

# Diagnostic Accuracy of Modified Biophysical Profile in Predicting Poor Perinatal Outcome in Pregnancies Complicated by Hypertension at Term

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## ABSTRACT

**Background:** Hypertension in pregnancy has an impact to improve the perinatal and maternal morbidity and mortality which is very important determinant to improve sustainable developmental goals. The high perinatal mortality in women with hypertension in pregnancy is mainly due to fetal growth restriction and iatrogenic preterm delivery.

**Aim:** The diagnostic accuracy of modified biophysical profile is assessed in predicting perinatal outcome in hypertensive pregnancies taking Apgar score at 5 minutes at gold standard

**Methods:** A cross sectional study was conducted in Department of Obstetrics & Gynecology, Unit II Services Hospital, Lahore from 26-6-2021 to 26-12-2021. After meeting the inclusion criteria 180 females were enrolled. Then all females underwent assessment of MBPP. All females were managed efficiently as per standard management protocols. Then females followed-up till delivery of baby. Data analysis was done on SPSS version 22.

**Results:** In this study the mean age of the females was 30.27±5.91 years, there were 29(16.11%) females were nulliparous, 44(24.44%) females had parity 1. MBPP predict poor perinatal outcome in 42(23.3%) females. The sensitivity, specificity and diagnostic accuracy of MBPP was 72%, 95.38% & 88.89% respectively.

**Conclusion:** This present study concluded that the modified biophysical profiles a useful and cost effective tool for predicting perinatal outcome in hypertensive pregnancies

**Keywords:** Pregnancy, Perinatal outcome, Modified Biophysical Profile

## INTRODUCTION

Sustainable developments goals aim to improve maternal and perinatal mortality. Hypertension in pregnancy and its complications are considered the most challenging reason to deal in reducing maternal mortality. According to NICE guidelines it complicates out of 30 out of 100 women and that affects 20% - 30%. Team of experts in obstetrics are doing research to reduce the complications in high risk pregnancy in terms of its complications leading to unconsciousness state leading to pre-eclampsia and eclampsia, and increase admission in high dependency unit due to hypertensive complications. This in turn escalate the perinatal complications in terms of low birth or fetal growth restriction, iatrogenic deliveries, fetal distress due to placental insufficiency and increase neonatal admissions.<sup>2</sup> In a Pakistani study, the frequency of poor Apgar score was noticed in 20.1% hypertensive pregnancies.<sup>3</sup> It is recommended by American College of Obstetricians and Gynecologists to offer antepartum fetal surveillance with biophysical profile for pregnancies at increased risk of antepartum fetal demise. The fetal biophysical profile (BPP) is a noninvasive test, by ultrasound to early diagnose fetus with signs of distress by its movements, tone breathing and amniotic fluid volume. It can be adjuncted with non-stress test to increase its positive predictive value<sup>4</sup>.

Increasing trend toward antepartum fetal monitoring aim to minimize the neonatal admissions in nursery and improve the perinatal outcome. Now modified bio physical profile (MBPP) is an antepartum surveillance test combining non stress test and AFI, instead of four parameters as in traditional BPP.<sup>3,5</sup> A study conducted in China had resulted in terms to define results of MBPP as 55.6% and 96.3% in predicting poor perinatal outcome.<sup>6</sup> Another study reported the sensitivity of 43.75% and specificity of MBPP 75.53% in predicting poor perinatal outcome (poor Apgar score).<sup>7</sup> But Shanta IJ observed the results in terms of prediction of perinatal outcome by modified biophysical profile as 88%<sup>8</sup>. Rationale of this study is to assess the predictive accuracy

of MBPP in predicting perinatal outcome in hypertensive pregnancies. MBPP use less features for prediction of fetal wellbeing instead of traditional BPP method.

This is time and cost effective. Literature showed that MBPP has low accuracy for prediction of fetal outcome. But controversial results have been obtained from literature and there is no local evidence present in literature which could help us in determining the accuracy of MBPP. So, we want to conduct this study, so that we can assess the local data and apply the results of this study in local setting and can be able to implement the use of MBPP in routine in labour room. This will also help to improve our practice and will also help to reduce the burden of obstetricians.

**Objective of the study:** The diagnostic accuracy of modified biophysical profile is assessed in predicting perinatal outcome in hypertensive pregnancies taking Apgar score at 5 minutes at gold standard

## MATERIALS & METHODS

After getting permission from Hospital Ethical Review Board a cross sectional study conducted in Department of Obstetrics & Gynecology, Unit II Services Hospital, Lahore from 26-6-2021 to 26-12-2021. Sample size of 180 females were calculated and taking expected percentage of poor Apgar score i.e. 20.1% with sensitivity of MBPP i.e. 70% with 13% as keeping error and specificity of MBPP i.e. 88% with 12% possibility of error in hypertensive pregnancies. The Inclusion Criteria was Females of age 20-40years with parity<5, with gestational hypertension (as per operational definition) presenting at gestational age >37 weeks in active labour (>3contractions within 10 minutes, cervical os>4cm). The exclusion criteria was females with known diabetes or gestational diabetes diagnosed by OGTT, chronic hypertension (BP≥140/90mmHg) before 20 weeks, preeclampsia (BP≥140/90mmHg with proteinuria and eclampsia convulsions with raised blood pressure or anemia (Hb<10g/dl) and with cardiac problem (on medical record), liver disease (AST>40IU, ALT>40IU, or hepatitis B or C), renal disease (creatinine>1.2mg/dl)

**Data Collection Procedure:** One hundred and eighty females presenting at gestational age >37 weeks in active labour (>3 contractions within 30 minutes, cervical os<4cm) were consented

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for the study from labour room of Department of Gynecology and Obstetrics, Services Hospital Lahore. Informed consent was obtained from all patients. Detail biodata of patients including (name, age, gestational age, parity, BMI, BP) were noted. Then all females undergo assessment of MBPP by researcher herself. A quick ultrasound was done and amniotic fluid index was noted. Then CTG was also done and non-stress test was performed. MBPP was calculated and it was labeled as positive if non-stress test is suspicious or non-reassuring (presence of <2 acceleration in fetal heart beat in a 20-minute trace or more than 40-minute testing period) and AFI≤5cm detected on abdominal ultrasound) and was labeled as negative if non-stress test is reactive (presence of ≥2 accelerations in fetal heart beat within a 20-minute period) and AFI 6-21cm detected on abdominal ultrasound). Females were labeled as positive or negative according to the test result. All females were managed efficiently as per standard management protocols. And record keeping and meticulous follow up done till birth of baby. After delivery, Apgar score was noted and poor Apgar score was labeled if baby had APGAR<7 at 5minutes and it were labeled as negative if baby had APGAR≥7 at 5minutes (as per operational definition). All deliveries were done by researcher herself and careful record keeping on designed proforma.

**Data Analysis:** Data entry on excel and analysis by SPSS version 22. Mean and SD were used for quantitative variables including age, gestational age and BMI. Frequency and percentage was used for Qualitative variables like perinatal outcome (poor Apgar score) .2x2 table was generated to calculate sensitivity, specificity, PPV, NPV and diagnostic accuracy of MBPP. Data was stratified for age, gestational age, BMI, BP and parity. Post-stratification, 2x2 tables were generated for each stratum to calculate sensitivity, specificity, PPV, NPV and diagnostic accuracy of MBPP.

**RESULTS**

In this study total 180 females were included who fulfilled the criteria. The mean age of the females in study was 30.3±5.0 years. The mean gestational age of the females was 38.54±1.032 weeks. Out of 180 females, there were 29(16.11%) females were nulliparous, 44(24.44%) females had parity 1, 51(28.33%) females had parity 2, 34(18.89%) females had parity 3 and 22(12.22%) females had parity 4. The mean BMI of the females was 24.79±4.98 kg/m<sup>2</sup> (Table 1).

This study had the mean systolic blood pressure of the females was 169.69±18.63 mmHg and mean diastolic blood pressure of the females was 96.06±5.54 mmHg with minimum & maximum values of 90 & 110 mmHg respectively. MBBP predict poor perinatal outcome in 42(23.3%) females. The frequency distribution shown in Table 2

Out of 180 females the poor perinatal outcome by APGAR at 5 minutes noted in 50(27.78%) females. Fig#1 the results in terms of sensitivity and specificity were was 72% and 95.38% respectively taking poor perinatal outcome on basis of APGAR score as gold standard.

The results of modified biophysical profile in relation to age, BMI and blood pressure taking poor perinatal outcome as gold standard is summarized in table 3

Table 3: Validity of MBBP taking poor perinatal outcome by APGAR

Age	MBBP	Poor perinatal outcome		Sensitivity	Specificity	Diagnostic accuracy
		Positive	Negative			
<30	Positive	20	4	58.82%	92.86%	80%
	Negative	14	52			
>30	Positive	16	12	100%	97.3%	97.78%
	Negative	0	72			
Gestational age (weeks)	Positive	19	4	79.17%	93.12%	89.16%
	Negative	5	55			
BMI	Positive	14	0	51.85%	97.5%	81.94%
	Negative	13	45			
Systolic Blood Pressure	Positive	26	3	76.47%	95.31%	88.78%
	Negative	8	61			
Diastolic blood pressure	Positive	33	6	71.74%	95.04%	88.62%
	Negative	13	115			

According to this study in null & primary parity patients, diagnostic accuracy of 79.45% taking poor perinatal outcome as gold standard as compared to & 95.33% in multiparity taking poor perinatal outcome as gold standard. In patients with normal BMI, the sensitivity, and specificity of 51.85% and 100%respectively taking poor perinatal outcome as gold standard.

The study results showed that in patients with systolic blood pressure 140-170 mmHg, the sensitivity, specificity and diagnostic accuracy of 76.47%, 95.31% & 88.78% respectively taking poor perinatal outcome as gold standard. Similarly, among patients with systolic blood pressure 171-200 mmHg, the sensitivity, specificity and diagnostic accuracy of 62.5%, 95.45% & 89.02% respectively taking poor perinatal outcome as gold standard. Patients with diastolic blood pressure 90-100 mmHg, the sensitivity, specificity and diagnostic accuracy of 71.74%, 95.04% & 88.62% respectively taking poor perinatal outcome as gold standard. Similarly, among patients with diastolic blood pressure 101-110 mmHg, the sensitivity, specificity and diagnostic accuracy of 75%, 100% & 92.31% respectively taking poor perinatal outcome as gold standard.

Table 1: Demographic characteristics of study population

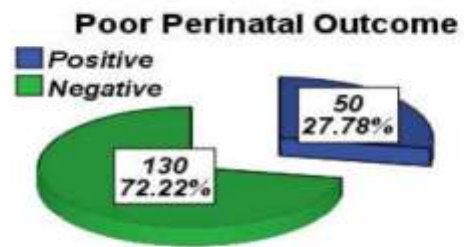
Characteristics	Mean	SD	Min.	Max.
Maternal age (years)	30.27	5.91	20.00	40.00
Gestational age of women (weeks)	38.54	1.032	37.00	40.00
BMI	24.79	4.98	16.50	34.93
Systolic BP (mmHg)	169.7	18.63	140.00	200
DiastolicBP (mmHg)	96.06	5.54	90	110

Table-2: Frequency Distribution of Modified Biophysical Profile

CRP	Poor Perinatal Outcome		Total
	Positive	Negative	
Positive	36(85.7%)	6(14.3%)	42(100.0%)
Negative	14(10.1%)	124(89.9%)	138(100.0%)
Total	50(27.8%)	130(72.2%)	180(100.0%)

Sensitivity 72% Specificity 95.38%  
 PPV 85.71% NPV 89.86%  
 Diagnostic Accuracy 88.89%

Fig. 1:



## DISCUSSION

This is a cross-sectional study carried out at Unit II, Department of Gynecology and Obstetrics, Services Hospital, Lahore to assess the diagnostic accuracy of modified biophysical profile to assist in predicting perinatal outcome in patients with hypertension in pregnancy including Apgar score at 5 minutes as gold standard. Maternal and perinatal morbidity is important pillar of health care of the country. Fetal biophysical profile is a well-established method of Feto maternal surveillance in pregnancies at high risk of complications. Modified biophysical profile (MBPP) was first described by Nageotte et al. In this study the MBBP predict poor perinatal outcome in 42(23.3%) females while the poor perinatal outcome by APGAR at 5 minutes noted in 50(27.78%) females. The sensitivity of test was 72% and results showed specificity and diagnostic accuracy of MBPP as 95.38% & 88.89% respectively taking poor perinatal outcome on basis of APGAR score as gold standard. Some of the studies are discussed below showing their results as. A study by Nageotte MP et al documented that babies who are growth restricted can be determined well by use of modified biophysical profile and predict in perinatal outcome. Jankidevi S. Borade et al concluded that biophysical profile is a cost-effective investigation to escalate timely management in intervention for babies at risk of intrauterine demise. One study showed that the sensitivity and specificity of MBPP were 70% and 88% in predicting poor perinatal outcome (poor Apgar score). According to study results by Eden et al<sup>63</sup> had chances of the neonate admission in neonatal unit are greater with abnormal results of biophysical profile.

## CONCLUSION

This present study concluded that the modified biophysical profile is a useful and cost-effective tool for predicting perinatal outcome in hypertensive pregnancies

**Author contribution:** **RA:** Concept and Data collection, **NB:** Initial Drafting, Discussion Writing and Final Proof reading, **WR:** Data Analysis, **AM:** References writing And Data Analysis, **UZ:** Data Analysis, **SH:** Discussion Writing, **TW:** Discussion Writing and Final Proof reading

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