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Original Research Article

## Comparison of the biophysical profile and modified biophysical profile in prediction of the fetal outcome in pregnancy induced hypertension

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### ABSTRACT

**Background:** Pregnancy induced hypertension is one of the major causes of fetal morbidity and mortality. Biophysical profile is one of the tests performed to predict the fetal outcome which though is simple, is time consuming and costly. This study was performed to compare the modified biophysical profile to the biophysical profile.

**Methods:** 200 patients over the gestation period of 34 weeks with pregnancy induced hypertension were divided into Group A consisting of 100 patients who were studied with biophysical profile (BPP) and Group B consisting of 100 patients who were studied by the modified biophysical profile (MBPP).

**Results:** Mild hypertension was found in 80% of the cases while 20% of the cases had severe hypertension. Most of the patients were primigravida while very few of them were fourth gravidae. 78 patients had a score of BPP 8-10, out of which 7 had fetal distress while 71. Abnormal BPP score (<6) was observed among 22% of the patients in group A. Of these 22 patients, 9 patients had a score of <2 and all of them delivered by LSCS due to chronic fetal distress. Among the MBPP score, IUGR was seen among 4 fetuses who had a low score. Out of the 5 patients who had fetal distress, 2 fetuses were still born. Both BPP and MBPP were comparable to each other in terms of sensitivity, specificity and the predictive negative and positive values.

**Conclusions:** Since BPP requires more expertise than MBPP in terms of processing and time saving, MBPP can be used as a substitute to BPP.

**Keywords:** Biophysical profile, Modified biophysical profile, Pregnancy induced hypertension

### INTRODUCTION

The field of obstetrics has developed radically since the times of the old, when 'delivery' pertained more to the delivery of the baby and not so much about its well-being. Caesarean was then considered to be dangerous, if not fatal. However, now, with the changing times, more care is being taken towards the well-being and the fetal outcome, as much as a safe and non-complicated delivery.

High risk pregnancies form about one fourth to one third of the total pregnancies and are likely to cause the maximum number of fetal morbidity and mortality. Of these, the major bulk is contributed by the hypertensive disorders of the mother. This is estimated to be about 6-10% of all pregnancies. Of them about 20% are preterm births.<sup>1</sup>

About 7.3 million perinatal deaths occur every year around the world and most of these occur in Asia. In India alone, around 890000 deaths of the infants occur

annually.<sup>2</sup> An estimated number of 3.77% of deaths occur in India with the rural areas being the largest contributor with 5.44% compared to the urban.<sup>3</sup> This high rate of morbidity and mortality has influenced many researchers to identify newer methods to evaluate the well-being of the fetus intra and antepartum. Fetal movement is an indicator of proper CNS function. During hypoxemia, the fetal movement decreases due to the attempts by the fetus to conserve energy, thereby raising a concern. A chemoreceptor response to hypoxemia, leads to vagally mediated reflexes slowing the fetal heart rate, thereby appearing as decelerations. Fetal heart monitoring system has improved with increased sophisticated instrumentations for antenatal assessment of fetal well being.<sup>4</sup>

These changes can be measured by biophysical profile (BPP) which was defined by Manning for the first time, which included five variables such fetal breathing, movement, tone, amniotic fluid and non-stress test with ultra sound or Doppler to measure the fetal heart rate.<sup>5</sup> The modified biophysical profile (MBPP) was suggested by Nageotte et al which combines the non-stress test as a short term marker of the fetal stat and for the long term placental function, it utilizes the amniotic fluid index.<sup>6</sup>

As biophysical profile is laborious and requires a person trained in ultrasonic visualization of the fetus, modified biophysical profile is nowadays being used as the first line antepartum screening test.

## METHODS

This study conducted by Department of Obstetrics and Gynecology, Dhanalakshmi Srinivasan Medical College and Hospital for a period of three years. Out of the 7854 deliveries conducted at the hospital, 409 had pregnancy induced hypertension, with more than 34 weeks of gestation. Of these, 200 patients were randomly selected into the study by random table method. Informed consent was taken from all the patients. Those who were unwilling to participate in the study were excluded.

All of these selected patients were equally divided into two groups. Group A consisted of 100 patients who were studied with biophysical profile (BPP) and Group B consisted of 100 patients who were studied by the modified biophysical profile (MBPP).

The selection of the study patients was restricted to 34 weeks and above as if the biophysical profile score is low, immediate intervention can be given and the perinatal morbidity and mortality will be low. Also, the incidence of respiratory distress in these fetuses will be the lowest in this gestational age and the fetal weight will be close to 2 kgs or more.

All the patients were subjected to detailed physical and clinical examination. Apart from obtaining blood for biochemical and hematological investigation, blood

pressure was taken for all of them and noted. Urine was collected to check the albumin levels.

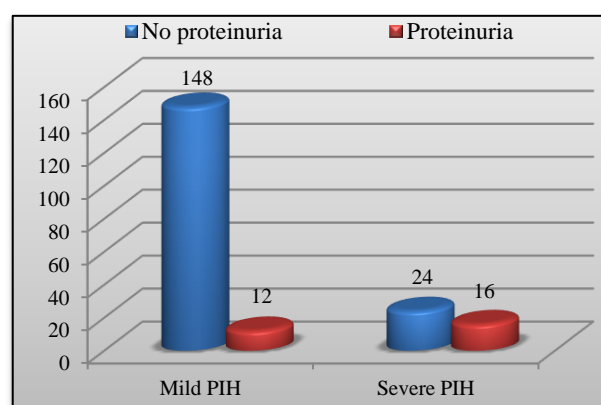
BPP was performed in Group A patients according to Manning et al.<sup>1</sup> 5 variables that were taken into consideration were Foetal breathing movements, Gross body movements, Fetal tone, Reactive fetal heart rate, and qualitative amniotic fluid volume. For a normal reading the score given for each parameter was 2 and for abnormal, it was 0. The BPP was done 2-3 hours after a meal and was repeated every week till the time of delivery, if the BPP score was more than 6 and repeated twice weekly if the score was less than 6. The maximum number of procedures done on a single patient was 4.

The MBPP was done using the method proposed by Vintzileos et al, which included only 2 parameters being Non stress test (NST) and Amniotic fluid index (AFI). Score of 2 was given if the NST was reactive i.e. when there was an acceleration of foetal heart rate 3 times in 10 minutes, or acceleration of 15 beats/min lasting for 15 seconds, with good beat to beat variability and no decelerations. If there were accelerations of less than 2 in 10 minutes, with <15 beats per min or lasting <15 seconds, with poor beat to beat variations or presence of decelerations, the score given was 0. MBPP was measured 2-3 hours after a meal and repeated weekly till the time of delivery if both the parameters were good. As per the management of the protocol, BPP and MPP scoring was repeated in some patients where necessary.

Foetal outcome was done based on the APGAR score, with the maximum of 10 showing the well-being of the infant., need for resuscitation, signs of prematurity, Birth weight etc.

## RESULTS

5.2% of the total pregnant women who came in for delivery had pregnancy induced hypertension.



**Figure 1: Classification of PIH patients.**

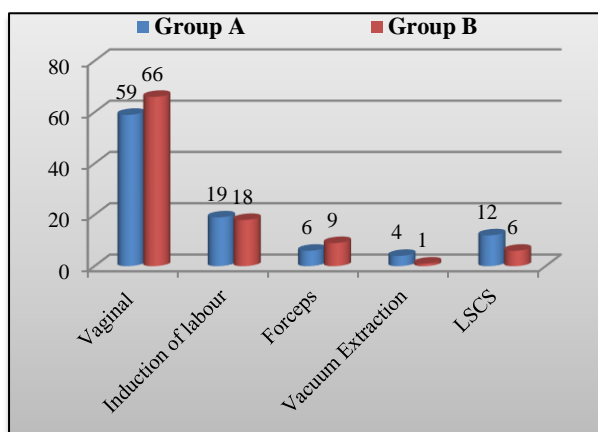
Out of the study subjects, 148 (74%) of them had mild hypertension with no proteinuria while 24 (12%) of them

had severe hypertension with no proteinuria (Figure 1). Mild hypertension was found in 80% of the cases while 20% of the cases had severe hypertension. These patients were equally distributed into the two groups at the beginning of the study.

**Table 1: Classification of the patients according to the gravida.**

	Group A	Group B
Primi	116 (58%)	108 (54%)
Second gravidae	52 (26%)	59 (29.5%)
Third gravidae	22 (11%)	27 (13.5%)
Fourth Gravidae	9 (4.5%)	6 (3%)
More than 4	1 (0.5%)	0 (0)

Most of the patients were primigravida while very few of them were fourth gravidae (Table 1). There was only 1 subject who was 5th gravidae in Group A.

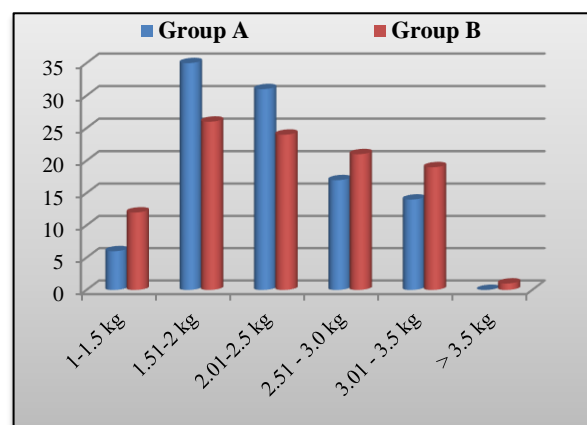


**Figure 2: Type of delivery**

Most of the women delivered through vaginal delivery (59% if group A and 66% in Group B). Induction of the labor was the next common mode of delivery. There were only 12% in Group A and 6% in group B who had undergone LSCS (Figure 2).

78 patients had a score of BPP 8-10, out of which 7 had fetal distress while 71 (91%) did not. All these patients delivered by vaginal delivery. Abnormal BPP score (<6) was observed among 22% of the patients in group A. Of these 22 patients, 9 patients had a score of <2 and all of them delivered by LSCS due to chronic fetal distress. 13 patients has a score of 4-6, out of which 8 had fetal distress while 5 did not.

All those who did not have fetal distress delivered normally through vaginal delivery, while of the 8, 2 were delivered by LCSC and 3 each by vacuum extraction and forceps (Table 2). 5 patients had IUGR babies and 8 had meconium staining liquor.



**Figure 3: Birth weight of the foetus.**

**Table 2: Fetal outcome.**

BPPScore	Deliveries with		Morbidity		Mortality	
	No Fetal distress	Fetal distress	Meconium	IUGR	Still Born	Neonatal death
0-2	0	9	9	8	0	1
4-6	5	8	6	9	0	0
8-10	71	7	8	5	1	0
<b>MBPP</b>						
Low score	2	5	5	4	2	0
Equivocal with NR NST (poor)	1	3	3	2		2
Equivocal with AFI<5 cm (good)	4	3	4	4	0	0
Highest score	75	7	5	13	2	0

The sensitivity of the BPP score was higher than that of MBPP score which was only 55.6% sensitive, while the specificity of later was only marginally higher.

The predictive value of a negative or a positive test was comparable to each other as was the percentage of false positives and false negatives (Table 3).

**Table 3: Comparison of BPP and MBPP.**

	BPP score	MBPP score
Sensitivity	70.8%	55.6%
Specificity	93.4%	96.3%
Predictive value of a positive test	77.2%	72.8%
Predictive value of a negative test	91%	88.8%
Percentage of false positives	6.6%	3.7%
Percentage of false negatives	41.2%	55.7%
Perinatal morbidity (IUGR)	30.1%	22.3%
Perinatal mortality	1.3%	5.8%

## DISCUSSION

The major goal of foetal surveillance during pregnancy is the identification of any compromising factors which can lead to foetal morbidity and mortality. Therefore, there is a need for the best and the least troublesome method to identify the foetus at risk so that immediate action can be taken. There has been tremendous development in the field of science in identifying the foetal heart rate as well as foetal movements. Manning described a multiparameter approach to assess the foetus using 4 variables- three foetal movements, tone, breathing and non-stress test.<sup>5</sup> However, a modification was done to this by combining two variables, the non-stress test and the amniotic fluid index.<sup>7</sup>

Chamberlain, had reported the outcome of pregnancy by the AFV measurement and Phelan reported the usefulness of the semiquantitative assessment of amniotic fluid index (AFI).<sup>8,9</sup> Biophysical profile was first performed as a first line antepartum test by Clarke, while Miller worked on the modified BPP resulting in the wide acceptance of this test. In the present study, the patients were divided into two groups, with group A tested with BPP and group B with MBPP. Both groups were as far as possible identical in terms of their gravidity, parity and severity of the PIH etc. The surveillance for this study was initiated at 34 weeks gestation, with most of them primigravidae.

The sensitivity of the BPP score was 70% while it was 56% by MBPP score, though this difference was not significant. The false positive and the false negative values were comparable in both the groups. This was in concordance to another study by Jamal et al who also found no significant difference in the sensitivity, specificity, negative and positive predictive values of BPP and MBPP score.<sup>4</sup> Similar results were found in another similar study by Young et al, and Millar et al who also concluded that the false negative rate of MBPP is fairly comparable with the false negative rate of complete BPP.<sup>10,11</sup>

In our study 22 patients had a score of <6 with BPP score and 7 with low score with MBPP. Most of these patients had fetal distress and out of them, LSCS was performed on most of them. This high incidence of performing LSCS for abnormal test scores was reported in another study by Jamal et al wherein 90% of the abnormal score patients were treated with caesarian section.<sup>1</sup> AFI<5 was seen among 7 patients out of the 18 abnormal cases (38.9%), out of which 3 had fetal distress. Manning in his study reported a 42.7% AFI<5cm score, while Miller et al reported 82.7%. Eden et al in their study had 88.4% patients with AFI<5cm among the abnormal patients in their study.<sup>12</sup> This variation in the scores could be due to the fact that not only preeclampsia patients, but also those with mild PIH were included into the present study.

The non-stress test with vibroacoustic stimulation test has an additional advantage of obtaining a startling response in the fetus and predicting a full BPP score of 8-10, thereby enabling the use of MBPP instead of BPP as a routine test. This was also suggested by Saringolu et al.<sup>13</sup> In present study, there were 1.3% mortality on Group A and 5.8% in Group B. This was similar to a study by Raparthi et al, who reported a mortality rate of 3.33% among the patients who underwent MBPP scoring.<sup>14</sup> Eden et al reported a mortality rate of 1.2% on their study.<sup>12</sup>

## CONCLUSION

We conclude that both BPP and MBPP were equally comparable in terms of sensitivity and specificity. The predictable negative and positive values were also similar. Since BPP requires more expertise than MBPP in terms of processing and time saving, MBPP can be used as a substitute to BPP. However, the final decision should remain with the treating physician and the availability of the required equipment and the skilled personnel.

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