Evaluation of fetal outcome by biophysical profile in term pregnancy in women with less fetal movement

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ABSTRACT

Background: Reduced fetal movement at term may indicate fetal compromise. Biophysical profile (BPP) is widely used to assess fetal well-being, yet its predictive value for neonatal outcomes in such cases requires further evaluation. This study aimed to assess the relationship between BPP scores and fetal outcomes, including Apgar scores, need for immediate resuscitation, and NICU admission, in term pregnancies with reduced fetal movement.
Methods: An analytical cross-sectional study was conducted at the department of obstetrics and gynecology, Dhaka Medical College and Hospital, Bangladesh, from August 2019 to July 2020. A total of 100 term pregnant women with reduced fetal movement were enrolled. Participants were classified into normal (≥8/10) and abnormal (≤6/10) BPP groups. Neonatal outcomes were recorded and analyzed using chi-square tests with significance set at $p<0.05$.
Results: Poor Apgar scores at one minute occurred in 33.3% of neonates in the abnormal BPP group versus 1.72% in the normal group ($p<0.001$). At five minutes, all neonates in the normal group had good Apgar scores, compared to 81% in the abnormal group ($p=0.001$). Immediate resuscitation was required in 33.3% of neonates in the abnormal group versus 1.72% in the normal group ($p<0.001$). NICU admission was significantly higher in the abnormal group (16.67% versus 1.72%, $p=0.007$).
Conclusions: Abnormal BPP scores were strongly associated with adverse fetal outcomes, while normal scores were highly reassuring. BPP remains an effective tool for evaluating fetal well-being in term pregnancies with reduced fetal movement.

Keywords: Biophysical profile, Fetal outcome, Reduced fetal movement

INTRODUCTION

Maternal perception of fetal movement is regarded as one of the most reliable indicators of fetal well-being during pregnancy. Movements such as rolling, fluttering, or kicking represent intact neurological function and adequate intrauterine oxygenation. Conversely, reduced or absent fetal movements may signify hypoxia, metabolic acidosis, or placental dysfunction, often preceding adverse outcomes such as stillbirth or neonatal morbidity.[1] It has been estimated that up to 15% of women experience decreased fetal activity during pregnancy, and over half of mothers of stillborn infants retrospectively report reduced movement before diagnosis.[2] At term, complaints of less

fetal movement are among the most frequent reasons for hospital admission, necessitating accurate and timely evaluation strategies.

Several modalities have been used for antepartum fetal surveillance, including cardiotocography, contraction stress testing, and kick charts. However, these methods are limited by high false-positive rates and variable reproducibility.[3] The introduction of real-time ultrasonography enabled direct visualization of fetal activity and combined with electronic monitoring, led to the development of the biophysical profile (BPP).[4] The BPP integrates five parameters: fetal breathing, gross body movement, tone, amniotic fluid volume, and non-stress test reactivity. Each parameter is scored as either normal (2 points) or abnormal (0 points), with a maximum total of 10. A score ≥8 is considered reassuring, whereas a score ≤6 suggests possible fetal compromise requiring closer monitoring or expedited delivery.[5]

BPP has since become a cornerstone in the management of high-risk pregnancies. Evidence suggests that it reduces false-negative diagnoses of fetal distress and provides valuable information on both acute and chronic hypoxic changes. Abnormal BPP scores have been associated with adverse neonatal outcomes, including low Apgar scores, increased need for resuscitation, neonatal intensive care unit (NICU) admission, and perinatal mortality.[6,7] Nevertheless, findings remain heterogeneous, and debate persists regarding its predictive value for long-term outcomes. Some studies report strong associations between abnormal BPP and poor neonatal outcomes, while others observe limited predictive capacity, particularly for mortality.[8,9]

The burden of reduced fetal movement is particularly relevant in low- and middle-income countries, where maternal health resources are constrained. In Bangladesh, decreased fetal movement is a common antenatal complaint, but evidence linking BPP scores to neonatal outcomes in such settings is limited.[10] Rising cesarean section rates and continuing neonatal morbidity highlight the need for reliable, non-invasive monitoring methods that can guide obstetric decision-making without contributing unnecessarily to intervention rates.

This study was therefore undertaken to evaluate fetal outcomes as assessed by Apgar scores, immediate resuscitation, and NICU admission in relation to normal and abnormal BPP scores in term pregnancies with reduced fetal movement. By focusing on these short-term neonatal outcomes, the study aimed to clarify the clinical utility of BPP in predicting fetal well-being and informing management decisions.

METHODS

This analytical cross-sectional study was conducted in the department of obstetrics and gynecology, Dhaka Medical College and Hospital, Bangladesh, from August 2019 to July 2020. A total of 100 pregnant women at term with reduced fetal movement were enrolled.

Participants were divided into two groups: group A with normal BPP (≥8/10) and group B with abnormal BPP (≤6/10).

Inclusion criteria

Singleton term pregnancy (≥37 weeks). Maternal complaint of reduced fetal movement.

Exclusion criteria

Gestational diabetes mellitus. Pre-eclampsia or eclampsia. Other significant maternal medical disorders.

Study procedure

Women presenting with a term pregnancy and a complaint of reduced fetal movement were initially assessed by the attending physician, followed by evaluation by the principal investigator. After screening, 100 eligible women were included. Data were collected through a structured questionnaire that incorporated demographic variables, clinical features, laboratory findings, and relevant obstetric details. Each participant underwent a detailed history and clinical examination, supported by laboratory investigations where indicated.

All enrolled women received a complete biophysical profile (BPP) assessment according to the Manning scoring system. This included real-time ultrasonographic evaluation of fetal breathing, gross body movement, tone, and amniotic fluid volume, combined with a non-stress test to assess fetal heart rate reactivity. Each parameter was scored as 2 (normal) or 0 (abnormal), and women were categorized into two groups: normal BPP (≥8/10) and abnormal BPP (≤6/10).

The intrauterine condition was evaluated using BPP scores, and fetal outcomes were subsequently documented. Outcomes of interest included Apgar scores at one and five minutes, requirement of immediate resuscitation, admission to the neonatal intensive care unit (NICU), stillbirth, and neonatal death. Data on delivery and neonatal condition were obtained from direct observation, delivery notes, and neonatal charts. Participants were followed until discharge from the hospital, ensuring complete documentation of immediate perinatal outcomes.

Ethical considerations

The study received ethical approval from the ethical review committee of Dhaka Medical College and Hospital. Written informed consent was obtained from all participants. Confidentiality was maintained, and participation was voluntary without impact on standard care.

Statistical analysis

Data were analyzed using SPSS version 20.0 for Windows. Continuous variables were expressed as mean±SD, and categorical variables as frequencies and percentages. Comparisons between groups were performed using chi-square tests. Statistical significance was considered at p<0.05.

RESULTS

Table 1 shows the proportion of study patients in different age groups. The highest number of patients fell in the age group of 18-30 years, of which 81.04% cases were in the normal biophysical profile group and 88.10% cases were in the abnormal biophysical profile group. The mean age group of the study population was found to be 25.49±5.27 years.

Table 1: Age distribution of study patients (n=100).

Age (years)	Group A normal BPP (n=58) (%)	Group B abnormal BPP (n=42) (%)
<18	1 (1.72)	0 (0)
18-30	47 (81.04)	37 (88.10)
>30	10 (17.24)	5 (11.90)

Table 2: Distribution of study patients with gestational age and gravida (n=100).

Obstetrics variables		Group A normal BPP (n=58) (%)	Group B abnormal BPP (n=42) (%)	P value
Gestational age	Term (37-40 weeks)	55 (94.83)	41 (97.62)	0.482
	Post-dated (>40 weeks)	3 (5.17)	1 (2.38)	
Gravidity	Primigravida	16 (27.59)	16 (38.10)	0.266
	Multigravida	42 (72.41)	26 (61.90)	

Table 3: Relationship of Apgar score with biophysical profile (n=100).

Apgar score		Group A normal BPP (n=58) (%)	Group B abnormal BPP (n=42) (%)	P value
Apgar score 1 minute	Poor (<7)	1 (1.72)	14 (33.3)	<0.001
	Good (≥7)	57 (98.27)	28 (66.7)	
Apgar score 5 minutes	Poor (<7)	0 (0)	8 (19.1)	0.001
	Good (≥7)	58 (100)	34 (81)	

Table 4: Relationship of fetal outcome with biophysical profile (n=100).

Fetal outcome		Group A normal (58) (%)	Group B abnormal (42) (%)	P value
Immediate resuscitation	Needed	1 (1.72)	14 (33.3)	<0.001
	Not needed	57 (98.27)	28 (66.7)	
NICU admission	Needed	1 (1.72)	7 (16.67)	0.007
	Not needed	57 (98.27)	35 (83.3)	

Table 2 shows that the majority of patients were in term pregnancy in both groups. The difference was statistically insignificant (p>0.05). Most of the cases were multigravida in both groups. In the normal biophysical profile group 42 (72.41%), cases were multigravida. In the abnormal biophysical group 26 (61.90%), cases were multigravida. The difference was statistically insignificant (p>0.05).

Relationship of Apgar score with biophysical profile was given in Table 4. In the normal biophysical profile group, 57 (98.27%) cases had a good Apgar score at 1 minute. In the abnormal biophysical profile group 28 (66.7%), cases belonged to a good Apgar score at 1 minute. Relationship of the biophysical profile with the Apgar score at 1 minute was found statistically significant (p<0.05). All the babies in the normal biophysical profile group had good Apgar scores at 5 minutes, as well as the majority of babies in the abnormal biophysical profile group also had good Apgar scores at 5 minutes. The difference was statistically significant (p value <0.05).

Out of 100 cases, 15 had needed immediate resuscitation. In a normal Biophysical profile, only 1 (1.72%) neonate needed immediate resuscitation. In abnormal Biophysical profile 14 (33.3%) neonates needed immediate resuscitation. The difference was statistically significant (p <0.05). In a normal biophysical profile 1 (1.72%) neonate had needed NICU admission. In abnormal biophysical profile 7 (16.67%) neonates needed NICU admission. The difference was statistically significant (p<0.05).

DISCUSSION

This study investigated the relationship between biophysical profile (BPP) scores and immediate fetal

outcomes in term pregnancies where women presented with reduced fetal movement. The findings showed that abnormal BPP scores were significantly associated with poor Apgar scores at both one and five minutes, increased need for immediate resuscitation, and higher rates of neonatal intensive care unit (NICU) admission. These results reinforce the role of BPP as an effective predictor of neonatal morbidity and a valuable surveillance tool in late pregnancy.

The mean age group of women in our study was 25.49±5.27 years. More than 80% of the women in the study fell into the age group 18-30. This is comparable to the study conducted by Ullah et al, where the mean age of the patient was 28.67±6.42 years.[6] Another study was conducted by Anupama et al, where the mean age of the study population was 25.70±4.25 years.[11]

In the present study, 96% patients were found to be in term pregnancy and only 4% patients were postdating pregnancy. Mean gestational age was 38.13±1.17 weeks. A similar observation was noticed in Anupama et al. study, where the maximum number of subjects was found between 37-38 weeks of age and the mean gestational age was 37.00±1.79 weeks.[11] The majority of patients in this study were multigravida 68%. Similar observation was found in Ullah et al study where out of 100 patients 34% were primigravida and 66% were multigravida.[6]

The Apgar score remains a widely used and clinically meaningful parameter for assessing neonatal well-being immediately after birth. In this study, neonates with abnormal BPP scores were substantially more likely to have Apgar scores <7 at one and five minutes. Similar associations have been reported in multiple studies. Singh et al demonstrated that abnormal BPP scores correlated strongly with low Apgar scores, suggesting compromised intrauterine conditions.[7] Ullah et al also showed that neonates born to mothers with abnormal profiles had significantly lower Apgar scores and were at greater risk of intrapartum hypoxia.[6] These findings are further supported by Manzoor et al, who highlighted that BPP can serve as a reliable indicator of intrapartum distress and neonatal compromise.[8] The present study's finding that all neonates in the normal BPP group achieved good Apgar scores at five minutes underscores the strong negative predictive value of BPP, consistent with prior literature.[4]

The need for immediate neonatal resuscitation was also significantly higher among the abnormal BPP group in this study. This finding is aligned with the work of Rehman et al, who observed that neonates of mothers with abnormal profiles had markedly higher rates of resuscitation and subsequent NICU admission.[9] Similarly, Afzal and Nasreen reported that abnormal BPP scores were predictive of perinatal morbidity, including respiratory distress requiring resuscitative support.[12] These results suggest that abnormal BPP scores do not merely reflect transient intrapartum compromise but are closely linked with meaningful neonatal outcomes requiring active intervention.

NICU admission provides another objective measure of neonatal morbidity. In this study, neonates in the abnormal BPP group were significantly more likely to require NICU care. Comparable results have been documented by other investigators. Manandhar et al found that low BPP scores were strongly associated with higher NICU admission rates.[13] A study by Purushotham et al comparing BPP with Doppler velocimetry similarly demonstrated that abnormal BPP scores predicted higher neonatal morbidity and greater need for specialized care.[14] These observations reaffirm that BPP is not only a screening tool but also a valuable predictor of outcomes that directly impact neonatal survival and quality of care.

Despite these associations, one important observation in this study was the absence of significant differences in neonatal mortality between the groups. This finding mirrors results from several studies that emphasize the limitations of BPP in predicting perinatal death. Lalor et al, in their Cochrane review, concluded that while BPP reduces morbidity, it does not consistently lower perinatal mortality.[15] Vintzileos et al earlier highlighted that the test has high sensitivity for detecting compromised fetuses but lacks specificity for predicting ultimate mortality outcomes.[16] Neonatal death is multifactorial and may occur due to acute events such as placental abruption or umbilical cord accidents that cannot always be detected by antenatal surveillance methods.

In summary, the findings of this study reaffirm that abnormal BPP scores are strongly associated with adverse neonatal morbidity, while normal scores are highly reassuring of good neonatal outcomes. These results support the continued use of BPP in pregnancies complicated by reduced fetal movement, particularly in low-resource settings. However, clinicians should remain mindful of the test's limitations in predicting perinatal mortality and integrate it with other clinical and diagnostic information to optimize care.

The study was limited by its relatively small sample size and single-center design, which may reduce external validity. Neonates were followed only during the immediate postnatal period, preventing assessment of long-term developmental outcomes.

CONCLUSION

Abnormal biophysical profile scores were significantly associated with adverse fetal outcomes, including poor Apgar scores, increased need for resuscitation, and higher NICU admissions, in women presenting with reduced fetal movement at term. Normal scores were highly predictive of good neonatal outcomes. BPP thus remains a valuable tool for fetal surveillance, particularly in resource-limited settings, though its results should be interpreted alongside clinical judgment.

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