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Original Research Article

Modified biophysical profile in the role of predicting fetal outcome in high risk pregnancies

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ABSTRACT

Introduction: High risk pregnancies are these that result in maternal or fetal morbidity or mortality. These may include conditions such as pre-eclampsia, eclampsia, oligohydramnios, anemia. Therefore, it becomes very important for early identification of the risk so that immediate treatment can be given. In order to reduce the morbidity and mortality of both the mother and child. the non stress test and NST with the amniotic fluid volume (Modified biophysical profile) are some of the tests used for this purpose.

Materials and Methods: After the demographic details and clinical evaluation, Non stress test (NST) was done for all the patients. The fetal heart rate, movements and tone was measured along with the uterine contractions. If there were more than 2 fetal movements with two accelerations of 15 beats / minute or more within 10 mintues of monitoring, the test was rendered reactive. The amniotic fluid volume and Index were measured.

Results: The mean age of the women was 23.3 ± 5.1 years and the mean gestational age of them was 34.87 ± 3.91 weeks. The most predominant risk factors which was present in the expectant mothers was decreased movements of the fetus, followed by hypertension and Oligohydramnios. 27% of the patients had to be induced for vaginal delivery while spontaneous delivery was seen in 22% of the cases. 24% of the patients elected to go in for LSCS delivery while emergency LSCS was done on 14% of the patients. 68 (46.9%)mothers with high risk pregnancy had a normal NST and AFI, while 43 (29.7%) of them had an Abnormal NST with Abnormal AFI. 11 (7.6%) of them had Normal NST but an Abnormal AFI and 23 (15.9%) had and Abnormal NST with a Normal AFI.

Conclusion: The overall sensitivity and the specificity of NST, AFI and MBPP are comparable to each other in the detection of fetal distress, though MBPP is marginally better.

1. Introduction

One of the most important landmarks in the life of a woman is motherhood. This is an event that not only she, but her whole family wait for. And nothing can be more important than to make this happy event smooth, with least amount of pain and complications. However, every day, around 830 women die due to birth related complications.[1] 47 out of 1000 women globally and about 25 women per thousand in India die each year with these complications.[1] Thus, the greatest challenge to an obstetrician is to identify and counter these complications at the earliest[2] These complications may be due to individual, environmental or circumstantial factors, which tend to result in adverse effects to both the mother and child, ending in high risk pregnancies.

High risk pregnancies are these that result in maternal or fetal morbidity or mortality. These may include conditions such as pre-eclampsia, eclampsia, oligohydramnios, anemia etc.[3] Therefore, it becomes very important for early identification of the risk so that immediate treatment can be given. In order to reduce the morbidity and mortality of both the mother and child, there are a number of antepartum fetal surveillance methods.[4] All of them mainly include

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the electronic monitoring of the fetal heart rate, assessment of the amniotic fluid volume, mainly by ultrasonogram, and observation of various biophysical parameters of the fetus.[5] However, these may lead to the caesarian section delivery.[6–8]

Some of the common methods whIch are used for the surveillance of the fetal heart rates are the contraction stress test (CST), the non stress test (biophysical profile) and NST with the amniotic fluid volume (Modified biophysical profile). A cardiotocograph machine measures the fetal heart rate along with the mother's contractions, but it is not said to be very reliable on its own. It has been reported that the if the oxygen supply through the placenta to the baby is reduced, then the fetal movements also reduce. Thus the fetal activity is one of the measures to predict the outcome.

The biophysical profile measures the fetal movement along with the tone and breathing. The modified BPP measures all these along with the volume of the amniotic fluid surrounding the baby.[9] The MBPP is said to have high positive and negative predictive value.

This study was done to evaluate the efficacy of modified biophysical profile as a predictor of the fetal outcome in case of high risk pregnancies.

2. Materials and Methods

This study was done by the department of obstetrics and Gynaecology at Mahaveer Medical college during the period of one year i.e from October 2018 to August 2019. 145 patients with high risk pregnancies and with a gestation age of more than 32 weeks were included into the study. All these patients were chosen randomly. Patients having one or more of the following characters were considered to be high risk pregnancies – age above 35 years, post dated pregnancy, hypertension, anemia, gestational diabetes, decreased fetal movements, pre-eclampsia, gestational age beyond 40 weeks, clinically suspected intraueterine growth restriction. Fetuses with congenital abnormalities, patients with low risk pregnancies, high risk pregnancy with less than 32 weeks of gestation, seriously ill patients, multiple pregnancies were excluded from the study.

The nature of the study was explained to the patients and their relatives and informed consent was taken from all of them. Those who refused the consent were excluded from the study. Detailed demographic data was collected from all the patients and they were subjected to thorough clinical examination. Maternal complications such as earlier history of still birth, low weight gain of the mother during the pregnancy, any thyroid, renal or cardiac history, anemia and Rh incompatibility were specifically noted.

Non stress test (NST) was done for all the patients. The fetal heart rate, movements and tone was measured along with the uterine contractions. If there were more than 2 fetal movements with two accelerations of 15 beats / minute or more within 10 mintues of monitoring, the test was rendered reactive. The amniotic fluid index in such as case should be >5.0cm. In case of no spontaneous accelerations after 10 minutes of monitoring, stimulation of the fetal sound was performed by direct application of an artificial larynx onto the mothers abdomen. This stimulation was done for 1 second followed in 1 minute for 2 seconds. In case there were still no accelerations, it was further repeated for 3 seconds after 1 minute. If there was no acceleration after 20 minutes on monitoring, it was continued for 20 more mintues. After 40 minutes, if there were still no movements, the test was considered to be non reactive.

This test was done twice a week for all the patietns till their delivery. In case the NST score was non reactive but the amniotic fluid indes was <8, the patient was considered for LSCS. In case of a reactive and normal AFI, the patient was encouraged for spontaneous labour. If the patient was non reactive with low AFI, in the last 7 days also, then the delivery was analysed.

All the patietns were monitored during the delivery for meconium stained liquor, APGAR score of the fetus, morbidity in the fetus or perinatal death.

All the data was statistically analysed using the charts and tables. For comparison, chi square test was used.

3. Results

There were 145 high risk pregnant mothers included into the study. The mean age of the women was 23.3 ± 5.1 years and the mean gestational age of them was 34.87 ± 3.91 weeks. The number of women with < 8 Amniotic Fluid index was, 54 (37.2%), and those $\geq$8 was 91 (62.8%). 66 (45.5%) of the women had a nonreactive Non stress test and 71 (48.96%) of them had an Abnormal Biophysical Profile (Table 1).

Table 1: Baseline characteristics of the patients

Characteristics	Number
Mean Age (in years)	23.3 ± 5.1
Mean Gestational Age (in weeks)	34.87 ± 3.91
Amniotic Fluid Index Status	
< 8	54 (37.2%)
$\geq$8	91 (62.8%)
Non Reactive NST	66 (45.5%)
Abnormal Biophysical Profile	71 (48.96%)

The most predominant risk factors which was present in the expectant mothers was decreased movements of the fetus, seen in 48 (33.1%) cases, followed by hypertension in 36 (24.8%), Oligohydramnios in 32 (22.1%), hypothyroidism in 29 (20%) and gestational diabetes in 24 (16.6%) mothers (Table 2).

27% of the patients had to be induced for vaginal delivery while spontaneous delivery was seen in 32 (22%) of the cases. 35 (24%) of the patients elected to go in for LSCS delivery while emergency LSCS was done on 20 (14%) of the patients (Figure 1).

Table 2: Risk factors of mothers

Risk Factors	Number (%)
Anemia	22 (15.2%)
Hypertension	36 (24.8%)
Gestational Diabetes	24 (16.6%)
Hypothyroidism	29 (20%)
Decreased fetal mobility	48 (33.1%)
Oligohydramnios	32 (22.1%)
RH incompatibility	9 (6.2%)
Bad obstetric History	13 (9%)
IUGR	11 (7.6%)
Others	8 (5.5%)

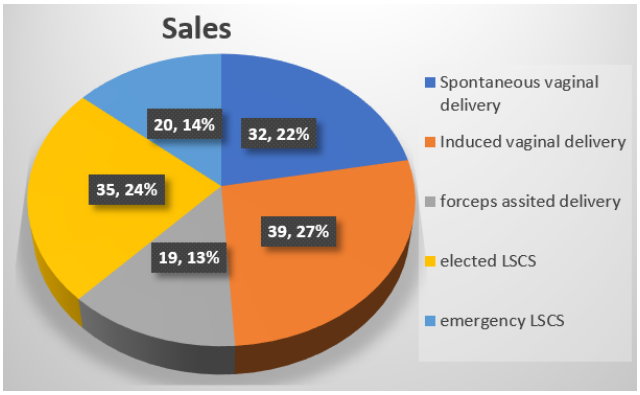

Fig. 1: Mode of delivery

Meconium stained liquor was seen in 20 (30.3%) Abnormal NST patients, 13 (24.1%) Low AFI and 22 (31%) abnormal BPP patients. Amongst the normal NST patients, Meconium stained liquor was seen in 4 (5.1%) patients, in 11 (12.1%) normal AFI patients and 2 (2.7%) normal BPP patients. A low APGAR score was observed in 24 (36.4%) Abnormal NST patients, 4 (5.1%), normal NST patients, 18 (33.3%) low AFI, 10 (11%) normal AFI, 26 (36.6%) abnormal BPP and 2 (2.7%) normal BPP patients. 46 babies were admitted to the neonatal unit for further monitoring out of which, 40 (60.6%), 32 (40.5%) and 41 (57.7%) has abnormal NST, low AFI and abnormal BPP respectively (Table 3).

68 (46.9%)mothers with high risk pregnancy had a normal NST and AFI, while 43 (29.7%) of them had an Abnormal NST with Abnormal AFI. 11 (7.6%) of them had Normal NST but an Abnormal AFI and 23 (15.9%) had and Abnormal NST with a Normal AFI (Table 4).

The overall sensitivity of NST, AFI and MBPP was 93.5%, 91.6% a d 06.9% respectively while the specificity was 20.5%, 39.2% and 41.1% respectively. The PPv was 74.7%, 80.4%, and 79.5% and NPV was 73.2%, 80.4% and 79.5% among the NST, AFI and MBPP respectively (Table 5).

4. Discussion

In the 19^{th} century itself, the limit of the fetal heart rate was reported to be around 120 beats per minute by Winkel in 1893, but it took around 60 years for the first heart beat to be heard in 1950.[10] Since then there has been a steady development in the monitoring of the fetal heartbeat and quantification of the fetal activity.[11–14] As a result, discrepancy of the fetal heart rate and monitoring being of vital importance has been known for a long time now. In 1976, an easy and reliable method to monitor the fetal heart rate to be Non stress test was suggested.[15] Over time, the two variables, NST and AFI were used.[16–18] In the present study, also we have compared the efficacy of NST and AFI and MBPP as a predictor for the fetal distress in high risk pregnancies.

The mean age of the women in the present study was 23.3 $\pm$ 5.1 years and the mean gestational age of them was 34.87 $\pm$ 3.91 weeks. This was corroborated by a study by Agarwal et al, who reported a mean age of 24.32 and the gestational mean to be 35.23 weeks.[3] A similar study by Nageotte et al reported a mean age to be 28.2 $\pm$ 6 and a mean gestational age to be 40.1 $\pm$ 2.3 weeks, both of which were slightly higher than that of our study.[5]

The number of women with < 8 Amniotic Fluid index was, 54 (37.2%), and those $\geq$8 was 91 (62.8%) in our study. A similar study by Agarwal et al had a total of 32.8% of the patietns with an AFI od < 8.

The most predominant risk factors which was present in the expectant mothers was decreased movements of the fetus, seen in 48 (33.1%) cases, followed by hypertension in 36 (24.8%), Oligohydramnios in 32 (22.1%), hypothyroidism in 29 (20%) and gestational diabetes in 24 (16.6%) mothers. In a study by Borade et al, in accordance to our study, hypertension was the most predominant risk factor in the mother after prolonged pregnancy with no other risk factor. IUGR and oligohydramnios were other common risk factors.[19] Vijayalakshmi et al also reported hypertension to be the most common cause of risk in 25% of the patients which was followed by decreased fetal movements and oligohydramnios.[20]

The most common method of delivery in our study was by induced vaginal delivery in 27% of the patietns, while 22% underwent spontaneous delivery. 24% of the patients underwent elective LSCS and 14% of the patients had emergency LSCS. In a similar study, Arya and Thapa, reported 14% of LSCS in the patients while the incidence of vaginal delivery was 54%.[21] A higher caesarian rate of 47% was seen in a study by Vijayalakshmi et al.[20]

In the present study, Meconium stained liquor was seen in 20 (30.3%) Abnormal NST patients, 13 (24.1%) Low AFI and 22 (31%) abnormal BPP patients. Amongst the normal NST patients, Meconium stained liquor was seen in 4 (5.1%) patients, in 11 (12.1%) normal AFI patients and

Table 3: BPP and fetal outcome

Outcome	NST		AFI		BPP	
	Abnormal	Normal/Reactive	Abnormal	Normal/Reactive	Abnormal	Normal/Reactive
Number	66	79	54	91	71	74
Meconium stained liquor (n=24)	20 (30.3%)	4 (5.1%)	13 (24.1%)	11 (12.1%)	22 (31%)	2 (2.7%)
APGAR<5m (n=28)	24 (36.4%)	4 (5.1%)	18 (33.3%)	10 (11%)	26 (36.6%)	2 (2.7%)
Admission to Neonatal Unit (n=46)	40 (60.6%)	6 (7.6%)	32 (40.5%)	14 (15.4%)	41 (57.7%)	5 (6.8%)
Low Birth weight (n= 59)	51 (77.3%)	8 (10.1%)	49 (90.7%)	10 (11%)	53 (74.6%)	6 (8.1%)
Newborn mortality (n=4)	4 (6.1%)	0 (0)	3 (5.6%)	1 (1.1%)	4 (5.6%)	0 (0)

Table 4: MBPP Parameters

Parameter	Number (%)
Normal NST, Normal AFI	68 (46.9%)
Abnormal NST, Abnormal AFI	43 (29.7%)
Normal NST, Abnormal AFI	11 (7.6%)
Abnormal NST, Normal AFI	23 (15.9%)

Table 5: Overall ourcome of NST, AFI and MBPP

Overall outcome	NST	AFI	MBPP
Sensitivity	93.5%	91.6%	96.9%
Specificity	20.5%	39.2%	41.1%
Positive Predictive Value	74.7%	80.4%	79.5%
Negative Predictive Value	73.2%	78.8%	74.6%

2 (2.7%) normal BPP patients. A low APGAR score was observed in 24 (36.4%) Abnormal NST patients, 4 (5.1%), normal NST patients, 18 (33.3%) low AFI, 10 (11%) normal AFI, 26 (36.6%) abnormal BPP and 2 (2.7%) normal BPP patients. 46 babies were admitted to the neonatal unit for further monitoring out of which, 40 (60.6%), 32 (40.5%) and 41 (57.7%) has abnormal NST, low AFI and abnormal BPP respectively. Similar results were observed by Agarwal et al and Maurya et al.[3,22]

Overall, the present study showed a sensitivity of 93.5%, 91.6% and 96.9% among the NST, AFI and MBPP respectively, while the specificity was low with 20.5%, 39.2% and 41.1% in the same categories. The PPv was 74.7%, 80.4%, and 79.5% and NPV was 73.2%, 80.4% and 79.5% among the NST, AFI and MBPP respectively. Agarwal et al, in their study reported the sensitivity and specificity individually for the different tests and found AFI to be 57.7% sensitive and 73.7% specific, while Sultana et al[23] reported it to be 57.1% and 51.3%. A study by Tasneem et al[24] reported the sensitivity for thick/thin meconium to be 80.6% while Anand et al[25] found the sensitivity to be 62% for MSL.

5. Conclusion

Our results show that the overall sensitivity and the specificity of NST, AFI and MBPP are comparable to each other in the detection of fetal distress, though MBPP is marginally better.

6. Source of Funding

None.

7. Conflict of Interest

None.

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