ORIGINAL ARTICLE

Correlation of modified biophysical profile and perinatal outcome in high-risk pregnancy

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Received: 29-09-2020
Accepted: 10-10-2020

How to cite this article:
Aparajeeta K, Gupta R, Mishra P, Agrawal G. Correlation of modified biophysical profile and perinatal outcome in high-risk pregnancy. Int J Adv Integ Med Sci 2020;5(4):100-103.

Source of Support: Nil,
Conflicts of Interest: None declared.

ABSTRACT

Aim: To evaluate efficacy of Modified Bio Physical Profile (MBPP) in predicting perinatal outcome in high risk pregnancy. **Objectives:** 1. To assess the efficacy of (MBPP) as a tool for antepartum fetal surveillance. 2. To study the effect of (MBPP) in improving Perinatal morbidity and mortality. **Material and Methods:** This prospective study was conducted in the Department of Obstetrics and Gynecology, RMCH, Bareilly, UP. The study was conducted on patients visiting RMCH over a period of one year from 1st November 2018 to 31st October 2019. **Results:** From 560 cases, maximum were multigravida, age group 20-25 years with gestational age 35-37+6 week. PIH was most common risk factor than IUGR than BOH. In BBP, NST and AFI were abnormal among majority of patient. **Conclusion:** The major goal of antepartum fetal surveillance is an appropriate and timely identification of fetuses at risk of morbidity and mortality. MBPP is an easy, cost effective and time saving measure and hence can be used as a primary antepartum fetal surveillance test.

KEY WORDS: Amniotic fluid index, high risk pregnancy, modified biophysical profile, Non Stres Test, perinatal outcome

INTRODUCTION

One of the most important landmarks in the life of a woman is her journey toward motherhood and the process of giving birth. Globally, the perinatal mortality rate is 47/thousand, however, in India, this rate is almost 25/thousand (World Health Organization Media Centre, 2016).[1]

For every 1000 live births, the perinatal mortality in India is about 37.7 but varies from state to state. It is higher in rural (54.4/1000 live birth) than urban (32.4/1000 live birth) areas.

A high-risk pregnancy refers to anything that puts the mother, fetus, or neonate at increased risk for morbidity or mortality during pregnancy or childbirth (Naim *et al.*, 2012; Karimi *et al.*, 2017).[2,3] Examples of high-risk pregnancies include both medical conditions that can cause poor outcomes such as anemia, chronic hypertension, diabetes type I or II, cardiac disorders, and smoking, as well as some obstetric high-risk factors that include high parity status, prior cesarean delivery, and prior stillbirth. Using proper surveillance method that includes well-timed induction of labor and vigilant monitoring, the unfavorable outcomes can be prevented.

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Identification of fetuses at risk for death or intrauterine death forms the main goal of antenatal testing. In many high-risk pregnancies, fetal injury and death occur due to cumulative effect from fetal hypoxia and acidosis. In fetuses with hypoxia being the factor, adaptive response is seen by fetus by increasing the blood supply to brain, heart, and adrenals and thereby a subsequent reduction in renal perfusion and fetal urine hence leading to oligohydramnios.

Various methods of evaluation of fetal vitality in high-risk pregnancies have been proposed. In 1980, Manning *et al.*[4] proposed the fetal biophysical profile that consists of the

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evaluation of four ultrasonographic criteria, three acute (fetal breathing movements, generalized fetal movements, and fetal tone), and one chronic (amniotic fluid index [AFI]) and one cardiotocographic criterion (transient accelerations in response to fetal movements). Modified biophysical profile (MBPP) is the sum of fetal heart reactivity as done by non-stress test (NST) with AFI which is the sum of measurements of the deepest cord-free amniotic fluid pocket in each of the four abdominal quadrants, as an indicator of long-term function of the placenta. This will effectively rule out fetal acidemia. The MBPP is considered normal if NST is reactive and AFI >5 cm. MBPP is considered abnormal if NST is non-reactive and AFI is 5 cm or less.

MATERIALS AND METHODS

This proposed prospective study was conducted in the Department of Obstetrics and Gynecology, Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh. The study was conducted on total of 560 antenatal patients visiting Rohilkhand Medical College and Hospital over a period of 1 year from November 1, 2018, to October 31, 2019.

Inclusion Criteria

Pregnant women with period of gestation 32 weeks or more and obstetrics complications such as pregnancy-induced hypertension (PIH), intrauterine growth restriction (IUGR), post-datism, bad obstetric history (BOH), Rh-negative pregnancy, gestational diabetes mellitus, anemia, previous lower section cesarean section, and antepartum hemorrhage.

Exclusion Criteria

Multifetal pregnancy and fetus with congenital anomaly.

Method of Collection of Data

After taking written and informed consent and fulfilling the inclusion criteria, patients were included into the study.

Method of Study

Pregnant woman with gestational age above 32 weeks with high-risk factors was selected. Detailed history was taken and thorough general, systemic and obstetrical examination was done. MBPP score was done for each patient consisting of NST recording for 20 min, followed by AFI measurement using four quadrant techniques. And after delivery perinatal outcome was noted, the following parameters were studied:

i. Fetal distress in labor
ii. Apgar score <7 after 5 min
iii. Admission to NICU
iv. Meconium aspiration syndrome
v. Low birth weight <2.5 kg
vi. Perinatal death.

The MBPP

The MBPP consists of the NST and an amniotic fluid volume assessment and requires 10 min. The MBPP is considered normal if the NST is reactive and the deepest vertical pocket of amniotic fluid is >5 cm. The MBPP is considered abnormal if either the NST is non-reactive or the deepest vertical pocket of amniotic fluid is 5 cm or less (Nageotte *et al.*, 1994).[5] A decreased fetal movement demands MBPP. In case, the NST is non-reactive or the amniotic fluid volume is low, a full BPP is usually done.

Statistical Analysis

The results are presented in frequencies, percentages, and mean ± SD. The Chi-square test was used for comparisons. $P < 0.05$ was considered statistically significant. All the analyses were carried out on SPSS 16.0 version (Chicago, Inc., USA).

OBSERVATIONS AND RESULTS

The results and observations recorded in the study are evaluated under the following parameters.

The mean age of women was 24.81 ± 4.41 years ranging from 18 to 37 years. More than half of women were multigravida (55.5%) and the mean gestational age was 36.23 ± 2.27 weeks.

PIH was the most common risk factor (33.9%). IUGR (21.2%) was the second most and BOH (12.9%) was the third most common risk factor.

Last NST was reactive (75.9%) and last AFI was ≥5 (91.2%) among majority of the women. Both the parameters (NST and AFI) were abnormal among 71.4% of patients.

Reactive NST was in 10% of patients in whom MAS was present and the association was statistically significant ($P = 0.0001$). Last AFI value was significantly ($P < 0.05$) associated with fetal distress in labor, Apgar score <7 after 5 min, MAS, and perinatal death.

Low birth weight (<2.5 kg) was in 30.5% of the newborns. Both NST and AFI were abnormal in 71.3% of newborn among whom birth weight was <2.5 kg. There was significant ($P = 0.0001$) association of birth weight with MBPP.

APGAR <7 was in 25.2% of newborn.

Both NST and AFI were abnormal in 59.6% of newborn among whom Apgar score was <7. There was significant ($P = 0.0001$) association of Apgar score with MBPP.

NICU admission was among 55.4% of newborn. Both NST and AFI were abnormal in 65.2% of patients who admitted their newborn to NICU. There was significant ($P = 0.0001$) association of NICU admission with MBPP.

Perinatal mortality was in 5.9% of the newborn. Both NST and AFI were abnormal in 57.6% of newborn in whom perinatal mortality was present. There was significant ($P = 0.0001$) association of perinatal mortality with MBPP.

DISCUSSION

The goal of antepartum fetal surveillance is early identification of the compromised fetus and timely intervention when the fetus is at danger, but still in an uncompromised state. MBPP includes AFI and NST. AFI is a marker of long-term placental function and NST is a marker of short-term fetal condition. The aim of this study is to assess the role of MBPP in high-risk pregnancies and assess perinatal outcome and to review the impact of NST and AFI individually in high-risk pregnancies.

In our present study overall, we found that 24.1% had non-reactive NST and 8.8% had AFI <5 cm which is equivalent to study done by Himabindu *et al.* (2015)

Similar findings were seen in studies done by Manning *et al.* (1980) and Miller *et al.* (1977).

The present study found that the mean age of women was 24.81 ± 4.41 years ranging from 18 to 37 years. Jamatia *et al.* (2019) found that the mean age was 24.63 ± 3.63 years among whom NST was done in preeclampsia pregnant women. Himabindu *et al.* (2015) discovered that majority (38%) of women in their study population belonged to the age group of 21–25 years. In the study on preeclamptic women by Adokiye *et al.* (2015), majority of patients (50.53%) were in the age group of 20–29 years.

In our study, the mean gestational age was 36.23 ± 2.27 weeks. Arya *et al.* (2017) showed that 46% were of gestational age 36–37 weeks [Figure 1].

The present study found that PIH was the most common risk factor (33.9%). IUGR (21.2%) was the second most and BOH (12.9%) was the third most common risk factor. Borade *et al.* (2018) also found PIH in 30% as risk factor and Vijayalakshmi and Sivakumari (2016) found 25.5% PIH in their study [Table 2].

In our study, last NST was reactive among the majority of women (75.9). Jamatia *et al.* (2019) observed that out of 100 preeclampsia pregnant women, 68 women have reactive NST. In the study conducted by Raouf (2014), there were 71.7% of cases of reactive NST. Himabindu *et al.* (2015) observed that 62% of women had reactive NST [Figure 2].

Regarding MBBP, this study showed that both abnormal were among the majority of patients (71.4%) followed by NST normal and AFI abnormal (19.8%), NST abnormal and AFI normal (4.5%), and both normal (4.3%). Jamatia *et al.* (2019) observed that 26% of women were found to have normal BPP while 6% had abnormal BPP. In the study by Vijayalakshmi and Sivakumari (2016), the distribution of MBPP test score results in the study indicates that the vast majority of the tests were normal in 85%, both parameters abnormal in 4.5% and either anyone parameter was abnormal in 10.5% (NST normal AFI abnormal in 8.5% and NST abnormal AFI normal in 2%).

In the present study, reactive NST was in 10% of patients in whom MAS was present and the association was statistically significant ($P = 0.0001$). None of the other perinatal outcomes were associated with last NST ($P > 0.05$). Vijayalakshmi and Sivakumari (2016) in their study found that 4.3% had thick meconium with reactive NST.

Panda *et al.* (2015) in their study found out in their study that 9.30% of infants had NICU admission in reactive group and 24.12% of infants had NICU admission in non-reactive group which is quite comparable to our study [Table 1].

Last AFI was ≥5 among majority of women (91.2%) in the present study. The present study revealed that AFI ≥5 was in 14.9% of patients in whom fetal distress in labor was present. AFI ≥5 was in 22.5% of patients in whom Apgar score was <7 after 5 min. Last AFI was significantly ($P < 0.05$) associated with fetal distress in labor, Apgar score < 7 after 5 min, MAS, and perinatal death. Gupta *et al.* (2017) evaluated the usefulness of intrapartum AFI (AFI<5) for prediction of fetal distress during labor and subsequent fetal morbidity. Among 118 women, they found that thick meconium-stained amniotic fluid was found high (46.15%) among oligohydramnios group of women. Thus, presence and nature of meconium-stained liquor was significantly associated with AFI ($P < 0.001$). The studies by Rutherford *et al.* (1987) showed 54% incidence, Sarno *et al.* (1990) showed 41.9% of thick meconium-stained amniotic fluid in the oligohydramnios group.

In our present study, low birth weight (<2.5 kg) was in 30.5% of patients. Both NST and AFI were abnormal in 71.3% of patients among whom birth weight was <2.5 kg. There was a significant ($P = 0.0001$) association of birth weight with MBPP. Jamatia *et al.* (2019) showed that low birth weight babies were 21% among whom NST was done in preeclampsia pregnant women.

The present study demonstrated that Apgar <7 was in 25.2% of patients. Both NST and AFI were abnormal in 59.6% of patients among whom Apgar score was <7. There was a significant ($P = 0.0001$) association of Apgar score with MBPP. Almost similar to this study, Jamatia *et al.* (2019) showed that Apgar <7 was in 21% of patients among whom NST was done in preeclampsia pregnant women. In the study by Vijayalakshmi and Sivakumari (2016), 5 min Apgar <7 was seen in 6.4% of cases when both parameters were normal, 42% when either parameters were abnormal, and 100% when both parameters were abnormal ($P < 0.001$ which is highly significant).

In the present study, NICU admission was among 55.4% of patients. Both NST and AFI were abnormal in 65.2% of patients who admitted to NICU. There was a significant ($P = 0.0001$) association of NICU admission with MBPP. Jamatia *et al.* (2019) demonstrated that NICU admissions were in 26% of newborns among whom NST was done in preeclampsia pregnant women. In the study by Vijayalakshmi and Sivakumari (2016), NICU admission were >7 days in 10% of cases with normal MBBP,

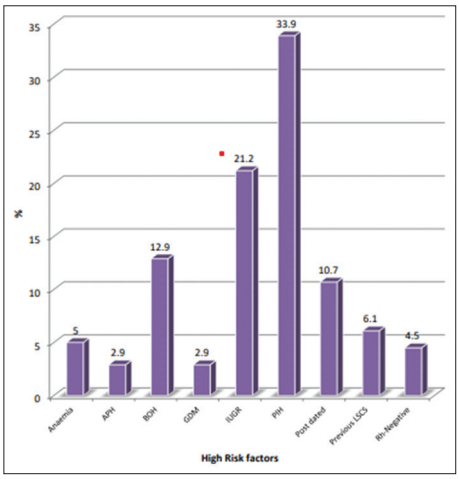

Figure 1: Distribution of women according to their high-risk factors

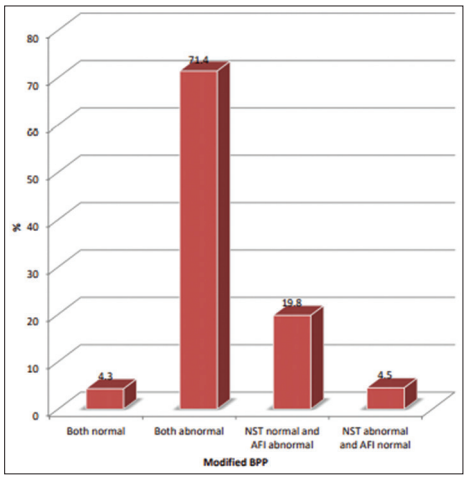

Figure 2: Distribution of women according to modified biophysical profile

38% when either one parameter is abnormal, and 100% when both parameters were abnormal (P <0.001 highly significant).

In the present study, perinatal mortality was in 5.9% of patients. Both NST and AFI were abnormal in 57.6% of patients whom perinatal mortality was present. There was a significant (P = 0.0001) association of perinatal mortality with MBPP. Manning *et al.* had mortality of 2.9% (1994) and Jamatia *et al.* (2019) showed that perinatal mortality was in 2% of newborns.

Table 1: Distribution of women according to last AFI (cm)

Last AFI	No. (n=560)	%
<5	49	8.8
≥5	511	91.2

AFI: Amniotic fluid index

Table 2: Distribution of women according to last NST

NST	No. (n=560)	%
Reactive	425	75.9
Non-reactive	135	24.1

NST: Non-stress test

SUMMARY AND CONCLUSION

The major goal of antepartum fetal surveillance is an appropriate and timely identification of fetuses at risk of morbidity and mortality and thus unnecessary delay in interventions can be avoided and hence a better perinatal outcome could be achieved.

An equally important goal is to avoid unnecessary intervention in an uncompromised fetus. Thus, MBPP is an easy, cost-effective, and time-saving measure and hence can be used as a primary antepartum fetal surveillance test to predict perinatal outcome and provide timely intervention in high-risk pregnancies.

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