

Role of Fetal Biophysical Profile in High Risk Pregnancy and Fetal Outcome

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Abstract

Background & Objective: To improve the obstetric result in high risk pregnancy by ante partum fetal assessment by biophysical profile scoring. *Methods:* 50 patients of high risk pregnancy was selected after 32 weeks of gestation and five variables of biophysical profile were scored. *Results:* BPP score 10/10 in 40% cases 8/10 in 32% cases & 6/10 or less in 28% cases. NST was reactive in 60% cases and non reactive in 40% cases. AFI was less than 5 in 12% cases. Delivery was by LSCS in 32% cases. NICU admission was 68% of which maximum had BPP score was 6 or less. *Interpretation & Conclusion:* Fetal biophysical profile is a very effective method for ante partum fetal surveillance. It has been seen low biophysical profile score of fetus results in increase operative delivery, birth asphyxia, low APGAR, increased NICU admission.

Keywords: Biophysical Profile; NST; Fetal Breathing Movement; Fetal Movement; Fetal Tone; Amniotic Fluid; APGAR.

Introduction

Attainment of motherhood is one of the normal and most wanted instincts of all women. This desire is one of the strongest desire and more so when she is a high-risk case. Pregnancy as a high-risk event was first recognized in 1901 by

Ballantyne in his paper titled "A plea for pre-maternity hospital". First antenatal clinic was established in 1911 in Boston, USA. Time is changing. The process of birth is the most dangerous journey an individual undertakes. A healthy Newborn is the goal of every expectant mother and her physician. Yet, for every 1000 births, the perinatal mortality in India is about 37.7 per 1000, but varies from 24.8 in Kerala to 75.5 per 1000 in Orissa. It is higher in rural (54.4) than urban (32.4) areas. It is estimated that about 7.3 million perinatal deaths occur annually in the world and most of these in the developing countries, especially in Asia. In the 19th Century, fetal assessment consisted of auscultation of fetal heart sounds and subjective recording of fetal movements. During the course of 20th century, these techniques have been augmented by electronic fetal heart rate monitoring and sonographic evaluation of fetal activity and amniotic fluid volume [1]. In the study the aim is (i) to prove the efficacy of biophysical profile as an effective tool for ante partum fetal surveillance (ii) to see the perinatal outcome in respect of BPP score (iii) to see the different components of BPP & perinatal outcome

Materials and Methods

This study was conducted at vims bellary Karnataka. which is a tertiary care centre and serves as a main referral hospital. In this prospective study 50 pregnant patients with high risk factors admitted to the ward because of their high risk factor after 32 weeks during a period from July 2015 to Dec. 2016 were considered as "Test Group". Fetal outcome was considered till 3 days after

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delivery. In the test group patients, a detailed history was taken. The risk factor for which the patient was included in the test group was noted. A thorough clinical examination was made at booking or admission and Blood Pressure, Pulse, Presence of Pallor, Oedema and Icterus was noted. A detailed Systemic examination was done. Obstetric examination was carried out. All preliminary investigations were made as out lined in the proforma and a baseline ultrasound scanning was done to rule out congenital anomalies and to confirm the gestational age. The patients were evaluated with the Biophysical Profile consisting of the Non - Stress Test recording for a period of 20 mins, followed by Amniotic Fluid Index measurement using 4 - Quadrant technique. The test was initiated at 32 weeks of Gestation or later at which risk factor was identified. The test was repeated weekly or bi-weekly or daily depending on severity of the risk factors included in the study were -1. Oligamnios, 2. PIH, 3.

IUGR, 4. APLS, 5. Postdatism, 6. BOH, 7. Rh-negative pregnancy, 8. Renal disease, 9. Placenta previa, 10. Diabetes/GDM. The details of intrapartum monitoring, the amount and color of liquor, and the outcome details like APGAR, birth weight, need for resuscitation and NICU admission and condition at discharge were noted down.

Results

The study and control groups consisted of 50 high risk pregnant patients. Totally 161 BPP tests were performed on 50 patients in the study group and the following observation were made.

Pregnancies with preeclamptic toxemia, BOH, Rh Negative pregnancy and period of gestation beyond 40 weeks formed the major risk factors. Total figure shows more than 50 patients because same patient had more than one risk factor.

Table 1: Distribution of risk factors

Sr. No.	Risk Factor	No. of Patients (N = 50)	%age
01	PIH	14	28
02	Renal transplant	01	02
03	Recipient BOH	10	20
04	RhNeg	10	20
05	Postdatism	09	18
06	Diabetes	04	08
07	Oligoamnios	06	12
08	Bronchial asthma	01	02
09	Antidepressant	01	02
10	IUGR	05	10
11	ART pregnancy	01	02
12	Placenta previa	02	04

Table 2: Gravida Distribution

Sl. No.	Gravida	No. of patients
01	Primi - Gravida	18
02	2 nd Gravida	11
03	3 rd Gravida	14
04	4 th Gravida	07

Majority of patients were primi gravida

Table 3: Age distribution

Sr. No.	Age in Years	No. of Patients
01	16 - 20	04
02	21 - 25	15
03	26 - 30	17
04	31 - 35	11
05	36 - 40	03

Majority of patients belonged to the 26 - 30 age group in both (Graph - 3).

Table 4: Blood group

Sr. No.	Blood Group	No. of Patients
01	A Positive	08
02	A Negative	05
03	B Positive	10
04	B Negative	07
05	AB Positive	04
06	O Positive	14
07	O negative	02

Table 5: Number of times BPP performed

No. of Test	No. of Patients	Percentage
1	13	26
2	07	14
3	11	22
4	07	14
5	12	24

Table 6: Gestational age at first BPP

Sr. No.	Gestational age in weeks	No. of patients	Percentage
1	32 - 33	02	04
2	33 - 34	02	04
3	34 - 35	04	08
4	35 - 36	02	04
5	36 - 37	03	06
6	37 - 38	10	20
7	38 - 39	14	28
8	39 - 40	04	08
9	> 40	09	18

No. of patients does not tally as same patient has undergone BPP in different gestational age.

Table 7: Last BPP score

BPP score	No. of patients	Percentage
10	20	40%
8	16	32%
≤6	14	28%

Table 9: Last FBM result

Sr. No.	Result	No. of patients	Percentage
1	Present	34	68%
2	Absent	16	32%

Table 10: Last Foetal body movement result

Sr. No.	Result	No. of patients	Percentage
1	Present	42	84%
2	Absent	08	16%

Table 11: Last Foetal Tone result

Sr. No.	Result	No. of patients	Percentage
1	Present	48	96%
2	Absent	02	4%

Table 12: Last AFI result

AFI result	No. of patients	Percentage
<5	06	12%
5 - 9	40	80%
>9	04	8%

Table 13: Last test - delivery interval

Delivery Interval	No. of Patients	Percentage
<12 hr.	04	8%
12 - 24 hr.	13	26%
24 - 48 hr.	19	38%
48 - 72 hr.	07	14%
>72 hr.	07	14%

Table 14: Mode of delivery

Mode of delivery	No. of Patients	Percentage
Vaginal	26	52%
Vacuum	05	10%
Forceps	03	6%
LSCS	16	32%

LSCS

Table 15: Last test result vs. mode of delivery

BPP score	LSCS	Vaginal	Instrumental
10	02	18	0
8	02	10	06
≤6	12	0	02

Table 16: Last NST result vs. mode of delivery

NST	LSCS	Vaginal	Instrumental
Reactive	04	25	01
Non-reactive	12	01	07

Table 17: Last FBM result vs. mode of delivery

FBM	LSCS	Vaginal	Instrumental
Present	04	26	04
Absent	12	0	04

Table 18: Last Foetal body movement result vs. mode of delivery

FM	LSCS	Vaginal	Instrumental
Present	8	26	8
Absent	8	0	0

Table 19: Last Foetal tone result vs. mode of delivery

FT	LSCS	Vaginal	Instrumental
Present	14	26	8
Absent	2	0	0

Table 20: Last AFI result vs. mode of delivery

AFI	LSCS	Vaginal	Instrumental
<5	4	1	1
9-May	10	25	5
>9	2	0	2

Table 21: Last BPP result vs. APGAR score

BPP	APGAR		p - value
	<7	>7	
10	3	17	0.0001
8	10	6	
<6	12	2	

APGAR less than 7 indicates fetal hypoxia which is significantly higher with low BPP score, same is also reflected by p - value.

Table 22: Last FBM result vs. APGAR score

FBM	APGAR		p -value
	<7	≥7	
Present	18	24	0.048
Absent	07	01	

Fetal hypoxia is significant with absent fetal breathing movement (p value - 0.048)

Table 23: Last Foetal body movement result vs. APGAR score

FM	APGAR		p -value
	<7	≥7	
Present	23	25	0.489
Absent	02	0	

p - value shows insignificant relation of fetal body movement & fetal hypoxia

Table 24: Last AFI result vs. APGAR score

AFI	APGAR		p value
	<7	≥7	
<5	05	01	0.018
5 - 9	18	22	
>9	02	02	

Table 25: Last NST result Vs. APGAR score

NST	APGAR		p value
	<7	≥7	
Reactive	06	24	0.0001
Non-reactive	19	01	

Fetal hypoxia is significantly higher in non reactive NST group

Table 26: Indication for LSCS

Indication	No.	Percentage
Severe PIH	09	56.25
Fetal Distress	10	62.50
Placenta previa	02	12.50
Non progress of labour	04	25
Abruptio	01	6.25
IUGR oligoamnios	03	18.75

Total no. of LSCS delivery was 16, table figure does not tally because few cases had more than one risk factor.

Table 27: BPP result Vs. NICU admission & Neonatal Death

BPP result	NICU	With mother	Death	p value
10	04	16	0	0.0002
8	10	06	0	
≤6	14	0	0	

Perinatal morbidity and NICU admission were quite high with low BPP score

Table 28: BPP result Vs. Meconium staining liquor

BPP result	Meconium		Meconium absent
	Thick	Thin	
10	0	02	18
8	01	06	09
≤6	03	10	01

The incidence of meconium staining of liquor, which is an indicator of fetal hypoxia with respect to the last BPP result, as shown in table - 28. It is observed that presence of thick meconium is increased whenever the test parameters were abnormal either individually or in combination.

Table 29: BPP result Vs. Birth Asphyxia

Sr. No.	BPP result	Birth Asphyxia	Percentage	P value
1	10	03	12%	0.0001
2	8 - 10	10	40%	
3	≤6	12	48%	

The incidence of birth asphyxia was significantly high with low BPP score.

Discussion

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

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

It is a combination of five parameters in BPP is: - Non stress test (NST), Fetal breathing movement (FBM), Fetal body movements (FM), Fetal tone (FT)

and amniotic fluid Index (AFI). The first being a short-term marker and the last one is long term marker of placental function and fetomaternal perfusion [2].

The test group consists of 50 high risk pregnant patient at 32 wks or more period of gestation. The major risk factors are PIH, BOH, Postdatism, Rh Negative pregnancy, oligamnios with or without IUGR, Diabetes with or without systemic changes.

Majority of the patients were primigravida (38%), All of them are from middle class family and dependent of defence service personnel. Hence patient population is from all over India with different cultural background with different languages.

Majority of patients were in the age group of 26-30yrs (34%) and 21-25yrs (30%) i.e. 21-30yrs (64%).

The surveillance of patients was initiated at or beyond 32 weeks gestation. Majority of patients were admitted in hospital wards (99%). In majority of cases the first BPP scoring was done at 38-39wks gestation (28%) and 37-38wks gestation (20%). This was because of late referral from the dependent MI rooms (Medical inspection room is the smallest unit of health care delivery system) and being a tertiary centre the number of complicated cases were also more. We had two cases where testing was initiated at 32-33 wks (4%) and nine cases where first BPP scoring was done beyond 40th weeks (18%). This hospital has a good NICU setup and can salvage fetuses beyond 30 wks gestation or 800 gm. fetal weight.

There were 161 tests performed on 50 patients with an average test per patient being 3.22. In the present study highest no of test performed is 5 (24%) and lowest no of test performed 1 (26%). In Manning et al study group average test per patient was 1.9.

The last test done shows 40% normal BPP score (10/10). Last NST result shows 60% reactive NST and 40% non reactive NST, Fetal breathing movement were present in 64% cases where as fetal movement and fetal tone were present in 84% and 96% cases respectively. Last AFI result shows 12% cases of oligamnios and 80% cases with AFI 5-9.

The test delivery interval shows that maximum deliveries were with in 72 hours (64%) of performing a test. In few cases (14%) the test was not repeated beyond 72 hours and those are the cases with 10/10 BPP score.

46% of patients had vaginal delivery, 16% had instrumental delivery and 32% had LSCS. However in the NST reactive group, 75% of the patient who had LSCS had a BPP score of ≤6. Among the patient who had non-reactive NST, 60% had LSCS and 5% had vaginal delivery whereas 35% needed assistance and had instrumental delivery.

None of the patients with absent FM, FT had vaginal delivery. Both groups were terminated by LSCS. This proves that FT & FM are good indications for fetal well being but they are late detectors of fetal jeopardy in utero.

The abnormal NST was 60% in the present study group which is similar to study by Manning et al (60%) [3,5]. Though higher findings of abnormal NST were recorded in study by Miller et al (90.8%) & Eden et al (96%) [4]. 16% of the cases had shown abnormal FM in the present study which is similar to study by Eden et al (28%). Though study by Manning et al shows abnormal FM in 66.5% cases and the same in Miller's study 32.4%. Abnormal fetal breathing movement of present study group was 32% which is similar to study by Eden et al (36%) [6]. The same in Manning et al study group was 59.2% but 48% in Miller et al study group. Abnormal fetal tone was 4% in the present study group which was lower than Manning et al (21%), Miller et al (18.2%), Eden et al (14%). Remarkable difference has been seen in AFI scoring in this study. In the present study AFI < 5 was only in 12% cases whereas it was 42.7% in Manning et al study group, 86.1% in Miller et al study group and the same in Eden et al study group was 88.4%. Table 29 shows the comparative study of findings of Manning et al, Miller et al and Eden et al along with the results of the present study.

Table 30:

Test Result	Study Group			Present Study
	Manning	Miller	Eden	
Abnormal NST	60%	90.8%	96%	60%
Abnormal FM	66.5%	32.4%	28%	16%
Abnormal FBM	59.2%	48%	36%	32%
Abnormal FT	21%	18.2%	14%	4%
AFI < 5	42.7%	86.1%	88.4%	12%

All cases with BPP ≤ 6 had 100% NICU admission though there was no perinatal death. In Eden et al study group perinatal mortality was 4.5% with BPP score ≤ 4 . 80% cases with BPP 10/10 required no NICU admission. However if BPP scoring was normal, only 15% of the babies born had an APGAR score < 7. But in Eden et al study group only 1.5% cases had APGAR < 7 with normal BPP scoring.

In patients with BPP score ≤ 6 , 90.3% cases had meconium stained liquor and 100% cases had birth asphyxia.

In Manning et al study group 75% patient had fetal distress with BPP ≤ 6 but only 21.2% cases had meconium stained liquor. This shows significant fetal hypoxia with low BPP score.

In this present study birth asphyxia was quite high, 48% among the BPP ≤ 6 whereas the incidence of birth asphyxia was 6% in Manning et al group, 2.7% in Miller et al group and 1.5% in Eden et al group.

The p - value of BPP in study group (considering APGAR score & NICU admission) is 0.0001 which is quite significant. The p - value as per the individual variable is quite significant with NST (p value - 0.0000), satisfactory with AFI (p value - 0.018), FBM (p value - 0.048) and insignificant with FM, FT.

BPP variables	p - value	Comments
NST	0.0001	Significant
FBM	0.048	Significant
FM	0.489	Insignificant
FT	0.532	Insignificant
AFI	0.018	Significant

APGAR	0.0001	Significant
NICU admission	0.0002	Significant
Birth Asphyxia	0.0001	Significant

p-value of different perinatal outcome comparing with BPP score

The results of this study confirm the high predictive value of the normal BPP score for a good neonatal outcome. The non reactive NST, absent FBM and low AFI are very good indicator for fetal hypoxemia in utero. The absence of FT or FM is of no significant value as they are quite late marker of hypoxemia. Combination of the biophysical variables has increased the specificity of the testing and increased the ability to predict the fetus at jeopardy.

Conclusion

Fetal BPP scoring with combination of five parameters fulfils the maximum criteria of antenatal fetal surveillance.

It is easy to study, reports readily available, no contraindication and comfortable to patient being a non-invasive test.

In this study BPP has been used as primary antepartum fetal surveillance method for high-risk pregnancies and has improved the outcome. Study by Eden et al showed 5.94% mortality which was quite high.

Hence the quest for an ideal fetal surveillance test continues in view of an healthy mother and healthy baby.

References

1. Manassiev N: What is normal heart rate of a term fetus? Br J of Obstet Gynecol 1996; 103:1272.
 2. Manning FA, Hill LM, Platt LD. Qualitative amniotic fluid determination by ultrasound ante partum detection and intra uterine growth retardation. Am J Obstet Gynaecol 1981; 139:254-259.
 3. Manning FA, Platt L D, Sipor L; Ante partum fetal evaluation - development of a fetal Biophysical Profile; Am J Obstet Gynaecol 1980; 136:787.
 4. Read JA, Miller FC. Fetal heart rate acceleration in response to acoustic stimulation as a measure of fetal well-being. Am J Obstet Gynaecol 1977; 129:512.
 5. Miller M, Paul RH, Rabello YA. The biophysical profile - ante partum testing in the 1990's. Am J Obstet Gynaecol 1996; 174:812.
 6. Eden L, Hetzles G, Smith CV. Perinatal outcome with biophysical profile. Am J Obstet Gynaecol 1994; 170:1620.
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