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Biophysical Profile with Mode of Delivery and Immediate Neonatal Outcome in Term Pregnancies with Reduced Fetal Movement

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Abstract

Background: Fetal movement is an early sign of life and indicates well-being. Reduced fetal movement is common in pregnant women, affecting perinatal outcomes and increasing risks of stillbirth, growth restriction, distress, and preterm birth. The biophysical profile (BPP) assesses fetal well-being in the last trimester. This study evaluated the association between BPP scores, delivery mode, and neonatal outcomes in women with reduced fetal movement at term. ***Methods:*** This analytical cross-sectional study was conducted at the Department of Obstetrics and Gynaecology, Dhaka Medical College and Hospital, Bangladesh, from August 2019 to July 2020. One hundred women at ≥37 weeks of gestation with reduced fetal movement were enrolled and divided into normal (≥8/10) and abnormal (≤6/10) BPP groups. Maternal demographics, mode of delivery, and perinatal outcomes were recorded. Data were analyzed using SPSS version 20.0. ***Results:*** Caesarean section rates were significantly higher among women with abnormal BPP (80.95%) compared to those with normal scores (46.55%) (p=0.002). Vaginal deliveries predominated in the normal group. Perinatal outcomes were generally favorable, but neonatal death and stillbirth occurred more frequently in the abnormal BPP group (7.14%) compared to the normal group (1.72%), though this difference was not statistically significant. ***Conclusion:*** Abnormal BPP scores correlated with higher caesarean rates and adverse outcomes. However, no significant difference in mortality was observed. Findings suggest BPP helps identify at-risk fetuses, but delivery decisions should combine test results and clinical judgment to balance intervention with outcomes.

Keywords: Biophysical profile, reduced fetal movement, neonatal outcome, term pregnancy.

INTRODUCTION

Maternal perception of fetal movement has long been recognized as one of the earliest indicators of fetal well-being. A sudden reduction in fetal activity is often a source of concern for both the mother and the clinician, as it may indicate compromised intrauterine conditions. Globally, up to 15% of pregnant women report a change in fetal movement during gestation, and approximately half of women experiencing stillbirth retrospectively acknowledge reduced movements before diagnosis [1]. The challenge, therefore, lies in accurately identifying pregnancies at risk of adverse outcomes when women present with reduced fetal movement at term.

The biophysical profile (BPP), introduced by Manning in the 1980s, is a comprehensive assessment tool combining sonographic and cardiotocographic parameters to evaluate fetal well-being [2]. It consists of five components—fetal breathing movement, gross body movement, fetal tone, amniotic fluid volume, and non-stress test reactivity—each scored dichotomously, with a maximum total score of ten [3]. A score ≥8 is generally considered reassuring, whereas a score ≤6 is suggestive of fetal compromise and may warrant intervention [4].

The test has been widely adopted due to its non-invasiveness, reproducibility, and ability to assess both acute and chronic fetal hypoxia.

While numerous studies have established the association between abnormal BPP scores and perinatal morbidity and mortality, evidence remains inconsistent regarding its influence on the mode of delivery and immediate neonatal outcomes [5,6]. Abnormal BPP scores frequently lead to increased obstetric interventions, particularly caesarean sections, due to clinicians' cautious approach to potential hypoxia [7]. However, whether these interventions consistently translate into improved neonatal survival and well-being is less clear [8]. Some studies suggest that abnormal BPP is strongly predictive of intrapartum fetal distress and the need for operative delivery [9], while others argue that its predictive capacity for immediate neonatal outcomes such as Apgar scores, need for resuscitation, or early neonatal death is limited [10,11].

In low- and middle-income settings, where intrapartum monitoring resources may be constrained, the BPP serves as an invaluable adjunct for decision-making. The tendency to intervene operatively in abnormal BPP cases, however, raises questions about the balance between maternal surgical risk and neonatal benefit. Understanding this balance is particularly important in countries like Bangladesh, where caesarean rates are rising and neonatal morbidity remains a critical public health concern [12].

This study aimed to evaluate the relationship between BPP scores and the mode of delivery, alongside immediate neonatal outcomes in women presenting with reduced fetal movement at term. By focusing on these outcomes, the study seeks to provide evidence to inform clinical decision-making and contribute to the debate on whether BPP should guide operative intervention in such cases.

METHODOLOGY & MATERIALS

This was an analytical cross-sectional study conducted in the Department of Obstetrics and Gynecology, Dhaka Medical College and Hospital, Bangladesh, over 12 months from August 2019 to July 2020. The study included 100 women at term pregnancy presenting with reduced fetal movement who fulfilled the inclusion and exclusion criteria. Participants were divided into two groups according to BPP score: Group A, normal BPP (≥8/10), and Group B, abnormal BPP (≤6/10).

Sample Selection

Inclusion criteria:

- Term singleton pregnancy (≥37 weeks).
- Maternal complaint of reduced fetal movement.

Exclusion criteria:

- Gestational diabetes mellitus.
- Hypertensive disorders of pregnancy (pre-eclampsia, eclampsia).
- Other medical comorbidities complicating pregnancy.

Study Procedure

Eligible participants underwent detailed history taking, clinical examination, and routine investigations upon admission. BPP was performed for each participant using real-time ultrasonography combined with non-stress testing. Five fetal parameters—gross body movement, fetal breathing, fetal tone, amniotic fluid volume, and reactive fetal heart rate—were assessed according to the Manning scoring system. A score of 2 was assigned for normal findings and 0 for abnormal findings. The final BPP score guided grouping. Pregnancy outcomes, including mode of delivery, Apgar scores at one and five minutes, need for resuscitation, neonatal intensive care unit (NICU) admission, stillbirth, or neonatal death, were prospectively recorded.

Ethical Consideration

The study received approval from the Ethical Review Committee of Dhaka Medical College and Hospital. Written informed consent was obtained from all participants after explaining the study objectives and procedures. Confidentiality was maintained, and participants were assured of their right to withdraw at any stage without affecting clinical care.

Statistical Analysis

Data were analyzed using SPSS version 20.0 for Windows. Categorical variables were summarized as frequencies and percentages, and continuous variables as means with standard deviations. The chi-square test was applied for categorical comparisons between groups. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1: Baseline characteristics of study participants (n=100)

Variables		Group A Normal BPP (n=58)	Group B Abnormal BPP (n=42)	P-value
Age (years)	<18	1 (1.72)	0 (0.0)	0.46
	18–30	47 (81.04)	37 (88.10)	
	>30	10 (17.24)	5 (11.90)	
Gestational age	Term (37–40 weeks)	55 (94.83)	41 (97.62)	0.482
	Post-dated (>40 weeks)	3 (5.17)	1 (2.38)	

Variables		Group A Normal BPP (n=58)	Group B Abnormal BPP (n=42)	P-value
Gravidity	Primigravida	16 (27.59)	16 (38.10)	0.266
	Multigravida	42 (72.41)	26 (61.90)	

Table 1 shows the baseline characteristics of the study population. 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. 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).

Table 2: Relationship of Perinatal outcome with Biophysical profile (n=100)

Mode of delivery	Group A Normal BPP (n=58)	Group B Abnormal BPP (n=42)	P-value
Normal vaginal delivery	29 (50.00)	5 (11.91)	0.002
Instrumental delivery	2 (3.45)	1 (2.38)	
Caesarean section (LUCS)	27 (46.55)	36 (80.95)	

Table 2 shows that normal vaginal delivery was higher in the normal biophysical profile than in the abnormal biophysical group. The caesarean section rate was higher in the abnormal biophysical profile group. The difference was statistically significant (p-value < 0.05).

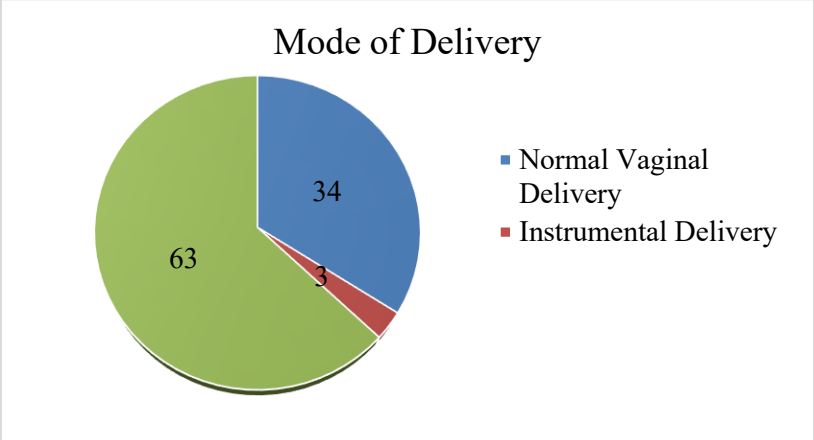

Figure 1: Distribution of the population based on mode of delivery (n=100)

Out of 100 cases 34% had normal vaginal delivery, 3% had instrumental delivery, and 63% had caesarean section.

Table 3: Relationship of Perinatal outcome with Biophysical profile (n=100)

Perinatal outcome	Group A Normal BPP (n=58)	Group B Abnormal BPP (n=42)	P-value
Take home alive	57 (98.27)	39 (92.86)	0.332
Neonatal death	1 (1.72)	2 (4.76)	
Stillbirth	0 (0.0)	1 (2.38)	

Table 3 shows that the majority of cases had a good perinatal outcome in both groups. There was only one neonatal death that occurred in the normal biophysical profile group, whereas two neonatal deaths occurred in the abnormal Biophysical profile group. The difference was statistically insignificant (p=>0.05).

DISCUSSION

This study examined the relationship between biophysical profile (BPP) scores, mode of delivery, and immediate neonatal outcomes in women presenting with reduced fetal movement at term. The findings showed that women with abnormal BPP scores were significantly more likely to undergo caesarean section compared with those with normal scores, while vaginal deliveries were more common in women with reassuring profiles. This pattern highlights the central role of BPP in guiding obstetric decisions, particularly when there is concern about intrauterine hypoxia.

The observation that nearly 81% of women in the abnormal BPP group required caesarean delivery is consistent with earlier findings. Manandhar et al. reported a strong association between low BPP scores and operative delivery, with abnormal scores nearly doubling the likelihood of caesarean section [7]. Similarly, Anupama et al. demonstrated that almost all women with abnormal BPP underwent caesarean delivery, underscoring the test's influence on clinical management [13]. Such outcomes reflect the high sensitivity of BPP in identifying potential compromise but also raise concerns about whether this leads to over-intervention in cases where perinatal benefit is uncertain.

Caesarean delivery has undoubtedly contributed to improved neonatal outcomes in many high-risk scenarios, yet rising operative rates present significant challenges, particularly in resource-limited settings. The World Health Organization recommends caesarean rates of 10–15%, but in countries like Bangladesh, rates often exceed this threshold, placing pressure on healthcare systems and exposing women to unnecessary surgical risks [14]. The strong association observed in this study suggests that abnormal BPP is a major driver of operative deliveries, but it remains essential to balance timely intervention against the risk of unnecessary procedures.

Regarding neonatal outcomes, this study found that survival was generally favorable in both groups, though adverse outcomes such as stillbirth and early neonatal death occurred more often in the abnormal BPP group. This aligns with previous studies that demonstrated higher morbidity among neonates with abnormal BPP. Singh *et al.,* observed significantly poorer Apgar scores and increased need for neonatal resuscitation among these cases, while Rehman et al. reported greater rates of NICU admission and early neonatal mortality [10,11]. These findings highlight that abnormal BPP scores, though not always predictive of mortality, are strong indicators of neonatal compromise at birth.

Nonetheless, the absence of statistically significant differences in perinatal mortality between the two groups in this study is noteworthy. This observation mirrors the findings of Lalor *et al.,* in their Cochrane review, which found insufficient evidence that BPP reduces perinatal deaths compared with other surveillance methods [6]. Afzal and Nasreen also noted that while BPP can reliably predict neonatal morbidity, its predictive capacity for mortality is limited [8]. This raises an important clinical dilemma: abnormal BPP scores may increase the likelihood of operative intervention without consistently reducing mortality, suggesting that their benefits may be more in preventing short-term morbidity rather than death.

One explanation for this limitation is the multifactorial nature of perinatal mortality. Acute and unpredictable events such as cord prolapse, placental abruption, or intrauterine infection may lead to adverse outcomes regardless of antenatal BPP findings. Oyelese and Vintzileos highlighted that even a normal BPP cannot rule out sudden catastrophic events that occur between surveillance and delivery [15]. Similarly, Heazell and Froen noted that stillbirths may occur despite reassuring fetal assessments, reflecting the complexity of fetal compromise [16]. This underlines the importance of combining BPP with vigilant clinical monitoring and, where available, additional diagnostic modalities.

In summary, this study reinforces the strong association between abnormal BPP scores and increased caesarean delivery, while also demonstrating a trend toward poorer neonatal outcomes in these cases. However, the lack of significant differences in perinatal mortality highlights the limitations of relying solely on BPP to determine delivery decisions. The findings suggest that BPP should continue to play an important role in fetal surveillance, but always in conjunction with clinical judgment and, where possible, other diagnostic modalities. This balanced approach can help optimize perinatal outcomes while minimizing unnecessary surgical interventions.

Limitations of the study

The study had some limitations.

1. A small sample size was taken in this study.
2. The study population was collected from one selected hospital in Dhaka city, so the results of the study may not reflect the exact picture of the country.
3. The babies were followed up until their hospital stay. Long-term follow-up is required to ascertain their development.

CONCLUSION

Abnormal biophysical profile scores were strongly associated with higher rates of caesarean delivery in women presenting with reduced fetal movement at term. While these scores also correlated with adverse neonatal outcomes, differences in perinatal mortality were not statistically significant. The findings underscore the need for judicious interpretation of BPP in guiding delivery decisions, particularly in settings where caesarean rates are already high. BPP remains a valuable tool for fetal surveillance but should be integrated with clinical assessment to optimize outcomes.

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Conflicts of Interest: There are no conflicts of interest.

Ethical Approval: The study was approved by the Institutional Ethics Committee.

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