. When both NST and AFI were normal, least number of NICU admission were present, which was 9(8.18%) and when NST abnormal and AFI normal, or when NST normal and AFI abnormal, 4(36.36%) and 3(42.86%) cases were observed respectively. (Table 8)

Table 9: Causes of NICU Admission.

Cause	Number of Patients (N=29)	Percentage
Meconium Aspiration Syndrome	5	17.2%
Respiratory Distress Syndrome	9	31.0%
Birth Asphyxia	8	27.6%
Jaundice	7	24.2%

Out of 29 cases of NICU admission, maximum cases were due to Respiratory Distress Syndrome 9(31%), due to Birth Asphyxia was in 8(27.6%) cases, due to Jaundice was in 7(24.2 %) cases and due to Meconium Aspiration Syndrome was in 5(17.2%) cases. (Table 9)

Table 10: Comparison of MBPP and Mode of Delivery.

MBPP	Vaginal (%) (n= 102)	LSCS (%) (n=48)	P Value
Both Normal (110)	93 (84.5)	17 (15.5)	P < 0.001
Both Abnormal (22)	6 (27.2)	16 (72.8)	
NST abnormal – AFI normal (11)	1 (9.1)	10 (90.9)	
NST normal – AFI abnormal (7)	2 (28.6)	5 (71.4)	

When NST and AFI both parameters were normal, 93(84.5%) cases had vaginal delivery and 17(15.5%) cases had delivery by caesarean section. When both parameters were abnormal, 6(27.2%) cases had vaginal delivery and 16(72.8%) had delivery by caesarean section. When NST was abnormal and AFI was normal, 1(9.1%) case had vaginal delivery and 10(90.9%) had delivery by caesarean section. When NST was normal and AFI was abnormal 2 (28.6.2%) cases had vaginal delivery and 5(71.4%) had delivery by caesarean section which is found to be statistically significant (p<0.001). (Table 10)

Discussion

The main aim of antenatal fetal surveillance is timely identification of compromised fetus. The best method is which aims at identifying the fetus at risk, but still in an uncompromised state and requires immediate intervention. At the same time intervention should be avoided which is going to be risky and costly for both mother and fetus.

Modified biophysical profile scoring is a part of comprehensive fetal assessment which has been the basis of this study.

It is a combination of: - Non stress test (NST), and amniotic fluid Index (AFI). The first being a short-term marker and the last one is long term marker of placental function and feto-maternal perfusion.

The test group consists of 150 pre-eclamptic pregnant patients at 34–40 weeks of gestation.

Maximum cases were in age group 21–25 years.

Majority of cases belonged to gestational age 38–40 and maximum cases were primi gravida.

Of the 150 NST's in MBPP, 77% were reactive and 23% were non-reactive. The AFI values were >5 in 83.4% of the cases. (Table 11) Earlier works by Miller et al (1996), Eden et al (1998) and Sowmya K P et al (2017) also showed similar results, evident from the following.

Table 11: Comparison of MBPP results with other study groups:

Test results	Miller et al	Eden et al	Sowmya K P et al	Present study
Reactive NST	90.8%	96.0%	68.57%	77%
AFI >5	86.1%	88.4%	91.43%	83.4%

The mode of delivery in the study group with respect to MBPP result showed that when MBPP was normal with respect to both parameters, the incidence of LSCS and vaginal delivery among these were 18.8% and 44.28% respectively. When the MBPP was abnormal with respect to both parameters 60% of the cases had LSCS and 40% of them had vaginal delivery.

This shows that the mode of delivery in cases where MBPP was normal was vaginal in most of the cases and the incidence of LSCS in cases where MBPP was abnormal was increased.

The incidences for LSCS for fetal distress in various studies were as follows:-

Booked cases were more and majority of the cases were referred as our hospital is a tertiary referral centre.

Out of 150 cases studied 26 cases were having babies with meconium stained liquor. (Table 12) When both parameters were abnormal there were 63.63% cases were MSL. When both parameters were normal there were only 3.63% cases were MSL. When NST was abnormal and AFI normal 45.45% cases were MSL and when NST was normal and AFI abnormal 42.8% cases were MSL.

Hence from the above results, it is seen that the incidence of perinatal morbidity with respect to meconium is increased when both MBPP parameters were abnormal, and more so when NST abnormal compared to AFI abnormal when individual parameters were considered.

The volume of amniotic fluid was measured according to the four quadrant technique.

The present study was done to evaluate fetal outcome in relation to MBPP.

Table 12: Summarised Data.

Outcome Parameters	Both Parameters Normal	NST Normal AFI Abnormal	NST Abnormal AFI Normal	Both Parameters Abnormal
Meconium Stained Liqour	4	3	5	14
LSCS	17	5	10	16
APGAR <7	4	2	9	14
Admission to NICU	9	3	4	13

This suggests that MBPP is a simple and cost effective tool in determining the major aim of antenatal patient which is the outcome of baby.

MBPP provides a holistic approach to the pre-eclampsia cases. It aids in deciding the mode of delivery as well as predicts the neonatal outcome.

Conclusion

Modified biophysical profile (MBPP) is easier, less time consuming, cost effective and patient compliant test.

- When the Modified biophysical profile is normal, it gives reassurance that the fetal status is good with good perinatal outcome. At the same time, when MBPP is abnormal, it indicates that the fetus may be compromised.

- When the MBPP is abnormal there is increased incidence of perinatal morbidity as well as mortality.

- When considered individually, abnormal AFI was associated with increased incidence of perinatal morbidity and abnormal NST was associated with increased incidence of perinatal morbidity as well as perinatal mortality.

- MBPP can be used as a primary antepartum fetal surveillance test to predict perinatal outcome and provide timely intervention in high risk pregnancies.

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