https://doi.org/10.29309/TPMJ/2025.32.09.8818

The Professional Medical Journal
www.theprofesional.com
2025, Volume, 32 Issue, 09

ORIGINAL ARTICLE

Association of biophysical profile with APGAR score.

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Article Citation: Riaz U, Hassan F, Riaz Z, Riaz B, Saleem M. Association of biophysical profile with APGAR score. Professional Med J 2025; 32(09):1149-1154. https://doi.org/10.29309/TPMJ/2025.32.09.8818

ABSTRACT… Objective: To determine frequency of neonatal outcomes in neonates born to mother with good BPP score. **Study Design:** Descriptive Cross-sectional study. **Setting:** Department of Gynecology & Obstetrics Hilal -E- Ahmar hospital Faisalabad. **Period:** 30th November 2020 to 29th May 2021. **Methods:** A total of 385 pregnant women with age of gestation from 36 weeks to 42 weeks and 20 to 40 years of age were included. Patients with eclampsia and pre-eclampsia, IUGR, premature rupture of membranes, antepartum hemorrhage were excluded. Biophysical profile (BF) was calculated for all patients. Follow up was carried out till delivery where the type of delivery and APGAR score of neonates was noted, Neonates having APGAR Score of more than7/10 were labelled as having good APGAR score. **Results:** Mean age of patients was 28.48± 4.13 years. Majority of the patients 247 (64.16%) were between 18 to 30 years of age. In this study, frequency of neonatal outcomes in neonates born to mother with good BPP score was Good APGAR score in 338 (87.79%), Neonatal resuscitation in 45 (11.69%) and neonatal admission in 23 (5.97%). **Conclusion:** Frequency of good neonatal outcome in neonates born to mother with good BPP score was high.

Key words: APGAR Score, BPP, Good Biophysical Profile, NICU Admission.

INTRODUCTION

The global prevalence of newborn morbidity and death varies. Direct comparisons may be hard due to differing definitions and classifications. Nonetheless, significant discrepancies are documented between high-income nations and low income countries with respect to newborn mortality rates (4/1000 versus live births 33 /1000 live births).[1] In 2018, the newborn death rate in Pakistan was 6.94 /1000 births, which is fairly high in our area.[2]

Various prenatal fetal surveillance technologies have been developed over the last several decades, and the hunt for the most effective way to predict newborn illness in the antenatal period is currently underway.[3] Antepartum fetal testing refers to a collection of techniques developed to distinguish between fetuses that are in a normal state and those that may be impaired, prior to the initiation of labour.[4] The primary methods utilized for evaluating the condition of the fetus are the contraction stress test (CST), non-stress test (NST), biophysical profile (BPP), fetal movement count, modified BPP, and umbilical artery Doppler velocimetry. The NST and CST were two predominant modalities utilized for fetal monitoring; nevertheless, their efficacy as prognostic indicators for an asphyxiated neonate is limited.[5] The primary US-based methods employed for assessing fetal well-being are the Biophysical profile, modified Biophysical profile and duplex Doppler velocimetry.[6]

BPP is a non-invasive test to indicate whether or not fetal asphyxia exists. It can also be used to assess risk of fetal death during the prenatal period. BPP score combines dynamic fetal variables (tone, breathing and movements) AFI, and CTG into a composite rating system.[7] It is a fetal parameter evaluation that combines NST with dynamic real-time B mode ultrasonography.

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Article received on: 06/12/2024
Date of revision: 13/06/2025
Accepted for publication: 14/06/2025

It is a clinical instrument that converts the degree of dynamic biophysical activities into a standard that may be used. It comprises both acute fetal status indicators and certain chronic fetal and intrauterine disease markers. BPP better predicts neonatal acidity at birth and consequently the probability of fetal mortality than Apgar score. Measures can be made to intervene in a damaged fetus before persistent metabolic acidosis leads to fetal mortality.[8]

The benefits of employing BPP to measure fetal health include its wide acceptance, non-invasive nature, shorter time requirements, and provision of comprehensive information regarding fetal architecture and parameters representing acute and chronic response to hypoxia. It assesses fetal neurodevelopment and placental health.[9]

Prior research that included 200 participants, employed a biophysical profile to determine neonatal outcome. The patients' mean age was 28.7+4.2, with a range of 23-29, and 52.59% were primigravida, while 47.5% were multigravida. The patients' mean gestational age at the time of admission was 37.7 weeks. According to findings, 90.2% of subjects with a normal final BPP score had a satisfactory outcome. APGAR score at birth was normal in 93.9% of infants whose mothers had a normal previous BPP, whereas 7.6% required resuscitation and only 2.3% were admitted to the NICU.[6]

The rationale of this study is to determine neonatal outcomes in mothers having good BPP in pregnancy. This data will help us in predicting neonatal outcome in other pregnant women with good BPP score. Predicting the morbidity and risk factor beforehand will help in early intervention soon afterbirth hence will reduce the morbidity and mortality in neonates.

METHODS

This descriptive, cross-sectional study was conducted at Department of Gynaecology & Obstetrics, HILAL-E-AHMAR Hospital, Faisalabad from 30th November 2020 to 29thMay 2021. The sample was calculated using Open epi software keeping 95%confidence interval, 1.5% absolute precision, and 2.3% previously reported least frequency[6] with Consecutive, non-probability, sampling technique.

Inclusion Criteria

- 20 to 40 years
- The pregnant women with age of gestation from 36 weeks to 42 weeks.
- Patients having BPP more than 8/10.

Exclusion Criteria

- The cases with eclampsia and pre-eclampsia (assessed on history and medical record).
- The cases with intra-uterine growth retardation (IUGR) assessed on USG.
- The cases with Premature rupture of membranes, antepartum hemorrhage (assessed on medical record).

Operational Definitions

Good Biophysical Profile

As defined by ACOG, the biophysical profile consists of an NST combined with four observations made by real time ultrasonography with a total score of 10.

It comprises five components:

- Non-stress test (continuous fetal heart rate (FHR) monitoring with two or more FHR accelerations at least 15 beats above the baseline and last for 15 seconds from baseline within a 20 minute period.
- Fetal breathing movements- one or more episodes of rhythmic fetal breathing movements of 30 seconds or more within 30 minutes.
- Fetal movements- three or more discrete body or limb movements within 30 minutes.
- Fetal tone- one or more episodes of extension of a fetal extremity with return to flexion or opening or closing of a hand.
- Determination of amniotic fluid volume- a single deepest vertical pocket greater than 2 cm is considered evidence of adequate amniotic fluid.

Each of the five components is assigned a score of either 2(present) or 0 (not present).

A score of 8 or more was taken as good biophysical profile.

Good APGAR Score

Score of more than 7/10 was taken as good APGAR score calculated at 5 minutes according to APGAR scoring chart

Characteristic	0	1	2
Color	Blue, pale	Body pink, extremities blue	Body completely pink
Respiratory effort	absent	Slow irregular	Strong cry
Heart rate	absent	Less than 100 bpm	More than 100bpm
Muscle Tone	limp	Some flexion of extremities	Active motion
Reflexes	absent	Grimace	cry

Data Collection Procedure

Following clearance from the hospital ethics council (110/HANF/24-02-25), 385 patients from the gynae OPD of Hilal-e-Ahmar hospital in Faisalabad were included. Written informed consent was taken, demographic data including age, gestational age and parity was noted. Complete physical examination was done. BPP was calculated for all patients. Patients were monitored till birth where the type of delivery and APGAR score of neonates was noted. Neonates having APGAR score of more than 7/10 were labelled as having good APGAR score. All data was noted on designed proforma. Neonates having poor APGAR score were treated.

Statistical Analysis

SPSS version 23 was used to enter and evaluate data. Quantitative factors like as age and gestational age were provided as mean SD. The frequency and percentages for parity, method of delivery (vaginal/c section), and neonatal outcome were computed. Age, gestational age, parity, and method of birth were all used to stratify the data. A p-value of <0.05 was regarded as statistically significant.

RESULTS

This study comprised of participants aged 20 to 40, with a mean age of 28.48 ±4.13 years. Most of the cases, (64.16%) were between the ages of 18 and 30. Mean gestational age and parity was 38.92± 1.26 weeks and 3.13 ± 0.88 respectively. The distribution of patients based on the mode of birth reveals that 232 (60.26%) female experienced vaginal delivery, whereas 153 (29.74%) underwent caesarean section.

Variables	No of Patients	Percentage
Age (years)		
20-30	247	64.16
31-40	148	35.84
Gestational Age (weeks)		
36-39	270	70.13
40-42	115	29.87
Parity		
≤3	264	68.57
>3	121	31.43
Mode of Delivery		
Vaginal	232	60.26
C Section	153	29.74
Total	385	100.0

Table-I. Demographic characteristics of patients

In this study, frequency of neonatal outcomes in neonates born to mothers with good BPP score was Good APGAR Score in 338 (87.79%),Neonatal resuscitation in 45 (11.69%) and neonatal admission in 23 (5.97%) as-shown in Table-II.

	Neonatal Outcome	
	Yes	No
Good APGAR Score	338(87.79%)	47(12.21%)
Neonatal resuscitation	45(11.69%)	340(88.31%)
Neonatal admission	23(5.97%)	362(94.03%)

Table-II. Neonatal outcome

DISCUSSION

The perinatal period is widely recognized as the most critical and susceptible phase in an individual's life span, characterized by a significantly elevated mortality rate compared to subsequent stages of life. Preterm births, infections, hypertensive illness, and intrapartum hypoxia have been identified as significant factors contributing to peri-natal death.[10] Approximately two-thirds of perinatal fatalities are attributed to obstetrical factors. In order to tackle this issue,

several prenatal fetal surveillance approaches have been developed in recent decades, and the quest for the most effective approach is currently ongoing. Antepartum fetal testing encompasses a variety of techniques developed to distinguish between healthy and impaired fetuses before the commencement of labor. The primary methodologies employed for evaluating fetal well-being encompass NST, CST, BPP, fetal movement count, modified biophysical profile, and umbilical artery Doppler velocimetry[11]The NST and CST were two commonly utilized approaches for fetal surveillance; nevertheless, their efficacy in accurately predicting an asphyxiated newborn is limited.

The technique known as BPP involves the integration of NST with dynamic real-time B mode USG to evaluate certain fetal parameters. The clinical instrument in question is designed to incorporate the measurement of dynamic biophysical processes at various levels, therefore establishing a standardized and practical framework.[12] The assessment includes both immediate indicators of fetal well-being as well as long-term indicators of both fetal and intrauterine health. The BPP demonstrates superior predictive ability for neonatal acidosis at birth compared to the Apgar score, hence indicating a higher likelihood of fetal mortality. In the case of a compromised fetus, it is possible to implement interventions aimed at preventing fetal demise by addressing growing metabolic acidosis.[13] One advantage of utilizing BPP in the evaluation of fetal health is its widespread acceptance throughout the medical community. Additionally, the non-invasive nature of this assessment method is advantageous, as it does not need any intrusive procedures. Furthermore, BPP is a time-efficient approach, as it can be performed relatively quickly. Moreover, BPP provides comprehensive information on fetal architecture and several indicators that indicate both acute and chronic responses to hypoxia.[14] This study assesses the neurological behavior of the fetus and examines the condition of the placenta. The use of the BPP score with Doppler sonography has proven to be an efficient method for categorizing intrauterine growth restricted (IUGR) fetuses into various risk groups. The parameters encompassed under the BPP consist of the NST, USG assessment of the Amniotic fluid volume, determination of fetal breathing motions, evaluation of gross body movements, and assessment of fetal tone.[15] BPS score of less than 6 exhibits a notable correlation with early neonatal morbidity. A study conducted to determine the frequency of neonatal outcomes in neonates born to mother with good BPP score. In this study, frequency of neonatal outcomes in neonates born to mother with good BPP score was good APGAR score in 338 (87.79%), Neonatal resuscitation in45 (11.69%) and neonatal admission in 23 (5.97%) patients. In previous study BPP was used to assess neonatal outcome. Mean age was 28.7±4.2, 52.5% were primigravida and 47.5% were multigravida. At the time of admission, the average gestational age of the patients was 37.7 weeks. According to the findings, 90.2% of instances with a normal final BPP score had a satisfactory perinatal outcome. Apgar score at delivery was normal (>7/10) in 93.9% of newborns whose mothers had normal last BPP, whereas 7.6% needed resuscitation and only 2.3% were admitted to the NICU.

Similar findings were reported in research conducted by Bano et al, in which 70% of newborns had BPP ranges of 9-10, 26% had BPP ranges of 7-8, and 4% had BPP ranges of 4-6.[16]

Manandhar et al.[17] discovered that aberrant BPS increased the probability of perinatal death by 50% (p=0.000). This study found no significant link between Apgar score and newborn morbidities, although it did find a link between BPS and caesarean section. In the aforementioned study, nine (60%) of 15 participants in the BPS 8 group and three (75%) of four subjects in the BPS 4 group underwent caesarean section. On the contrary, Hina et al.15 found a stronger association between BPP and Apgar scores. The disparity in results might be explained by a difference in the number of participants having IUGR newborns, which was 12% in the research done by Manandar BL et al.[17]

According to a systematic review, role of BPP for fetal evaluation in high-risk pregnancies, most

of researches were of poor quality. There was no big difference between the groups in terms of fetal death or Apgar scores less than 7 at 5 minutes. More research should be conducted to further analyze the effectiveness of BPP in high-risk pregnancies, as the BBP group had a greater probability of caesarean section. Normal BPP scores are associated with a high likelihood of prenatal survival, but low scores are associated with a greater likelihood of perinatal mortality. Fetal discomfort, newborn unit hospitalization, and intrauterine growth restriction are all more common. These results clearly demonstrated that BPP score for determining risk to the fetus was correct. When compared to other methods, such as NST, BPP seemed to have a higher sensitivity. In past studies, fetal BPP scores showed both a higher sensitivity and specificity, but the negative predictive values didn't change much.[18]

CONCLUSION

This study revealed that there was a high incidence of favorable neonatal outcome in neonates born to mothers with a good BPP score. As a result, we propose that BPP testing provide a numerical score, providing an objective evaluation that may be used to detect varied degrees of fetal impairment. In pregnancies with a high risk of unfavorable perinatal outcome, BPP can be a beneficial tool for assessing fetal well-being.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Uzma Riaz:** Concept, critical review.
2	**Fatima Hassan:** Abstract writing.
3	**Zahra Riaz:** Manuscript writing.
4	**Bushra Riaz:** Data collection.
5	**Mahnoor Saleem:** Reference writing.