

The Impact of Lower Apgar Scores on Perinatal Outcomes: A Study of Neonatal Health in Bangladesh

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Abstract

Introduction: The relationship between Apgar scores and perinatal outcomes is a critical area of study in neonatal health, particularly in developing countries like Bangladesh. This study aims to explore the impact of lower Apgar scores on perinatal outcomes, providing valuable insights into neonatal health and the effectiveness of prenatal assessments.

Methods: This cross-sectional study involved 150 pregnant women from a medical facility in Dhaka, Bangladesh. Participants were assessed using the Biophysical Profile (BPP) score and Apgar scores at 1 and 5 minutes post-delivery. The study focused on the association between these scores and perinatal outcomes, including birth asphyxia, neonatal death, and INCU admissions. Statistical analysis was conducted to determine the significance of these associations. **Result:** The majority of the study population were young, with 62% aged between 18-25 years. A significant correlation was found between lower Apgar scores at 1 minute and adverse perinatal outcomes. Specifically, 100% of neonates with a BPP score of 6 had an Apgar score of less than 7 at 1 minute, compared to only 2.65% in the BPP score 10 group. Additionally, 52% of neonates with an Apgar score of less than 7 at 1 minute experienced birth asphyxia, and 48% required INCU admission.

Conclusion: The study highlights the critical role of Apgar and BPP scores in predicting adverse perinatal outcomes. Lower Apgar scores at 1 minute post-delivery are significantly associated with negative neonatal health outcomes, emphasizing the need for vigilant prenatal monitoring and preparedness for immediate neonatal care, particularly in resource-limited settings like Bangladesh. This research contributes to the understanding of neonatal health in such contexts and underscores the importance of predictive assessments in improving perinatal health outcomes.

Keywords: Pregnancy, Perinatal, Biophysical Profile Score, Perinatal Outcome.

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INTRODUCTION

Adverse perinatal outcomes, encompassing a spectrum of conditions such as preterm birth, low birth weight, neonatal morbidity, and mortality, pose a significant global health challenge. According to the World Health Organization, nearly 2.6 million neonatal deaths occurred globally in 2019, with a substantial proportion of these deaths occurring in low- and middle-income countries [1]. In Bangladesh, the scenario is particularly concerning, with the neonatal mortality rate

standing between 35-65 deaths per 1,000 live births as of 2019, significantly higher than the global average [2]. These statistics highlight the urgent need for effective tools and strategies to predict and mitigate the risks associated with adverse perinatal outcomes. The Apgar score, introduced by Dr. Virginia Apgar in 1952, has been a pivotal tool in neonatal care, providing a quick and efficient assessment of a newborn's health status immediately after birth [3]. This scoring system, evaluating appearance, pulse, grimace, activity, and respiration, offers crucial insights into the immediate

health needs of the newborn. Studies have consistently shown that lower Apgar scores, particularly those below 7, are strongly associated with adverse neonatal outcomes, including increased risks of neonatal intensive care unit (NICU) admission, neurological impairment, and mortality [4, 5]. In the context of Bangladesh, the relevance of the Apgar score is underscored by the country's high rates of neonatal complications. Research indicates that factors such as maternal health, socio-economic status, and access to healthcare significantly influence neonatal outcomes in Bangladesh [6]. A study conducted in Dhaka revealed that lower Apgar scores were significantly associated with higher rates of neonatal morbidity and mortality, emphasizing the score's predictive value in this setting [7]. The relationship between Apgar scores and specific perinatal outcomes, such as birth asphyxia and early neonatal death, has been the subject of extensive research. A study in a tertiary hospital in Bangladesh reported that low Apgar scores at 5 minutes were strongly correlated with neonatal asphyxia, a leading cause of neonatal mortality in the country [8]. Similarly, another study highlighted the association between low Apgar scores and early neonatal death, underscoring the importance of immediate postnatal care [9]. The predictive value of the Apgar score extends beyond immediate neonatal outcomes. Longitudinal studies have demonstrated that low Apgar scores can be indicative of long-term developmental and neurological issues [10]. In Bangladesh, where resources for neonatal care are often limited, the ability to quickly identify newborns at risk using the Apgar score is particularly valuable. Despite its widespread use, the Apgar score is not without limitations. The score's subjectivity and variability among different observers have been noted in the literature [11]. Additionally, the Apgar score's effectiveness in predicting long-term outcomes has been debated, with some studies suggesting that it should be used in conjunction with other neonatal assessments for a more comprehensive evaluation [12]. The current study aims to explore the impact of lower Apgar scores on perinatal outcomes in a Bangladeshi context. By examining the association between Apgar scores and a range of perinatal outcomes, including birth asphyxia, early neonatal death, and admissions to the INCU, this research seeks to contribute to the understanding of neonatal health in Bangladesh. The findings could inform clinical practices and policy decisions, potentially improving neonatal care and reducing the burden of adverse perinatal outcomes in the country.

METHODS

This cross-sectional observational study was conducted at the Department of Obstetrics and Gynaecology, Institute of Child and Mother Health, Dhaka, Bangladesh, from November 2017 to October 2018. The study aimed to assess the impact of lower Apgar scores on perinatal outcomes in a Bangladeshi context. The sample size was determined using a standard formula, considering a 95% confidence level and an estimated target population proportion of 50%. The final sample comprised 150 pregnant women, selected through purposive convenient sampling from outpatient and admission departments. The study population included pregnant women at or above 36 weeks of gestation. Inclusion criteria were pregnant women who underwent Biophysical Profile (BPP) scoring at or above 36 weeks of gestation. Exclusion criteria included conditions like impending eclampsia/pre-eclampsia, gestational diabetes mellitus, fetal distress, antepartum hemorrhage, and gross congenital anomalies in the fetus. Data collection involved a preformed data collection sheet (questionnaire) after obtaining informed consent from the subjects. Detailed history and physical examination were conducted, and maternal and fetal outcomes were recorded. The primary variables measured included demographic details (age, occupation, socio-economic status), biophysical profile score by ultrasound, mode of delivery (spontaneous vaginal delivery or LUCS), Apgar score, and perinatal outcomes (healthy baby, birth asphyxia, neonatal death, stillborn, NICU admission, neonatal death). The Apgar score was assessed at 1 and 5 minutes post-delivery, and the association between Apgar scores and perinatal outcomes was analyzed. The biophysical profile score was determined using parameters such as non-stress test (NST) by cardiotocography (CTG) and measurements of amniotic fluid volume, fetal breathing movement, gross body movement, and fetal tone by ultrasound. Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 20. Data were presented in tables and graphs, and the Chi-square (χ^2) statistical test was used to determine associations between variables. Ethical considerations included approval from the Ethical Review Committee of the Institute of Child and Mother Health, and all participants provided written informed consent. Participant privacy and the right to refuse or withdraw from the study were upheld throughout the research process.

RESULTS

Table 1: Distribution of the study patients by demographic variable (n=150)

Demographic Variable	Number of patients	Percentage
Age (Years)		
18-25	93	62.00%
26-30	34	22.67%
>30	23	15.33%
Mean±SD	25.23±5.12	

Demographic Variable	Number of patients	Percentage
Range(min-max)	18-35	
Occupation		
Housewife	131	87.33%
Service	15	10.00%
Other	4	2.67%
Socio-economic status		
Low-income	79	52.67%
Lower-middle income	67	44.67%
Upper-middle income	4	2.67%

The demographic distribution of the 150 study participants revealed a young cohort, with the majority (62.00%) aged between 18-25 years, followed by 22.67% in the 26–30-year age group, and 15.33% over 30 years. The mean age was 25.23 years, with a standard deviation of 5.12, encompassing a range of 18 to 35 years. Occupationally, the vast majority of the participants were housewives, accounting for 87.33% of

the sample. This was followed by those in service (10.00%) and other occupations (2.67%). In terms of socio-economic status, over half of the participants (52.67%) were from low-income backgrounds, while 44.67% were from lower-middle-income groups, and a small fraction (2.67%) from upper-middle-income brackets.

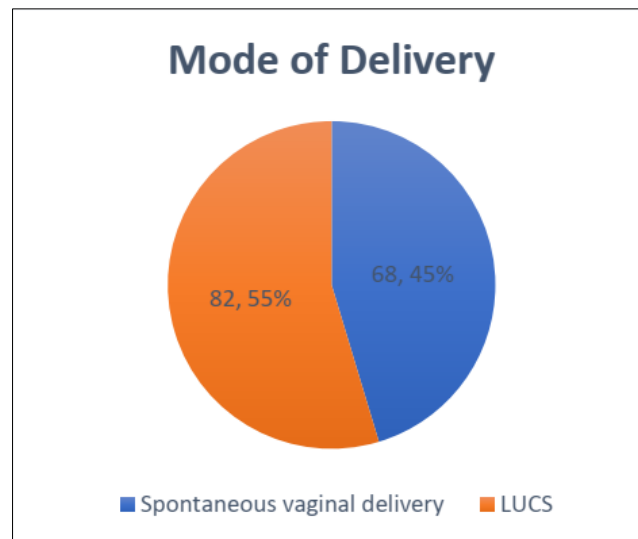


Figure 1: Distribution of participants by mode of delivery

The mode of delivery among the study participants showed a nearly even distribution between spontaneous vaginal delivery and lower uterine cesarean

section (LUCS). Out of the 150 participants, 68 (45.33%) had a spontaneous vaginal delivery, while 82 (54.67%) underwent LUCS.

Table 2: Distribution of the study patients by biophysical score (n=150)

Biophysical Score	Number of patients	Percentage
6	15	10.00%
8	22	14.67%
10	113	75.33%
Mean±SD	9.31±1.31	
Range(min-max)	6-10	

The distribution of biophysical scores among the 150 study participants highlighted a predominant trend towards higher scores. A significant majority, 113 participants (75.33%), had a biophysical score of 10, indicating generally favorable prenatal assessments. In contrast, 22 participants (14.67%) scored 8, and a smaller

group of 15 participants (10.00%) scored 6, which may indicate potential prenatal concerns. The mean biophysical score for the study group was 9.31, with a standard deviation of 1.31, covering a range from 6 to 10.

Table 3: Association between biophysical score and Apgar score (1min)

Apgar score (1min)	Score 6		Score 8		Score 10		P value
	n	%	n	%	n	%	
<7	15	100.00%	7	31.82%	3	2.65%	<0.01
≥7	0	0.00%	15	68.18%	110	97.35%	
Total	15	100.00%	22	100.00%	113	100.00%	

The association between biophysical scores and Apgar scores at 1 minute post-delivery revealed significant findings. For neonates with a biophysical score of 6, all (100%) had an Apgar score of less than 7 at 1 minute. In contrast, for those with a biophysical score of 8, 31.82% had an Apgar score of less than 7,

while a significant majority, 68.18%, had scores of 7 or higher. Notably, in the group with a biophysical score of 10, only a small fraction (2.65%) had an Apgar score of less than 7, with the overwhelming majority (97.35%) scoring 7 or above. The statistical significance of these findings is underscored by a P value of <0.01.

Table 4: Association between biophysical score and Apgar score (5min)

Apgar score (5min)	Score 6		Score 8		Score 10		P value
	n	%	n	%	n	%	
<7	8	53.33%	0	0.00%	0	0.00%	<0.01
≥7	7	46.67%	22	100.00%	113	100.00%	
Total	15	100.00%	22	100.00%	113	100.00%	

The relationship between biophysical scores and Apgar scores at 5 minutes post-delivery also presented significant insights. In the group with a biophysical score of 6, there was a notable split: 53.33% of neonates had an Apgar score of less than 7, while 46.67% scored 7 or higher. Remarkably, for both the

groups with biophysical scores of 8 and 10, all neonates (100%) achieved Apgar scores of 7 or above. There were no instances of Apgar scores below 7 in these two groups. This pattern is statistically significant, as indicated by a P value of <0.01.

Table 5: Perinatal outcome among patients with lower APGAR score at 1 minute (n=150)

Perinatal outcome	APGAR <7 (n=25)		APGAR ≥7 (n=125)		p-value
	n	%	n	%	
Healthy baby	9	36.00%	120	96.00%	<0.01
Birth asphyxia	13	52.00%	5	4.00%	
Early neonatal death	3	12.00%	0	0.00%	
Admission in INCU	12	48.00%	0	0.00%	

The study also examined perinatal outcomes in relation to Apgar scores at 1 minute among the participants. Of the 25 neonates with an Apgar score of less than 7 at 1 minute, the outcomes were as follows: 36.00% were healthy babies, 52.00% experienced birth asphyxia, 12.00% faced early neonatal death, and 48.00% required admission in the Intensive Neonatal Care Unit (INCU). In stark contrast, among the 125 neonates with an Apgar score of 7 or higher, 96.00% were healthy babies, only 4.00% experienced birth asphyxia, there were no instances of early neonatal death, and none required admission in the INCU. The differences in these outcomes were statistically significant, with a p-value of less than 0.01.

DISCUSSION

The findings of our study, focusing on the impact of lower Apgar scores on perinatal outcomes in Bangladesh, resonate with global research trends in neonatal health. The demographic profile of our study participants, predominantly young women, aligns with the reproductive trends in Bangladesh and underscores

the importance of focusing on this age group in perinatal research. A study by Mersha *et al.* also highlighted the significance of maternal age in influencing perinatal outcomes, particularly in developing countries [13]. A pivotal aspect of our study is the correlation between biophysical scores and Apgar scores at 1 and 5 minutes. The observation that 100% of neonates with a biophysical score of 6 had an Apgar score of less than 7 at 1 minute, compared to only 2.65% in the BPP score 10 group, is a critical finding. This stark contrast, with a P-value of 0.001s, is in line with the research by Lalor *et al.*, which demonstrated the utility of biophysical scores in predicting immediate neonatal health outcomes [14]. The improvement in Apgar scores from the 1-minute to the 5-minute mark, particularly among neonates with lower biophysical scores, is an important observation. This finding suggests the potential for neonatal recovery with appropriate care, a notion supported by the work of multiple researchers, who found that timely interventions could significantly improve outcomes for neonates with initially low Apgar scores [15–17]. Our study also sheds light on the significant correlation

between lower Apgar scores at 1 minute and adverse perinatal outcomes. The high incidence of birth asphyxia (52.00%) and the need for INCU admission (48.00%) among neonates with an Apgar score below 7 is alarming. These findings echo the results various global studies that have reported similar associations between low Apgar scores and adverse neonatal outcomes [18, 19]. The mode of delivery distribution in our study, with a significant proportion undergoing LUCS (54.67%), reflects a broader trend towards increased caesarean deliveries. While our study did not find a statistically significant association between biophysical score and mode of delivery (P-value: 0.393ns), some studies suggest that the mode of delivery can influence neonatal outcomes, particularly in cases of distress indicated by low biophysical scores [20]. In conclusion, our study contributes to the growing body of evidence on the predictive value of biophysical and Apgar scores in neonatal health. It underscores the need for enhanced antenatal surveillance and preparedness for immediate postnatal intervention, especially in resource-limited settings like Bangladesh. The findings are particularly relevant for healthcare providers in similar socio-economic and demographic contexts, where such predictive tools can significantly impact reducing neonatal morbidity and mortality.

Limitations of the Study: The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

Our findings reveal a significant association between lower Apgar scores at 1 minute and adverse perinatal outcomes, including a high incidence of birth asphyxia and increased necessity for INCU admission. The study underscores the importance of these scores as vital tools in prenatal and immediate postnatal care, especially in resource-limited settings. The results highlight the need for enhanced antenatal monitoring and preparedness for immediate neonatal intervention to improve perinatal health outcomes. This research contributes to the broader understanding of neonatal health in Bangladesh and offers valuable data for healthcare providers in similar socio-economic contexts, emphasizing the role of predictive assessments in reducing neonatal morbidity and mortality.

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

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