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Fetal Outcome Evaluation in High-risk Term Pregnancy Using Biophysical Profile at a Tertiary Hospital in Anambra State, Nigeria

Obi Adaeze Chidiogo [a], Okafor Chisolum Ogechukwu [a], Nwosu Chinekwu Skye [a*], Ezenri Uche [b], Obi Darlington Chukwudinma [c], Obasikene Catherine Nchedo [a] and Eze Kenneth C [a]

[a] Department of Radiology, Nnamdi Azikiwe University Teaching Hospital, Nnewi, Nigeria.
[b] Department of Obstetrics and Gynaecology, University Teaching Hospital, Nnewi, Nigeria.
[c] Department of Community Medicine, Nnamdi Azikiwe University Teaching Hospital, Nnewi, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. Authors OAC, OCO, NCS, EU, ODC, OCN, and EKC conceptualized the study, designed the research work, collected the data, did a formal analysis which contributed to the interpretation of the analyses, and wrote the manuscript. All authors approved the final manuscript.

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ABSTRACT

Introduction: A high-risk pregnancy is defined as a pregnancy in which there is a significant probability of an adverse maternal or fetal outcome that is more than the incidence of that outcome in the general population.

**Corresponding author: E-mail: cs.nwosu@unizik.edu.ng;*

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Aim: To determine the usefulness of biophysical profile evaluation in women with high-risk term pregnancies.
Methods: Biophysical profile (BPP) parameters were used to evaluate 160 high-risk women with term pregnancies.
Results: All the participants had normal amniotic fluid index values [AFI] of 8.1-24.0cm. Most of the participants 115 (71.9%) showed good BPP scores. Outcome at delivery was as follows; fetal distress [presence 8.9%, absence 91.1%], stillbirth = none, admission into the intensive care unit (ICU) [Yes 2.0%, No 88%], meconium staining [Yes 8.2%, Clear 91.8%], birth weight [< 2.5kg = 5.7%, > 2.5kg = 94.3%]. APGAR score at 1 minute [<7 = 5.1%, >7 = 94.9%] while at 5 minutes [<7 = 3.2%, > 7= 96.8%]. The commonest mode of delivery was vaginal 84 (52.8%). The association between gross body movement, fetal breathing movement, and fetal outcome was not statistically significant $p > 0.05$.
Conclusion: BPP parameters were found to be associated with fetal outcomes.

Keywords: Biophysical profile; fetal outcome; high-risk pregnancy; pregnancies; participants; p-value.

1. INTRODUCTION

A high-risk pregnancy is defined as a pregnancy in which there is a significant probability of an adverse maternal or fetal outcome that is more than the incidence of that outcome in the general population [1,2] High-risk pregnancies include pregnancies with co-existing chronic hypertension, diabetes mellitus, asthma, cardiac disease, seizure disorder, sickle cell anaemia and other haemoglobinopathies, renal disease, rhesus alloimmunization, HIV infection, etc [2,3].

It has been statistically determined that 10-20% of pregnancies are high-risk [4,5]. Term pregnancy is a pregnancy between 37 and 42 weeks of gestation [6] and it has been established that there is a progressive increase in perinatal morbidity and mortality during this period.[7] In Southern Nigeria, a combined perinatal mortality rate of 62.7/1000 live births was recorded in two teaching hospitals.[8]

Clinicians have developed several methods of assessing both antepartum and intrapartum fetal conditions. These methods include fetal movement counting (fetal kick counting), fetal breathing, the non-stress test, contraction stress test, acoustic stimulation tests, amniotic fluid volume, biophysical profile, modified biophysical profile, rapid biophysical profile, and Doppler velocimetry [9].

Fetal breathing is affected by several factors such as hypoxia, hypoglycaemia, sound stimuli, cigarette smoking, amniocentesis, impending preterm labour, gestational age, and fetal heart rate [9]. Amniotic fluid volume assessment is based on the rationale that decreased uteroplacental perfusion may lead to diminished fetal renal blood flow, decreased urine production, and ultimately oligohydramnios [9].

The ideal methods of antepartum fetal monitoring should be simple, safe, reproducible, reliable, non-invasive, and accurate to produce results that are immediately available with minimal expense and inconvenience to the fetus and its mother. The biophysical profile fulfills the above criteria.

Manning and colleagues [10] proposed a biophysical profile composed of four acute or short-term variables (fetal tone, movement, breathing, and non-stress test) and one chronic or long-term variable (amniotic fluid index) [11].

The biophysical profile can be described as an intra-uterine life non-invasive Apgar score to assess the presence or absence of asphyxia in the intra-uterine period [12]. Normal variables were each assigned a score of 2, and abnormal variables were given a score of 0 [9]. It has an all-or-none scoring system. The sum of all criteria yields the result, scores of 8 and 10 are considered normal [9,13]. A score of 6 is equivocal while scores less than 6 are abnormal. An equivocal result needs a procedure repeat while an abnormal result requires obstetric interventions, like delivery. The gestational age at entry is 25 weeks and observation is done for 30 minutes but usually less than 8 minutes is needed with a full 30-minute observation done in 2% of cases [13]. A pregnant woman is four times more likely to be delivered by caesarean section when the biophysical profile score is abnormal than when it is normal [14]. This study aimed to determine the usefulness of biophysical profiles in women with high-risk term pregnancies.

2. MATERIALS AND METHODS

2.1 Study Design

This was a prospective cross-sectional study of biophysical profile score and fetal outcome in high-risk term pregnancies at the Teaching hospital at Nnewi, Anambra State, South-East Nigeria. The study lasted 6 months (July-December 2019).

2.2 Study Population

The recruitment was by the convenience sampling technique and was from the antenatal clinics, labour, and post-natal wards, and who had ultrasound scans done in the Radiology department. The inclusion criteria were high-risk pregnant women at 37-42 completed weeks, single fetuses, and fetuses with no detected structural malformations. The exclusion criteria were multiple gestations, fetal congenital anomalies, pregnant women with antepartum haemorrhage, acute severe oligohydramnios secondary to membrane rupture, pregnancies of < 37 weeks, and failure to elicit some components of the BPP in a normal fetus due to some factors such as maternal CNS depression from medication.

2.3 Sample Size Determination

The minimum sample size was obtained using the formula [15,16] for calculating sample proportion in a cross-sectional study. $N_0 = Z^2pq/e^2$. Where N_0 is the sample size, Z^2 is the abscissa of the normal curve [for 95% = 1.96], P is the estimated population [10% = 0.1], q is the complement of p [1- p = 0.9], e is the desired level of precision (degree of accuracy) = 0.005. This gives 138.30. Anticipating an attrition of 10%, the expected minimum sample size was 153. A sample size of 160 was used for this study.

2.4 Study Technique

High-risk pregnant subjects at 37 to 42 weeks of gestation were recruited using the inclusion and exclusion criteria as a guide. A subject information sheet was administered to each of the participants before written informed consent was obtained freely and without coercion from the respondents with a thorough explanation of the objectives and expected outcomes of this study. Assurance of confidentiality and freedom to withdraw from the study at any stage was given. Participants were followed up till delivery and their perinatal outcomes were recorded in the datasheet.

Each participant was placed in a recumbent left lateral position and made as comfortable as possible on the examination couch [17]. Having the subject lie supine may cause compression of the inferior vena cava over time and dizziness. The abdomen was exposed from the xiphisternum to just below the suprapubic area. Acoustic gel was applied to the abdomen to obliterate the air interface between the probe and the skin surface and to act as a lubricant over the participants' skin. A general survey of the fetus was done with the fetal gestational age determination using the fetal biparietal diameter, abdominal circumference, and femur length. Subsequently, the biophysical profile parameters [fetal breathing, movement, tone, amniotic fluid volume, and non-stress test] and scores were obtained as follows:

2.4.1 Fetal breathing

Fetal breathing was identified by observing the movement of the diaphragm as reflected in stomach and liver movement. It lasted 30 seconds before a BPP score of 2 was given. Failure to observe fetal breathing over the 30-minute observation period gave a score of 0.

2.4.2 Fetal movement

During a 30-minute observation period, the fetus should be seen to show three gross body or limb movements. Fewer than three body or limb movements gave a score of 0. If adequate movement was not noted, stimulations like maternal change in position, walking around, and playing loud music were done.

2.4.3 Fetal tone

Flexion and extension movements were monitored. There should be at least one episode of good flexion and extension of fetal limbs or spine followed by a return to normal position. Flexion and extension of the arms or legs, arching of the spine, or opening and closing of hands were all good indicators of normal tone for a BPP score of 2. Failure to observe any of these movements in 30 minutes resulted in a score of 0.

2.4.4 Amniotic fluid volume

Amniotic Fluid Index (AFI) is the preferred method for quantitating amniotic fluid volume [17]. To obtain the AFI, the abdomen was first

divided into four quadrants using the linea albae for the right and left divisions and the umbilicus for the upper and lower quadrants. The AFI was obtained by summing up the maximum vertical amniotic fluid pocket diameter in each quadrant which is devoid of cord or fetal limb. Values between 5.1 and 25.0cm were given a score of 2. A total value of 5cm or less indicates oligohydramnios, regardless of gestation age (GA) while a score of >25cm indicates polyhydramnios [17]. However, if there is a fluid pocket that meets the 2cm criterion in both the vertical and horizontal planes, a value of 2 is assigned even in the presence of oligohydramnios by AFI calculation [17]. The single deepest pocket is also used to assess the amniotic fluid volume [18].

2.4.5 Non-stress test

On application of acoustic gel over the cardiotocograph (ctg) transducers, one of the transducers was placed over the uterine fundus while the second transducer was placed over the fetal back and secured. The acoustic gel applied obliterates the air interface between the probe and the skin and produces clearer images. The ctg was switched on and a recording of the fetal cardiac activity was recorded on the paper feed of the ctg machine. The woman was asked to specify when she noticed fetal movement. A normal fetus responds to fetal movement by an increase in fetal heart rate (FHR). A reactive (normal) result is when at least two or more accelerations (15 beats per minute above a baseline) occur in 30 minutes. If the results of the NST were negative (reactive), the BPP score was 2. A non-reactive (or positive) NST meant there had been fewer than 2 accelerations of FHR in 40 minutes and a score of 0 was given.

2.5 Statistical Analysis

Data entry and analysis were carried out with the aid of the statistical package for the social sciences (SPSS) Version 23 Armonk, NY, U.S.A, 2015. Descriptive statistics was used to summarize the respondent's socio-demographic profiles. Frequency distributions of all relevant variables were developed. Relevant means and proportions were calculated while associations between each of the biophysical profile variables and the fetal outcome were analyzed using a Chi-square test. A p-value of ≤ 0.05 was considered statistically significant.

3. RESULTS

A total of 160 subjects, aged 15 years and above with a mean age of 31.5 ± 5.1, participated in this study. The majority of the participants 90 (56.3%) belonged to the 25-34 age group while the least number of participants was seen in women > 45yrs - 3 (1.9%). Married participants were 157 (98.1%), two [1.3%] were widowed while only 1 (0.6%) was divorced. Secondary education was acquired by 78 (48.8%), followed closely by tertiary education 76 (47.5%). The highest most frequent parity was multigravida 98 (61.3%), followed by primigravida 36 (22.5%), and grand multipara 26 (16.3%) Table 1.

The commonest gestational age at presentation was 37 weeks (59 participants). Other gestational ages at presentation in descending order of frequency of occurrence were 38, 39, 40, and 41 weeks with 51, 36, 13, and 1 participant(s) respectively Table 2.

The majority of the participants delivered at 40 weeks gestational age and this was followed by delivery at 39 weeks and subsequently 38, 37, 41, and 42 weeks. The mean gestational age at delivery was 39.3, the median was 40.0, the standard deviation was 1.2, and the variance was 1.4. Fig. 1.

For BPP parameters, fetal movement was present in 155 (96.9%) of the fetuses and absent in 5 (3.1%). Fetal tone was present in all of the fetuses 160 (100%). Fetal breathing movement was present in 155 (96.9%) of the fetuses and absent in 5 (3.1%). All fetuses of the participants160 (100%) showed good amniotic fluid. The non-stress test showed 120 (75.0%) were reactive while 40 (25%) were non-reactive Table 3.

A biophysical profile score of 10/10 was seen in the majority of 115 (71.9%) participants followed by a score of 8/10 in 42 participants (26.3%), and then 6/10 in 3 participants (1.9%). None of the participants had scores of less than 6/10 Table 4.

All the subjects 160 (100%) had AFI within the normal range of 8.1 – 24cm Table 5.

Table 1. Socio-demographic characteristics of the participants

Variable		Frequency (N = 160)	Percentage (%)
Age category in years	15 – 24	19	11.9
	25 – 34	90	56.3
	35 – 44	48	30.0
	≥ 45	3	1.9
Age (mean ± Standard deviation)		31.5 ± 5.1	
Marital status	Married	157	98.1
	Divorced	1	0.6
	Widowed	2	1.3
Education status	Primary	6	3.8
	Secondary	78	48.8
	Tertiary	76	47.5
Pregnancy order	Primigravida	36	22.5
	Multigravida	98	61.3
	Grand multipara	26	16.3

Table 2. Gestational Age distribution at presentation

GA (weeks)	Frequency (%)
37	59 (36.88)
38	51 (31.88)
39	36 (22.50)
40	13 (8.13)
41	1 (0.63)
	160 (100)

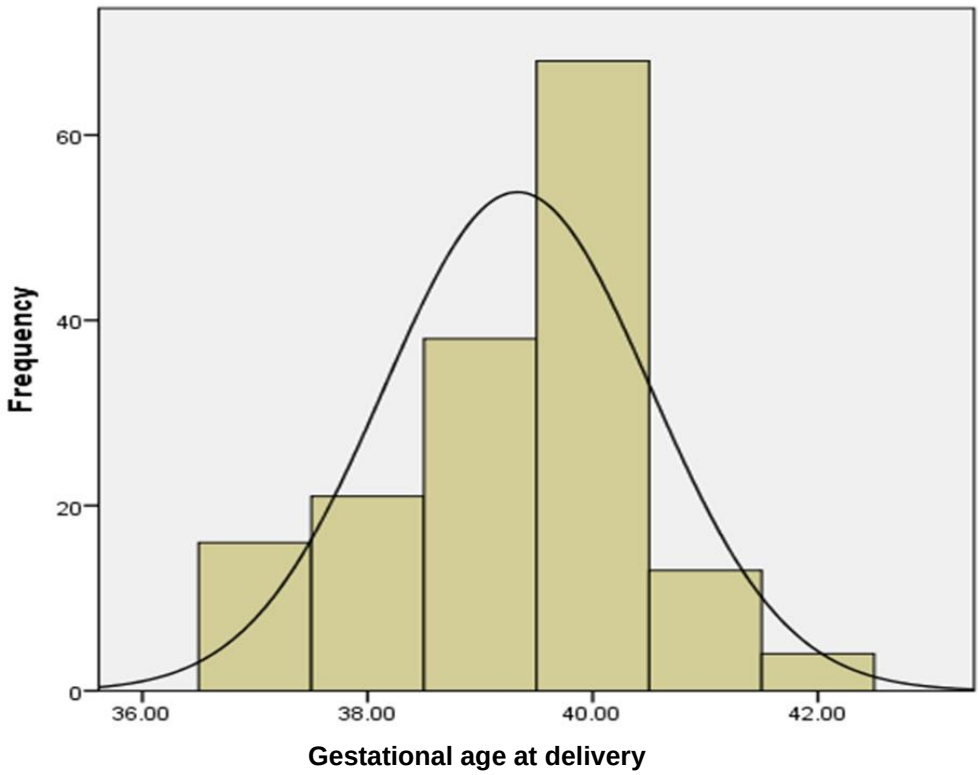

Fig. 1. Histogram showing the gestational age of participants at delivery
Mean= 39.33, Median= 40.00, Standard deviation= 1.19, and Variance= 1.41

Table 3. Biophysical profile parameters

Variable	Score	Frequency (N = 160)	Percentage (%)
Fetal movement	Zero	5	3.1
	Two	155	96.9
Fetal tone	Zero	0	0.0
	Two	160	100.0
Fetal breathing movement	Zero	5	3.1
	Two	155	96.9
Amniotic fluid	Zero	0	0.0
	Two	160	100.0
Non-stress test	Zero (non-reactive)	40	25.0
	Two (reactive)	120	75.0

Table 4. BPP Scores and frequency of occurrence

Variable	Frequency (N = 160)	Percentage (%)
BPP Grades*:*		
0/10	0	0.0
2/10	0	0.0
4/10	0	0.0
6/10	3	1.9
8/10	42	26.3
10/10	115	71.9
Total	160	100

Table 5. Amniotic fluid index (AFI) values with frequency of occurrence

AFI GRADES	Frequency of occurrence	Percentage of the frequency (%)
< or = 5.0cm	0	0
5.1-8.0cm	0	0
8.1- 24.0cm	160	100
➢ 24.0cm	0	0
Total	160	100

Table 6. Outcome of delivery

Variable		Frequency	Percentage (%)
Fetal distress	Present	14	8.9
	Absent	144	91.1
Stillbirth delivery	YES	0	0.0
	NO	158	100.0
Admission into ICU	YES	19	12.0
	NO	139	88.0
Colour of amniotic fluid	Clear	145	91.8
	Meconium stained	13	8.2
Neonatal birth weight	< 2.5Kg	9	5.7
	>2.5 Kg	149	94.3
APGAR score (1 minute)	< 7	8	5.1
	>7	150	94.9
APGAR score (5 minute)	< 7	5	3.2
	>7	153	96.8

Fetal outcomes were as follows; no fetal distress was 144 (91.1%) while fetal distress was present in 14 (8.9%). There were no stillbirths recorded 0(0%). Only 19 (12%) of the babies with fetal distress were admitted to the neonatal intensive care unit (NICU) while 139 (88%) were not admitted. Amniotic fluid was clear in 145 (91.8%) while 13 (8.2%) showed meconium-staining. Birth weight of > 2.5kg was recorded in 149 (94.3%) while 9 (5.7%) babies had < 2.5kg. APGAR score of > 7 in the first minute was seen in 150 (96.9%) babies while 8 (5.1%) scored < 7. APGAR score in 5 minutes of > 7 was recorded in 153 (96.8%) of the fetuses while those with < 7 were seen in 5 (3.2%) fetuses Table 6.

Mode of delivery, 84 (52.8%) had vaginal delivery followed by elective Lower segment caesarean section [LSCS] in 39 (24.5%). Emergency LSCS was recorded in 36 (22.6%). None of the participants had an instrumental mode of delivery Table 7.

Association between gross body movement and mode of delivery; fetal distress in labour, admission into NICU, amniotic fluid colour, birth weight, and APGAR scores at 1 and 5 minutes showed no statistical significance with P values > 0.05. Neonatal birth weight had a p-value > 0.999 Table 8.

Association between fetal breathing movement and mode of delivery; fetal distress in labour, admission into NICU, amniotic fluid colour, birth weight, and APGAR scores at 1 and 5 minutes showed no statistical significance P values > 0.05. Neonatal birth weight and APGAR score showed p-values of > 0.999 Table 9.

Table 7. Mode of delivery

Variable	Frequency (N = 160)	Percentage (%)
Vaginal	84	52.8
LSCS-Elective	39	24.5
LSCS-Emergency	36	22.6
Instrumental	0	0.0

Table 8. Association between gross body movement and fetal outcome

Fetal Outcome Parameters	Zero (%)	Two (%)	Total (%)	Test value	p-value
Mode of delivery:					
Vaginal	3 (60.0)	81 (52.6)	84 (52.8)	1.864	0.336
LSCS-elective	0 (0.0)	39 (25.3)	39(24.5)		
LSCS-emergency	2 (40.0)	34 (22.1)	36(22.6)		
Fetal distress in labour:					
Present	1(20.0)	13(8.5)	14(8.9)	0.793	0.375
Absent	4(80.0)	140(91.5)	144(91.1)		
Admission into NICU:					
Yes	1(20.0)	18(11.8)	19(12.0)	0.310	0.478
No	4(80.0)	135(88.2)	139(88.0)		
Colour of amniotic fluid:					
Clear	4(80.0)	141(92.2)	145(91.8)	0.948	0.353
Meconium-stained	1(20.0)	12(7.8)	13(8.2)		
Neonatal birth weight:					
< 2.5kg	0(0.0)	9(5.9)	9(5.7)	0.312	>0.999
≥ 2.5kg	5(100.0)	144(94.1)	149(93.3)		
APGAR score in 1 minute					
< 7	1(20.0)	7(4.6)	8(5.1)	2.397	0.231
≥ 7	4(80.0)	146(95.4)	150(94.9)		
APGAR score in 5 minutes					
< 7	0(0.0)	5(3.3)	5(3.2)		
≥ 7	5(100.0)	148(96.7)	153(96.8)		

Table 9. Association between fetal breathing movement and fetal outcome

Fetal outcome parameters	Zero (%)	Two (%)	Total	Test value	p-value
Mode of delivery:					
Vaginal	3(60.0)	81(52.6)	81(52.6)	1.864	0.336
LSCS-elective	0(0.0)	39(25.3)	39(24.5)		
LSCS-emergency	2(40.0)	34(22.1)	36(22.6)		
Fetal distress in labour					
Present	1(20.0)	13(8.5)	14(8.9)	0.793	0.375
Absent	4(80.0)	140(91.5)	144(91.1)		
Admission into NICU:					
Yes	1(20.0)	18(11.8)	19(12.0)	0.310	0.478
No	4(80.0)	135(88.2)	139(88.0)		
Colour of Amniotic fluid:					
Clear	4(80.0)	141(92.2)	145(91.8)	0.948	0.353
Meconium stained	1(20.0)	12(7.8)	13(8.2)		
Neonatal birth weight:					
<2.5kg	0(0.0)	9(5.9)	9(5.7)	0.312	>0.999
≥2.5kg	5(100.0)	144(94.1)	149(94.3)		
APGAR score in 1 minute					
<7	0(0.0)	8(5.2)	8(5.1)	0.275	>0.999
≥7	5(100.0)	145(94.8)	150(94.9)		
APGAR score in 5 minutes					
<7	0(0.0)	51(3.3)	5(3.2)	0.169	>0.999
≥7	5(100.0)	148(96.7)	153(96.8)		

The combined parametres of the biophysical profile score and fetal outcomes; mode of delivery, fetal distress in labour, admission into the NICU, amniotic fluid colour, birth weight, and APGAR score in 1 minute and 5 minutes showed no statistical significance p-values > 0.05. Neonatal birth weight and APGAR score at 5 minutes had p-values of >1.000 Table 10.

4. DISCUSSION

The findings in this study revealed that the majority of the respondents belonged to the 25-34 years age range. This agrees with that reported by Nisa et al [14] and Shrestha et al [19]. The maximum number of participants around 25-35 years is consistent with women's peak age of reproductive life.

This study showed that most of the respondents were multigravida which is similar to that reported by Ullah et al. [1], Prabu et al [20], and Nisa et al. [14]. This finding may reflect the fact that higher-order pregnancies are commonly associated with high-risk factors such as anaemia in pregnancy, pregnancy-induced hypertension, diabetes mellitus in pregnancy, and pregnancy on a background of chronic hypertension. It does not concur with that reported by Shrestha et al. [19] Himabindu et al [21], and Yogitha et al. [22] with more of their respondents being primigravidas.

A majority of the participants in this study had good biophysical profile scores of between 8 and 10. Studies by Ullah et al. [1] Singh et al. [23] Yogitha et al. [22] and Lotfalizadeh et al. [24] also recorded a higher proportion of the participants having a normal biophysical profile score. This may be attributed to the improving medical care for pregnant women.

Evaluating the mode of delivery, our study showed that more than half of the participants had vaginal delivery. This is in concordance with that reported by Prabu et al [20] and Himabindu et al. [21]. It may be attributable to the fact that the obstetricians were proactive in their management of these high-risk mothers and ensured delivery as soon as the fetuses attained viable age to avoid adverse pregnancy outcomes.

This study recorded fetal distress in labour as one of the commonest indications for LSCS. The study by Yogitha et al. [22] revealed that more than half were delivered through LSCS and the commonest indication for the LSCS according to studies by Yogitha et al. [22], Shrestha et al. [19] and Lohana et al. [7] was fetal distress in labour.

Table 10. Relationship between fetal outcome parameters and biophysical profile score

			Biophysical Profile Score			
			Zero (%)	**Two (%)**	**Total (%)**	
Mode of delivery	Vaginal	39.5 ± 0.9	3(60.0)	81(52.6)	84(52.8)	
	LSCS-Elective	39.1 ± 1.4	0(0.0)	39(25.3)	39(24.5)	0.336
	LSCS-Emergency	39.2 ± 1.4	2(40.0)	34(22.1)	36(22.6)	
Fetal distress in labour	Present	38.9 ± 1.4	1(20.0)	13(8.5)	14(8.9)	
	Absent	39.4 ± 1.2	4(80.0)	140(91.5)	144(91.1)	0.375
Admission into ICU	YES	38.7 ± 1.3	1(20.0)	18(11.8)	19(12.0)	
	NO	39.4 ± 1.1	4(80.0)	135(88.2)	139(88.0)	0.478
Colour of amniotic fluid	Clear	39.3 ± 1.2	4(80.0)	141(92.2)	145(91.8)	
	Meconium stained	39.5 ± 1.1	1(20.0)	12(7.8)	13(8.2)	0.353
Neonatal birth weight	< 2.5kg	38.0 ± 1.3	0(0.0)	9(5.9)	9(5.7)	
	≥2.5kg	39.4 ± 1.1	5(100.0)	144(94.1)	149(94.3)	1.000
APGAR score in 1 minute	<7	39.0 ± 1.4	1(20.0)	7(4.6)	8(5.1)	
	≥7	39.3 ± 1.2	4(80.0)	146(95.4)	150(94.9)	0.231
APGAR score in 5 minutes	<7	38.6 ± 1.5	0(0.0)	5(3.3)	5(3.2)	
	≥7	39.3 ± 1.2	5(100.0)	148(96.7)	153(96.8)	1.000

Our study revealed that a large majority of the babies had normal APGAR scores at one and five minutes and it is in agreement with the findings by Czeresnia et al. [25], Singh et al[26], and Lohana et al.[7] This may be because of the improvement in medical care provided by the Obstetricians.

This study revealed that a majority of the newborns had normal birth weights of > 2.5kg and it is corroborated by the studies of Lohana et al. [7], Ullah et al. [1], Maurya et al. [27], and Yogitha et al. [22] The good fetal outcomes recorded in this study could be a result of proper antenatal care in the University Teaching Hospital with many specialist obstetricians.

In this study, the number of neonates admitted into the NICU was slightly higher 19[12.0%] than that reported by Ullah [1] and Himabindu [21]. This showed that the majority of the neonates had good outcomes. The comparably increased number of neonates admitted to NICU in this study may be due to differences in sample size with this study having a higher sample size.

Our study showed no perinatal death and is similar to the finding reported by Lohana and colleagues [7]. Conversely, the study by Yogitha and colleagues [22] showed a mortality of one. The differences between the mortality recorded may be explained by the higher sample size in the study by Yogitha et al.

Fetal movement patterns are determined by the neurological development of the fetus as well as the metabolic state of the fetus [28]. Several studies have demonstrated that fetal movement is an important measure of fetal health. Our study demonstrated that the proportion of women who delivered through elective LSCS was higher in those with poor fetal gross movement when compared with those who had adequate gross fetal body movements. This is in agreement with that reported by McCarthy et al. [29] This shows that decreased fetal movement is associated with a greater incidence of caesarian sections. In our centre, subjects with low biophysical profile scores were more prone to deliver through a caesarean section in a bid to ensure the survival of the babies.

This study observed that when gross body movement was absent, more neonates had fetal distress compared with when gross body movement was present and it is similar to that observed by Poojari et al. [30] In contrast, a greater proportion of women with normal gross body movements had more low birth weight babies compared to women with absent gross body movements. This shows that a fetus of normal weight may not be responsive to gross body movement testing and it may be due to the sleep-wake patterns of the fetus or due to some maternal conditions like diabetes mellitus which results in large babies whose neurologic and metabolic status are compromised.

This study showed that the babies with abnormal APGAR scores at 5 minutes were seen in women with fetuses who had normal gross body movement and it is similar to that observed by McCarthy et al [29]. This study demonstrated that the proportion of women who delivered through emergency lower segment caesarian was higher in the women with absent fetal breathing movement compared to women in which fetal breathing movements were observed, thus showing that the absence of fetal breathing movement is associated with an increased rate of emergency caesarian sectioning in the mothers.

5. CONCLUSION

Biophysical profile parametres were found to be associated with fetal outcome. The combined biophysical profile score is a better indicator of the fetal outcome than using the individual parameters of the biophysical profile in determining the fetal outcome.

6. RECOMMENDATION

Health institutions involved in obstetrics and delivery services should develop policies that incorporate the biophysical profile scoring system in their patient management protocol and this should be routinely carried out for all pregnant women with any of the high-risk factors at term. This will greatly improve pregnancy outcomes, thereby reducing both maternal and perinatal morbidity and mortality.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as large language models, (ChatGPT, COPILOT, etc) and text-to-image generators have been used during the writing or editing of the manuscript.

CONSENT

As per international standards or university standards, patient(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

Ethical approval was received with a reference number of NAUTH/CS/66/VOL.11/118/2018/58.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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