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# Predictive Value of Biophysical Profile in Women Presenting with Decreased Fetal Movements in a Tertiary Care Hospital

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## ABSTRACT

**Background:** Adverse perinatal outcomes, such as preterm birth and low birth weight, are significant concerns, especially in low- and middle-income countries. This study aims to evaluate the predictive value of the Biophysical Profile (BPP) in identifying adverse perinatal outcomes in women with decreased fetal movements.

**Aim of the study:** The aim of the study was to evaluate the predictive value of the Biophysical Profile (BPP) in identifying adverse perinatal outcomes among women presenting with decreased fetal movements in a tertiary care hospital.

**Methods:** This prospective study was conducted in the Department of Obstetrics and Gynecology at Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from June 2021 to May 2022, involving 120 pregnant women with decreased fetal movements. BPP assessment and perinatal outcomes, including mode of delivery and NICU admission. Data were analyzed using SPSS version 22.0, with the chi-square test comparing perinatal outcomes across BPP categories ($p<0.05$).

**Results:** This study of 120 women with decreased fetal movements found that lower Biophysical Profile (BPP) scores were strongly linked to worse perinatal outcomes. While 70% had normal BPP scores, those with abnormal scores (0-4) had significantly higher rates of NICU admissions (62.5%), low Apgar scores (75%), and stillbirths (75%), all with $p < 0.001$. The results underscore the predictive value of BPP in identifying adverse outcomes.

**Conclusion:** The Biophysical Profile (BPP) is a reliable predictor of adverse perinatal outcomes, with lower scores significantly associated with increased morbidity and mortality.

**Key words:** Biophysical Profile, Decreased Fetal Movements, Perinatal Outcomes, Predictive Value, Maternal Health.

## INTRODUCTION

Adverse perinatal outcomes, such as preterm birth, low birth weight, and neonatal complications, present major global public health issues, with approximately 15 million preterm births each year, representing over 10% of all births.[1] This problem is particularly acute in low- and middle-income countries (LMICs), where limited healthcare resources often worsen complications. In Bangladesh, for example, maternal and newborn outcomes vary significantly depending on factors like the mode of delivery, with prior cesarean sections being a notable factor.[2] Research in these regions, including studies on gestational weight gain in rural Bangladesh, has identified links to negative perinatal outcomes, such as preterm birth and low birth weight.[3] These challenges underscore the need for enhanced prenatal care, with tools like the Biophysical Profile (BPP) playing an essential role in predicting adverse outcomes. The BPP, which combines fetal heart rate monitoring with assessments of

fetal movements, tone, breathing, and amniotic fluid volume, has proven particularly valuable in high-risk pregnancies, offering an effective means of early detection of fetal distress. Research indicates that poor BPP scores correlate with higher cesarean section rates and lower Apgar scores, further highlighting its importance in managing perinatal risks.[4]

Fetal movement (FM) is an important indicator of fetal health, serving as one of the earliest signs of life that a pregnant woman can feel.[5,6] As the pregnancy progresses, these movements become more coordinated. Ultrasound can provide an accurate visual assessment of fetal movements, making it a crucial part of prenatal evaluations.[7] Maternal perception of fetal movements is often used to monitor fetal well-being, as a decrease in fetal movement (DFM) is a common concern for pregnant women.[8] DFM has been linked to adverse perinatal outcomes, including fetal growth restriction, oligohydramnios, and stillbirth.[9,10,11] Various factors, such as maternal conditions like anemia or diabetes, can influence the perception of fetal movements, emphasizing the importance of comprehensive monitoring. To enhance perinatal outcomes, interventions like fetal movement counting and vibroacoustic stimulation (VAS) have been suggested. VAS, for instance, can improve results in non-stress tests (NST) by reducing non-reactive outcomes and shortening testing time, offering a practical, non-invasive approach for managing high-risk pregnancies.[12] While some studies question the predictive value of DFM, it remains a key aspect of prenatal care, providing valuable opportunities for timely intervention that can improve outcomes in high-risk pregnancies.

Decreased fetal movements often raise concerns about fetal well-being, and accurate identification of at-risk pregnancies can guide timely interventions. The Biophysical Profile (BPP), a non-invasive assessment of fetal health, has been widely used in obstetrics, but its predictive value in this specific context has not been fully explored. By examining the relationship between BPP scores and perinatal outcomes, this study contributes valuable insights into the effectiveness of the BPP as a tool for anticipating complications such as low Apgar scores, NICU admissions, and stillbirths. The purpose of this study was to evaluate the predictive value of the BPP in identifying adverse perinatal outcomes among women presenting with decreased fetal movements in a tertiary care hospital.

**Objective**

- The aim of the study was to evaluate the predictive value of the Biophysical Profile (BPP) in identifying adverse perinatal outcomes among women presenting with decreased fetal movements in a tertiary care hospital.

## METHODOLOGY & MATERIALS

This prospective, observational study was conducted in the Department of Obstetrics and Gynecology at Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from June 2021 to May 2022. The study included 120 pregnant women presenting with decreased fetal movements to assess their biophysical profile (BPP) findings and associated perinatal outcomes.

**Inclusion Criteria:**

- Pregnant women aged ≥18 years.
- Singleton pregnancies at ≥28 weeks of gestation.
- Women presenting with decreased fetal movements.
- Patients who provided written informed consent.

**Exclusion Criteria:**

- Multiple pregnancies.
- Known fetal congenital anomalies.
- Maternal conditions affecting fetal well-being (e.g., severe preeclampsia, uncontrolled diabetes).
- Patients with incomplete medical records or who declined participation.

Written informed consent was obtained, ensuring confidentiality and ethical compliance. Maternal history, parity, and gestational age (confirmed via first-trimester ultrasound or last menstrual period) were recorded. BPP was performed assessing fetal movement (≥3 movements in 30 minutes), fetal tone (≥1 episode of limb extension/flexion), fetal breathing (≥1 episode of ≥30 seconds in 30 minutes), amniotic fluid index (AFI ≥8 cm or oligohydramnios <8 cm), and non-stress test (NST: reactive or non-reactive). BPP scores were categorized as normal (8–10), equivocal (6), or abnormal (0–4). Perinatal outcomes included mode of delivery (vaginal or cesarean), NICU admission, respiratory distress, low Apgar score (<7 at 5 minutes), and stillbirths. Data were collected using a structured case report form and analyzed with SPSS version 22.0. Descriptive statistics summarized demographic and clinical characteristics, while the chi-square test was used to compare perinatal outcomes across BPP categories, with $p<0.05$ considered statistically significant.

**RESULTS**

**Table 1: Demographic Characteristics of the Study Population (n=120)**

| Variable | | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **Age (In years)** | 18–20 | 15 | 12.5 |
| | 21–25 | 65 | 54.2 |
| | 26–30 | 40 | 33.3 |
| | Mean±SD (years) | 24.17±3 | |
| **Gestational Age** | Mean±SD (weeks) | 36.8 ± 2.1 | |
| **Parity** | Primigravida | 78 | 65.0 |
| | Multiparous | 42 | 35.0 |

The age distribution indicated that the majority of participants (65, 54.2%) were in the 21–25 years age group, followed by 40 (33.3%) in the 26–30 years age group, and 15 (12.5%) in the 18–20 years age group. The mean age of the participants was 24.17 ± 3 years. Regarding gestational age, the mean was 36.8 ± 2.1 weeks. In terms of parity, 65.0% of the participants were primigravida, and 35.0% were multiparous.

**Table 2: Biophysical Profile (BPP) Findings in Women Presenting with Decreased Fetal Movements (n=120)**

| BPP findings | | Frequency (n) | Percentage (%) |
|---|---|---|---|
| **BPP Score** | Normal (8–10) | 84 | 70.0 |
| | Equivocal (6) | 31 | 25.8 |
| | Abnormal (0-4) | 4 | 3.3 |
| **Other BPP Components** | Non-Reactive NST | 55 | 45.5 |
| | Oligohydramnios (AFI < 8) | 45 | 37.2 |

The Biophysical Profile (BPP) scores among the participants were as follows: 84 participants (70.0%) had a normal BPP score of 8-10, 31 participants (25.8%) had an equivocal score of 6, and 4 participants (3.3%) had an abnormal score of 0-4. Additionally, 55 women (45.5%) had a non-reactive Non-Stress Test (NST), and 45 women (37.2%) were diagnosed with oligohydramnios, indicated by an Amniotic Fluid Index (AFI) of less than 8.

**Table 3: Perinatal Outcomes in Women Presenting with Decreased Fetal Movements (n=120)**

| Outcome | Frequency (n) | Percentage (%) |
|---|---|---|
| **Mode of Delivery** | | |
| Vaginal Delivery | 86 | 71.7 |
| Cesarean Section | 34 | 28.3 |
| **NICU Admission** | 19 | 15.8 |
| Respiratory Distress | 4 | 3.3 |
| Low Apgar Score (<7 at 5 min) | 15 | 12.5 |
| **Stillbirths** | 16 | 13.3 |

This table outlines the perinatal outcomes of the study population. Among the 120 participants, 86 (71.7%) delivered vaginally, while 34 (28.3%) underwent cesarean section. Neonatal outcomes included 19 (15.8%) NICU admissions, with 4 (3.3%) due to respiratory distress, and 15 (12.5%) neonates with a low Apgar score (<7 at 5 minutes). Notably, there were 16 (13.3%) stillbirths observed in this cohort.

**Table 4: Association Between Biophysical Profile (BPP) Scores and Perinatal Outcomes (n=120)**

| Perinatal Outcome | Score 6 (n=31) | Score 8–10 (n=84) | Score 0–4 (n=4) | p-value |
|---|---|---|---|---|
| Vaginal Delivery | 12 (38.7%) | 72 (85.7%) | 2 (50.0%) | <0.001 |
| NICU Admission | 8 (25.8%) | 6 (7.1%) | 5 (62.5%) | |
| Low Apgar (<7 at 5 min) | 7 (22.6%) | 5 (6.0%) | 3 (75.0%) | |
| Stillbirths | 4 (12.9%) | 0 (0.0%) | 12 (75.0%) | |

This table presents the distribution of perinatal outcomes based on BPP scores among the 120 participants. Among those with a normal BPP (8–10) (n=84), 72 (85.7%) had a vaginal delivery, 6 (7.1%) required NICU admission, 5 (6.0%) had a low Apgar score, and no stillbirths were recorded. In the equivocal BPP (6) group (n=31), 12 (38.7%) had a vaginal delivery, while adverse outcomes were more frequent, including 8 (25.8%) NICU admissions, 7 (22.6%) cases of low Apgar scores, and 4 (12.9%) stillbirths. Among the abnormal BPP (0–4) group (n=4), only 2 (50.0%) had a vaginal delivery, while NICU admission (5, 62.5%), low Apgar scores (3, 75.0%), and stillbirths (12, 75.0%) were significantly higher. Statistical analysis revealed a strong correlation ($p < 0.001$) between BPP scores and adverse perinatal outcomes.

## DISCUSSION

This study evaluates the predictive value of the Biophysical Profile (BPP) in identifying adverse perinatal outcomes among women presenting with decreased fetal movements at a tertiary care hospital in Bangladesh. Decreased fetal movement is a common concern in pregnancy and often signals potential fetal distress. Our findings underscore the crucial role of BPP in assessing fetal well-being, with significant associations between lower BPP scores and adverse outcomes such as stillbirths, NICU admissions, and low Apgar scores. These results emphasize the importance of timely, accurate monitoring to facilitate early intervention and improve perinatal outcomes for at-risk pregnancies.

In our study, the mean age of participants was 24.17 ± 3 years, with the majority falling within the 21–25-year age group (54.2%). This is consistent with the findings of Makhaik et al.[13], who reported a similar mean age of 24.52 years in their study on intrauterine growth-restricted fetuses. Primigravida women comprised 65.0% of our population, which aligns with the higher proportion of first-time mothers in their study. This suggests that younger, first-time mothers are more likely to be concerned about fetal movements. Additionally, the mean gestational age of 36.8 ± 2.1 weeks mirrors the late third-trimester assessments seen in their cohort, highlighting the importance of evaluating fetal well-being at this critical stage. These demographic trends stress the need for targeted prenatal education and vigilant monitoring, particularly for younger, first-time mothers, who may benefit most from timely interventions guided by BPP assessments.

In our study, 70.0% of participants had a BPP score between 8–10, consistent with findings by Vintzileos et al[14]., who also reported a predominance of higher BPP scores in women with fetal movement concerns. Similarly, 25.8% of women had a BPP score of 6, reflecting a common occurrence of mildly abnormal BPP results in this clinical context, as seen in Soufizadeh et al.'s study.[15] Additionally, 45.5% of women had a non-reactive NST, and 37.2% had oligohydramnios (AFI < 8), similar to the findings of Nalamaru et al.[16], which further emphasize the relevance of these BPP components in identifying at-risk pregnancies. These results reinforce the role of BPP as a key tool in assessing fetal well-being and highlight the importance of vigilant prenatal monitoring and timely intervention to improve perinatal outcomes.

Our study revealed that 71.7% of women had vaginal deliveries, while 28.3% underwent cesarean sections. These findings align with Bodner et al.'s study,[17] which also reported a higher rate of vaginal deliveries (87.6%). The NICU admission rate of 15.8% in our study, including 3.3% due to respiratory distress, is comparable to the 18% NICU admission rate reported in Nandi et al's[18] study, suggesting similar neonatal challenges in pregnancies complicated by decreased fetal movements. Additionally, 12.5% of neonates in our study had a low Apgar score (<7 at 5 minutes), comparable to the 8.75% incidence in their cohort. Notably, our study observed 16 (13.3%) stillbirths, underscoring the critical need for vigilant monitoring and timely interventions to improve outcomes. These findings suggest that perinatal outcomes in women presenting with decreased fetal movements can be managed similarly across different settings, with timely monitoring and interventions contributing to favorable outcomes.

Our study also highlighted significant associations between BPP scores and perinatal outcomes. Among participants with a normal BPP (8–10) score, 85.7% had vaginal deliveries, 7.1% required NICU admission, 6.0% had a low Apgar score, and no stillbirths were recorded. In the equivocal BPP (6) group, 38.7% had vaginal deliveries, while adverse outcomes were more frequent, including 25.8% NICU admissions, 22.6% low Apgar

scores, and 12.9% stillbirths. In the abnormal BPP (0–4) group, only 50.0% had vaginal deliveries, while NICU admission (62.5%), low Apgar scores (75.0%), and stillbirths (75.0%) were significantly higher. The significant p-values (<0.001) across all outcome variables reinforce the predictive value of BPP in identifying at-risk pregnancies. These findings, in line with those reported by Singh et al.[19], highlight the essential role of BPP in clinical practice, aiding in the monitoring of fetal well-being and guiding timely interventions to improve perinatal outcomes.

**Limitations of the study**

This study had some limitations:

- The study was conducted in a selected tertiary-level hospital.
- The sample was not randomly selected.
- The study's limited geographic scope may introduce sample bias, potentially affecting the broader applicability of the findings.

## CONCLUSION

The study demonstrates that the Biophysical Profile (BPP) is a valuable tool in predicting adverse perinatal outcomes in women presenting with decreased fetal movements. A normal BPP score (8–10) was associated with favorable outcomes, including a higher rate of vaginal deliveries and no stillbirths. In contrast, lower BPP scores (6 and 0–4) were significantly correlated with increased NICU admissions, low Apgar scores, and stillbirths, with the most severe outcomes observed in those with BPP scores of 0–4. These findings underscore the importance of BPP in antenatal monitoring, aiding in timely interventions to reduce perinatal morbidity and mortality.

## REFERENCES

1. Ghosh R, Causey K, Burkart K, Wozniak S, Cohen A, Brauer M. Ambient and household PM2. 5 pollution and adverse perinatal outcomes: A meta-regression and analysis of attributable global burden for 204 countries and territories. PLoS medicine. 2021 Sep 28;18(9):e1003718.
2. Nilsson C, van Limbeek E, Vehvilainen-Julkunen K, Lundgren I. Vaginal birth after cesarean: views of women from countries with high VBAC rates. Qualitative health research. 2017 Feb;27(3):325-40.
3. Hasan ST, Khan MA, Ahmed T. Inadequate maternal weight gain in the third trimester increases the risk of intrauterine growth restriction in rural Bangladesh. PloS one. 2019 Feb 8;14(2):e0212116.
4. Rehman A, Quddusi AI, Yasmeen N, Nadeem A. Frequency of adverse perinatal outcome in patients with poor biophysical profile. The Professional Medical Journal. 2020 Oct 10;27(10):2193-8.
5. Sinha D, Sharma A, Nallaswamy V, Jayagopal N, Bhatti N. Obstetric outcome in women complaining of reduced fetal movements. Journal of Obstetrics and Gynaecology. 2007 Jan 1;27(1):41-3.
6. Tveit JV. Decreased fetal movements in late pregnancy-importance today?.
7. Heazell AE, Sumathi GM, Bhatti NR: What investigation is appropriate following maternal perception of reduced fetal movements?. J Obstet Gynaecol 2005, 25:648-650.
8. Rayburn WF. Fetal body movement monitoring. Obstetrics and gynecology clinics of North America. 1990 Mar 1;17(1):95-110.
9. O'sullivan O, Stephen G, Martindale E, Heazell AE. Predicting poor perinatal outcome in women who present with decreased fetal movements. Journal of Obstetrics and Gynaecology. 2009 Jan 1;29(8):705-10.
10. Grant A, Valentin L, Elbourne D, Alexander S. Routine formal fetal movement counting and risk of antepartum late death in normally formed singletons. The Lancet. 1989 Aug 12;334(8659):345-9.
11. Harrington K, Thompson O, Jordan L, Page J, Carpenter RG, Campbell S. Obstetric outcome in women who present with a reduction in fetal movements in the third trimester of pregnancy.
12. Saraçoğlu F, Göl K, Şahin İ, Türkkanı B, Öztopçu C. The predictive value of fetal acoustic stimulation. Journal of Perinatology. 1999 Mar;19(2):103-5.
13. Makhaik S, Aggarwal N, Sharma S, Jhobta A, Tomar A, Kapila S. Predictive value of Biophysical Profile score in Intrauterine Growth Restricted Fetuses.
14. VINTZILEOS AM, CAMPBELL WA, INGARDIA CJ, NOCHIMSON DJ. The fetal biophysical profile and its predictive value. Obstetrics & Gynecology. 1983 Sep 1;62(3):271-8.
15. Soufizadeh N, Farhadifar F, Tamri S, Behafarid S, Sharifi K, Aslani S, Naqshbandi M. Diagnostic Value of Rapid Biophysical Profile in Comparison to Biophysical Profile in Pregnant Women with Insulin-Dependent Diabetes. Journal of Family & Reproductive Health. 2019 Dec;13(4):209.
16. Nalamaru PR, Reddy VM. Modified biophysical profile in the role of predicting fetal outcome in high risk pregnancies. Indian J Obstet Gynecol Res. 2020;7(3):364-8.
17. Bodner K, Wierrani F, Grünberger W, Bodner-Adler B. Influence of the mode of delivery on maternal and neonatal outcomes: a comparison between elective cesarean section and planned vaginal delivery in a low-

risk obstetric population. Archives of gynecology and obstetrics. 2011 Jun;283:1193-8.

18. Nandi N, Agarwal R. Prospective study of maternal perception of decreased fetal movement in third trimester and evaluation of its correlation with perinatal compromise. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2019 Feb 1;8(2):687-92.
19. Singh G, Sood R, Kaur K. Association of biophysical profile with neonatal outcome: an observational study. International Journal of Contemporary Pediatrics. 2017 Mar;4(2):421-5.