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Original Research Article

Modified biophysical profile in high-risk pregnancy-association with neonatal APGAR score

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ABSTRACT

Background: MBPP is used for evaluating fetal health and predicting fetal outcomes, which can help to minimize perinatal morbidity and death. It combines the non-stress test, an indicator of acute fetal hypoxia, with AFI, the second indicator of persistent fetal problems. Each patient has a non-stress test and an ultrasonic examination of liquor volume. A non-stress test that is reactive will reveal a healthy fetus. Hence, an attempt has been made to study the MBPP in high-risk pregnancies in predicting fetal outcome.

Methods: Hospital-based prospective clinical study on 200 high-risk pregnant women more than 37 weeks of gestation are screened using a modified biophysical profile. High-risk factors in the study include Gestational Hypertension, Preeclampsia, IUGR, Post-term pregnancy, Oligohydramnios, PROM, and Anemia. The study was conducted in the department of obstetrics and gynaecology, Narayana medical college and hospital, Nellore, Andhra Pradesh.

Results: In the present study, a total of 200 patients, 76.0% had both (NST, AFI) normal, 5.0% had both (NST, AFI) abnormal, 10.0% had Normal in NST and abnormal in AFI, 9.0% had abnormal in NST, and normal in AFI. The individual association between NST and AFI with the neonatal outcomes i.e., APGAR at 1 min and 5min have been studied and have been found to be statistically significant.

Conclusions: In the present study, we concluded that MBPP is an effective antepartum fetal surveillance test in high-risk pregnancies in predicting perinatal outcome.

Keywords: Modified biophysical profile, High-risk pregnancies, Nonstress test, Amniotic fluid index

INTRODUCTION

As is popularly known, no health issue has a larger impact on a country than maternal and perinatal death. Fetal testing entails a systematic, serial examination of the fetus with aim of identifying fetuses at risk so that appropriate measures can be taken to prevent harm or death. A fetal biophysical profile is one of the most acknowledged tests for assessing fetal well-being.¹ Antenatal detection of the fetus at risk for damage or death in utero remains a major challenge in modern obstetrics which is goal of ACOG & American Academy of Paediatrics (AAP).² High-risk pregnancies can result in many complications for the fetus.^{3,4} A high-risk pregnancy is one that is complicated

by a factor that has a negative impact on the pregnancy's outcome, whether it is maternal, fetal or both. A fetal biophysical profile is one of the most done tests for the evaluation of fetal well-being in high-risk cases.¹ The biophysical profile includes the study of five variables; Foetal tone, Foetal body movement, Foetal breathing movement, Amniotic fluid index (AFI), and Nonstress test (NST) to record fetal heart rate, the Biophysical profile is 2-phase testing which includes ultrasound & external Doppler monitor.⁶⁻⁸ The complete biophysical profile is more time-consuming, expensive, and cumbersome. Hence nowadays Modified BPP is used for evaluating fetal health and predicting fetal outcomes, which can help to minimize perinatal morbidity and death. It combines the

non-stress test, an indicator of acute fetal hypoxia, with AFI, the second indicator of persistent fetal problems.⁹ Non-stress test is basic, easy, uncomplicated, and non-invasive and one which can be easily repeated, whenever required. Non-Stress Test is classified as reactive and non-reactive.^{10,11} Each patient has a non-stress test as well as an ultrasonic examination of liquor volume. A non-stress test that is reactive will reveal a healthy fetus. Hence, an attempt has been made to study the MBPP in high-risk pregnancies in predicting fetal outcome.

METHODS

Hospital-based prospective clinical study conducted on women at Narayana medical college and hospital, Nellore.

Inclusion criteria

Inclusion criteria for current study were; High-risk pregnancies with Gestational age of more than 37 weeks and Gestational hypertension, Preeclampsia, IUGR, Post-term pregnancy, Oligohydramnios, PROM, Induced labor, anemia.

Exclusion criteria

Exclusion criteria for current study were; Pregnancy without any risk factors, Pregnancy with congenital anomalies, Intrauterine foetal death, The pregnant women meeting inclusion criteria are explained about the study and ultrasound procedure and NST.

Procedure

Consent was obtained. The pregnant women in the study will be subjected to a detailed history, general examination, clinical examination, routine laboratory investigations, non-stress test, and ultrasonographic examination. All the samples were collected and values were documented. The study participants’ Gestational age at delivery, mode of delivery, birth weight of baby, and APGAR at 1 min and 5 mins were followed up till delivery.

RESULTS

The present study consists of 200 pregnant women who had more than 37 weeks of gestation with high-risk pregnancies were admitted and screened using a modified biophysical profile, in the antenatal ward at the department of Obstetrics and Gynecology, Narayana medical college and hospital, Nellore, Andhra Pradesh. The risk factors in the present study is depicted in (Table 1). In a total of 200 patients, the highest risk factors were, 30 (15.0%) patients had oligohydramnios, 27 (13.5%) patients had anemia, 23 (11.5%) patients had preeclampsia, 18 (9.0%) patients had IUGR. The AFI in the present study is shown in (Table 2). In a total of 200 patients, 170 (85.0%) patients had normal amniotic fluid index, and, 30 (15.0%) patients had abnormal amniotic fluid index.

The non-stress test (NST) in the present study is shown in (Table 3).

Table 1: Risk factors included in the study.

Risk factors	N	%	Valid percent	Cumulative percent
Anemia	27	13.5	13.5	13.5
Asthma	2	1.0	1.0	14.5
BOH	5	2.5	2.5	17.0
Cardiac disease	2	1.0	1.0	18.0
decreased perception of fetal movements	13	6.5	6.5	24.5
Eclampsia	5	2.5	2.5	27.0
Epilepsy	2	1.0	1.0	28.0
GDM	10	5.0	5.0	33.0
GHTN	15	7.5	7.5	40.5
Hypothyroidism	15	7.5	7.5	48.0
IUGR	18	9.0	9.0	57.0
Oligohydramnios	30	15.0	14.5	71.5
Polyhydramnios	6	3.0	3.0	75.0
Postdated	7	3.5	3.5	78.5
Preeclampsia	23	11.5	11.5	90.0
PROM	14	7.0	7.0	97.0
Rh-ve pregnancy	6	3.0	3.0	100.0
Total	200	100.0	100.0	

Of a total of 200 patients, 172 (86.0%) patients had normal, and, 28 (14.0%) patients had abnormal. The modified BPP in the present study is shown in (Table 4). In a total of 200 patients, 76.0% had both (NST, AFI) are normal, 5.0% had both (NST, AFI) are abnormal, 10.0% had Normal in NST,

and abnormal in AFI, 9.0% had abnormal in NST, and normal in AFI.

The APGAR at 1 minute in this study is shown in (Table 5).

Table 2: Amniotic fluid index (AFI) in the present study.

AFI-CAT	N	%	Valid percent	Cumulative percent
Valid	Normal	170	85.0	85.0
	Abnormal	30	15.0	100.0
	Total	200	100.0	100.0

Table 3: Non-Stress test (NST) in the present study.

NST	N	%	Valid percent	Cumulative percent
Valid	Normal	172	86.0	86.0
	Abnormal	28	14.0	100.0
	Total	200	100.0	100.0

Table 4: Modified Biophysical profile in the present study.

MBPP	N	%	Valid percent	Cumulative percent
Valid	NST+N, AFI+N	152	76.0	76.0
	NST+N, AFI+ABN	20	10.0	86.0
	NST+ABN, AFI+N	18	9.0	95.0
	NST+ABN, AFI+ABN	10	5.0	100.0
	Total	200	100.0	100.0

Table 5: APGAR at 1 minute in this study.

APGAR-1-GRP	N	%	Valid percent	Cumulative percent
Valid	Normal	65	32.5	32.5
	Abnormal	135	67.5	100.0
	Total	200	100.0	100.0

Table 6: APGAR at 5 minutes in this study.

APGAR 5 min	N	%	Valid percent	Cumulative percent
Valid	Normal	160	80.0	80.0
	Abnormal	40	20.0	100.0
	Total	200	100.0	100.0

In a total of 200 patients, 65 (32.5%) patients had normal, and 135 (67.5%) patients had abnormal. The APGAR at 5 minutes in this study is shown in (Table 6). In a total of 200 patients, 160 (80.0%) patients had normal, and 40 (20.0%) patients had abnormal. The association between APGAR at 1 minute and MBPP is shown in (Table 5). Out of 152 cases of normal (both in NST & AFI), 40.1% of cases were normal APGAR at 1 minute, and 59.9% of cases were abnormal APGAR at 1 minute. Whereas in the 10 cases of abnormal (both in NST & AFI), 100.0% of cases were abnormal in APGAR at 1 minute. Moreover, the association between APGAR at 1 minute and MBPP was shown statistically significant ($p=0.001$).

The association between APGAR at 5 minutes and MBPP is shown in (Table 6). Out of 152 cases of normal (both in NST & AFI), 94.7% of cases were normal APGAR at 5 minutes, and 5.3% of cases were abnormal APGAR at 5 minutes. Whereas in the 10 cases of abnormal (both in NST

& AFI), 100.0% of cases were abnormal in APGAR at 5 minutes. Moreover, the association between APGAR at 5 minutes and MBPP was shown statistically significant ($p=0.001$).

DISCUSSION

This study was conducted at the department of obstetrics and gynecology, Narayana medical college hospital from December 2019 to October 2021. The study includes 200 pregnant women who are admitted in the hospital at more than 37 weeks of gestation with high-risk pregnancies are screened using a modified biophysical profile. High-risk factors involved in the study include gestational hypertension, Preeclampsia, IUGR, Post-term pregnancy, Oligohydramnios, PROM, anemia, and decreased fetal movements. Early detection of the compromised fetus and timely intervention is one of the major goals of antepartum fetal surveillance. It can be done by various methods.

Table 7: Association between APGAR at 1 minute and MBPP.

Parameters		MBPP				Total	
		NST+N, AFI+N	NST+N, AFI+ABN	NST+ABN, AFI+N	NST+ABN, AFI+ABN		
APGAR1 minute	Normal	Count	61	2	2	0	65
		% within APGAR-1-GRP	93.8	3.1	3.1	0.0	100
		% within MBPP	40.1	10.0	11.1	0.0	32.5
	Abnormal	Count	91	18	16	10	135
		% within APGAR-1-GRP	67.4	13.3	11.9	7.4	100
		% within MBPP	59.9	90.0	88.9	100.0	67.5
Total	Count	152	20	18	10	200	
	% within APGAR-1-GRP	76.0	10.0	9.0	5.0	100	
	% within MBPP	100.0	100.0	100.0	100.0	100	

Chi-square value = 17.219, p value=0.001 (Significant).

Table 8: Association between APGAR at 5 minutes and MBPP.

Parameters		MBPP				Total	
		NST+N, AFI+N	NST+N, AFI+ABN	NST+N, AFI+N	NST+ABN, AFI+ABN		
APGAR 5 Min	Normal	Count	144	9	7	0	160
		% within APGAR 5 Min	90.0	5.6	4.4	0.0	100.0
		% within MBPP	94.7	45.0	38.9	0.0	80.0
	Abnormal	Count	8	11	11	10	40
		% within APGAR 5 Min	20.0	27.5	27.5	25.0	100.0
		% within MBPP	5.3	55.0	61.1	100.0	20.0
Total	Count	152	20	18	10	200	
	% within APGAR 5 Min	76.0	10.0	9.0	5.0	100.0	
	% within MBPP	100.0	100.0	100.0	100.0	100.0	

Chi-square value = 94.958, p value<0.0001 (Very High Significance)

The best method is that, which identifies the fetus which is at risk, but present in an uncompromised state and requiring immediate intervention.

In the present study, MBPP, which is a combination of two parameters, is used as a primary surveillance test for high-risk patients. The two parameters are the non-stress test (NST), which is a short-term measure of fetal status and AFI, a long-term marker of placental function.

Risk factors

Preeclampsia, eclampsia, anemia, oligohydramnios, and other maternal problems are the leading causes of perinatal loss. These high-risk pregnancies must be recognized so that adequate surveillance and prompt interventions could be done to reduce perinatal morbidity and mortality.⁶⁻¹³ In this study, a total of 200 patients, the highest risk factors were, 30 (15.0%) patients had oligohydramnios, 27

(13.5%) patients had anemia, 23 (11.5%) patients had preeclampsia, 18 (9.0%) patients had IUGR.

In the study of Nageotte et al 44% of cases had post-term, 11.8% of cases had hypertension, 23.8% of cases had IUGR, and 6.0% of cases had diabetes.¹⁴ In a study by Eden et al (1988)¹³, 17.8% of cases had post-term, 27.9% of cases had hypertension, 16.6% of cases had IUGR, and 17.2% of cases had diabetes.

Amniotic fluid index (AFI)

In this study, a total of 200 patients, 170 (85.0%) patients had normal amniotic fluid index, and, 30 (15.0%) patients had abnormal amniotic fluid index. In study of Eden et al 86.1% of cases had AFI (>5), and 9.2% of cases had AFI (<5).¹³ In study of Patil et al 77.2% of cases had AFI (>5), and 10.6% of cases had AFI (<5).¹⁵

Non-stress test (NST)

The non-stress test was most useful in the evaluation of abnormal ultrasound monitored variables. In this study, a total of 200 patients, 172 (86.0%) patients had normal, and, 28 (14.0%) patients had abnormal. In a study of Eden et al 95.7% of cases had NST-active, and 4.3% of cases had NST-reactive.¹³ In the study of Patil et al 66.9% of cases had NST-reactive, and 14% of cases had NST-non-reactive.¹⁵

APGAR at 1 minute

In this study, a total of 200 patients, 65 (32.5%) patients had normal APGAR, 135 (67.5%) patients had abnormal APGAR.

APGAR at 5 minutes

In this study, a total of 200 patients, 160 (80.0%) patients had normal APGAR, 40 (20.0%) patients had abnormal APGAR.

Association of APGAR at 1 minute, 5 minutes with MBPP

In this study, out of 152 cases of normal (both in NST & AFI), 40.1% of cases were normal APGAR at 1 minute, and 59.9% of cases were abnormal APGAR at 1 minute. Whereas in the 10 cases of abnormal (both in NST & AFI), 100.0% of cases were abnormal in APGAR at 1 minute. Moreover, the association between APGAR at 1 minute and MBPP was shown statistically significant ($p=0.001$). In this study, out of 152 cases of normal (both in NST & AFI), 94.7% of cases were normal APGAR at 5 minutes, and 5.3% of cases were abnormal APGAR at 5 minutes. Whereas in the 10 cases of abnormal (both in NST & AFI), 100.0% of cases were abnormal in APGAR at 5 minutes. Moreover, the association between APGAR at 5 minutes and MBPP was shown statistically significant ($p=0.001$). In a study of Sowmya et al Out of 70 cases, 13 cases had an APGAR score of less than 7. When NST and AFI were normal, 1 baby had APGAR <7. When both NST and AFI were abnormal, 3 babies had APGAR <7. With normal NST and abnormal AFI, 3 babies had APGAR <7 and with abnormal NST and normal AFI, 6 babies had APGAR <7.¹⁰

CONCLUSION

Together, NST and AFI can be essential non-invasive approaches for diagnosing acute and chronic fetal impairment. Modified BPP is easier to implement, takes less time, is less expensive, and is a more patient-friendly test. When the test findings are normal, it gives reassurance that the fetus is healthy, with a decent perinatal outcome. NST is a short-term indicator of fetal status, while AFI is a long-term indicator of placental function. From this study, we concluded that MBPP is an effective primary antepartum fetal surveillance test in high-risk pregnancies in predicting perinatal outcomes.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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