

■ Original Research Article

Detection of Foetal Compromise Using Conventional Biophysical Profile and a Proposed Biophysical Profile with the Non-stress Test replaced with Ultrasonographic Fetal Heart Rate Count

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Abstract

Background: Prompt recognition and management of fetal well-being abnormalities can reduce asphyxia and perinatal morbidity and mortality. Fetal monitoring aims to predict and diagnose fetal compromise to prevent brain damage or death. If fetal compromise is detected or suspected, urgent intervention may be necessary. In this study, the conventional fetal biophysical profile (FBP) demonstrated positive and negative predictive values of 90.9% and 62.7%, while the proposed profile had values of 91.2% and 82.1%. **Justification:** An alternative heart rate assessment method is crucial due to challenges in consistently including the Non-Stress Test (NST) component of FBP, often limited by the availability of CTG facilities. **Objective:** This study compared the conventional FBP, which includes the NST, with a proposed profile that replaces the NST with real-time fetal heart rate assessment via ultrasonography. **Methodology:** This prospective comparative cross-sectional study included 216 pregnant women at UNIMEDTH, Akure. Participants were divided into two groups of 108, one receiving the proposed Fetal Biophysical Profile (pFBP) and the other the conventional FBP. Fetal heart rate was assessed using ultrasound, and scores were assigned based on heart rate variations. The primary outcome was the APGAR score at delivery; secondary outcomes included NICU admissions and early neonatal death. **Results:** Abnormal FBP results were similar between groups, with severe asphyxia rates of 9.3% and 10.2%. The positive predictive values were comparable indicating no statistically significant difference between the groups. **Conclusion:** The CTG component can be replaced with real-time fetal heart rate counting especially when CTG is unavailable.

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INTRODUCTION

Fetal biophysical profile (BPP) refers to assessment of five discrete biophysical variables by ultrasound and cardiotocography. It is a standard tool in antepartum fetal assessment and usually done after 28 weeks though, better by 32 weeks upwards. A biophysical profile is recommended for women at increased risks of problems that could lead to complications or pregnancy loss. So also, for women that complain of reduction in perception of fetal kicks. The test is usually better done after

32 weeks gestational age when the neurological system that control

the various functions to be assessed are expected to have been well developed. Biophysical profile is a non-invasive test that predicts the presence or absence of fetal asphyxia and ultimately, the risk of fetal death in antenatal period.¹ The BPP combines data from 2 sources. First is ultrasonography using dynamic real-time B-mode to measure amniotic fluid volume (AFV) and to observe several types of fetal movement including gross body movement, fetal breathing -movement and fetal tone. Second is fetal heart rate monitoring called Non-Stress

Test (NST) obtained using a pulsed Doppler transducer integrated with a high-speed microprocessor which provides a continuously updated reading.²

In the conventional biophysical profile, the total fetal biophysical profile score is 10 and a score of 4 or below is regarded as abnormal total score, 6 is equivocal while 8 and above is normal. A poor fetal biophysical profile may warrant intervention or even immediate delivery. An umbilical artery Doppler assessment may be additionally carried out to evaluate fetuses with abnormal BPP scores. The Manning's fetal Biophysical profile described in the appendix was first proposed by FA Mannings et al in 1980.³ In the interpretation of fetal biophysical profile results, score 8-10 is normal with risk of perinatal mortality of 1.86 per 1000. Score of 6 is equivocal with risk of perinatal mortality of 9.76 per 1000. Score of 4, 2 or 0 are all abnormal with risk of perinatal mortality of 26.3, 94.0 and 285.7 per 1000 respectively within 7 days.

There has been attempts at modifying the fetal biophysical profile, one of such is the adoption of Amniotic fluid index and Non-stress test by R.D. Eden using only two parameters where he considered decreased amniotic fluid volume and spontaneous fetal heart rate decelerations as abnormal findings necessitating delivery and discovered that this was associated with increased incidence of meconium staining, deceleration during labour and caesarean section for fetal distress.⁴ However, because of scarcity of facilities for Non-stress test (CTG) in poor countries, even this modified biophysical profile will have less applicability. A Non-Stress Test (NST) is a prenatal test to assess fetal well-being by monitoring baby's heart rate in response to movement. A NST is considered reassuring if the fetal heart rate increases at least 15beats per minute over the baseline (between 120-160b/m) lasting 15sec, within a 20 min timeframe. This is called a reactive NST and is scored 2 in the conventional biophysical profile.

For a full CTG assessment, a normal CTG tracing⁵ is when Fetal heart rate is between 120-160b/m or 110-170b/m, no deceleration of Fetal Heart rate (FHR), baseline variability of 5-25beats per minutes (b/m) and if there is 2 cardio accelerations in 20min. Acceleration of FHR with contractions is a sign of healthy fetus, but absence in advance labour is not a poor sign. Suspicious fetal heart rate pattern on Cardiotocographic (CTG) tracing,⁶ gives absence of acceleration. Reduced variability <10b/min, Variable deceleration, Abnormal baseline fetal heart rate <110 & >170b/m. Pathological CTG tracing is when no acceleration plus two or more of the following: abnormal baseline rate, abnormal baseline variability, repeated late deceleration, variable deceleration with ominous features (duration >60s, late deceleration component, poor variability between/during decelerations.

Other additional tests that may be carried out especially when biophysical profile is abnormal include the assessment of the fetal electrocardiographic (ECG) waveform, laboratory examination of the effect of hypoxemia and acidosis on the ST segment, the ratio of the T –wave height to QRS height increase which increases in acute hypoxaemia,⁷ Fetal blood sampling and internal fetal heart rate monitoring include fetal scalp electrode (FSE) which detects the electrical energy produced during cardiac cycle, fetal pulse oximetry was introduced to provide a non-invasive measure of oxygen saturation to improve intrapartum assessment during labour.

The outcome of a very poor fetal biophysical profile after immediate delivery may be a distressed fetus which will require intensive resuscitative care and monitoring. APGAR scoring is used to categorize asphyxia that may have occurred. The APGAR score at one minute usually determines the further resuscitative measure to be employed. This, by necessity, has to be carried out in the delivery room immediately after birth.⁸

The vigorous infant usually has 1 minute APGAR score of 7 and above. The infant who is breathing well needs only brief and gentle suction of mouth, nose and pharynx. The patency of the oesophagus is checked by naso-gastric aspiration. The infant who is dusky but whose respiratory effort is satisfactory additionally gets oxygen administered through a face mask.

Moderate asphyxia is when 1 minute APGAR score is 4-6. Oxygen is administered by face mask after mouth and nose have been suctioned. If initial heart rate of less than 100 promptly accelerates, the infant probably does not need more than oxygen by face mask. If bradycardia or weak respiratory effort persists, intermittent positive pressure ventilation (IPPV) with Ambu-bag, mask and 100% oxygen at 30-40 breaths per minute and 30-40cm water pressure is administered.

Severe asphyxia is when 1 minute APGAR score is 0-3. Brief suction, intubation (naso-tracheal or orotracheal) and IPPV administration with 100% oxygen via Ambu-bag, to the tube at 30-40 breaths per min and pressure of 30-40cm of water. If heart rate is less than 60/min after 1min of IPPV, external cardiac massage at 60/min. Acidosis is usually of the combined type and may require sodium bicarbonate if it is mainly metabolic. If cardiac rate does not rise after 5min, consider intracardiac administration of 1ml of 1:10,000 dilution of adrenaline.

This study compared the conventional fetal biophysical profile (cFBP) that has CTG component with a proposed fetal biophysical profile (pFBP) that replaces the CTG component with real time counting of the fetal heart rate by ultrasonography in terms of fetal compromise detection.

The study sought to find out if there are significant differences between the conventional fetal biophysical

profile and the Fetal Biophysical profile that incorporates real-time Fetal Heart rate counting to replace the CTG Non-stress test.

The study is expedient because having the Non-Stress Test CTG component of fetal biophysical profile at all times has been difficult, therefore exploring an alternative heart rate assessment method in FBP is imperative due to the confusion usually encountered because of inability to include the NST component of FBP at all times due to paucity of CTG facilities

The fetal heart rate assessment component (CTG) in the conventional Fetal Biophysical Profile (cFBP) is usually completely missing, whereas, it is generally known that the total overall score of FBP is 10 with 2 points coming from each of the components. These underscore the need to explore and utilise alternative heart rate assessment modality to be part of fetal biophysical profile. The study is a prospective randomized comparative trial.

MATERIALS AND METHODOLOGY

Two groups of 108 consenting pregnant women each at gestational age of 32 weeks and above and with indication for fetal biophysical profile were recruited following a computer-generated randomization pattern. Group 1 represents the study group of the proposed fetal biophysical profile (pFBP) while Group 2 represents the control group of the conventional biophysical profile (cFBP). These interpretations are known only to the researchers. Two hundred and sixteen (216) envelopes were provided and labelled on the outside serially from 1 to 216. One randomization card labelled 1 or 2 according to the above pattern was kept inside the envelopes indicating whether patient will have the proposed fetal biophysical profile or the conventional fetal biophysical profile.

The envelopes were serially allocated to the pregnant women as they presented. The pregnant women did not know the particular type of biophysical profile they were to have, they only knew that it was a biophysical profile. The person involved in the recruitment and allocation of pregnant women was not involved in carrying out the biophysical profile. The conventional biophysical profile that was adopted was the Manning's Fetal Biophysical Profile that consist of Fetal tone, fetal gross body movement, fetal breathing movement, amniotic fluid volume and non-stress test (NST) by cardiotocography.

The proposed fetal biophysical profile consists of all above except NST which was replaced with real-time fetal heart rate counting (RFC) under ultrasound. The fetal heart rate was counted with ultrasound scanning machine 5 times in a period of 15 minutes observation with at least 1 minute in-between each count. FHR of

120-160beats per minute (bpm) is normal. Difference between the highest count and the lowest count of 5-25 beats within normal limit was scored 2. Difference between the highest count and the lowest count less than 5 beats/greater than 25 beats or any abnormal count was scored 0. The immediate neonatal outcomes at delivery of both groups in terms of APGA scores and NICU admission was compared. Normal results of group 1 compared with normal results of group 2. Abnormal results of group 1 compared with abnormal results of group 2. The table showing the scoring system of the proposed fetal biophysical profile and the conventional fetal biophysical profile is presented in appendix 1.

Participants were followed up till delivery and their perinatal outcomes were recorded in the datasheet. Management of labour was done according to the hospital's protocols with artificial rupture of membranes done as required. The study was carried out at the Department of Obstetrics and Gynaecology and Department of Radiology of the University of Medical Sciences Teaching Hospital Complex/State Hospital, Akure, Nigeria over a period of 8 months. It was a prospective comparative cross-sectional study.

The study population consisted of pregnant women that are at 32weeks gestational age or above who by indication require biophysical profile. The exclusion criteria include refusal to consent, pregnancy less than 32 weeks, fetal distress, antepartum haemorrhage and eclampsia while pregnant women that give consent and have indication for fetal biophysical profile and are at gestational age of 32 weeks and above were included. The patients were recruited upon their agreement to participate after detailed information have been provided to them in the way they understand. Ethical clearance was obtained from the institutions ethical committee. Sample size determination was done by using the following formula⁹: $N = 2 (z_{\alpha} + z_{\beta})^2 / (\delta/\sigma)^2$ This gave the minimum total sample size to 108 for each group.

Data was presented as descriptive statistics in tables consisting of frequency or absolute number of participants for each variable, the corresponding percentages, results of inferential statistical analysis like the chi-square and the p-values. Statistical Package for Social Sciences (SPSS) version 29.0 was used for data statistical analysis. Demographic data, and primary and secondary outcomes of both groups were compared with t-test (for quantitative measures). Categorical variables were compared by cross-tabulation with chi-square and significance determined using level of significance set at 0.05.

RESULTS

Table 1 presents the descriptive analysis of the Socio-demographic biodata of the patients in the 2 groups. The

demographic characteristics of the patients revealed that majority 81(37.5%) of them were in the age group 30-39years while only 5(4.6%) were above the age of 50years. Majority of the participants were married 132 (61%) and of the Yoruba ethnic group 153 (70.2%). Over 70% of the patients were Christians. Only 10.6% (23) of the patients were University graduates, about 30% (65)

Table 1: Socio-demographic characteristics of the patients

Variable	Proposed BPP n=108(%)	Manning's BPP n=108 (%)	Total=216 n=216(%)	Test of Sig. Pearson's	Chi square P value
Age group (Years)				49.703	<0.005
< 20	49(45.4)	13(12)	62(28.7)		
20-29	31(28.7)	21(19.4)	52(24.1)		
30-39	19(17.6)	62(57.4)	81(37.5)		
40-49	5(4.6)	11(10.2)	16(7.4)		
> 50	4(3.7)	16(7.4)	5(2.3)		
Marital Status				0.717	0.699
Single	34(31.5)	29(26.9)	63(29.2)		
Married	63(58.3)	69(63.9)	132(61.1)		
Separated	11(10.2)	10(9.3)	21(9.7)		
Ethnicity				0.022	0.881
Yoruba	77(71.3)	76(70.4)	153(70.2)		
Igbo	31(28.7)	32(29.6)	153(70.8)		
Religion				18.846	<0.005
Islam	17(15.7)	46(42.6)	63(29.2)		
Christian	91(84.3)	62(57.4)	153(70.8)		
Education				32	<0.005
Primary	31(28.7)	11(10.2)	19(9.0)		
Secondary	42(38.9)	44(40.7)	86(39.8)		
Tertiary	35(32.4)	53(49.1)	88(41.5)		
Occupation				56.914	<0.005
None	30(27.8)	12(11.1)	42(19.4)		
Trading	48(72.2)	32(48.1)	80(60.2)		
Business	0(0.0)	44(40.7)	44(20.4)		
Public Service	29	21	50		

Table 2 Obstetric Characteristics of the Patients in the 2 Groups

Variable	Proposed BPP n (%)	Manning's FBP	Total	Test of Sig. Pearson's	Chi square P value
Booking GA (weeks)				20.555	< 0.005
< 8	31(28.7)	11(10.2)	42(19.4)		
8-16	66(61.1)	64(59.3)	130(60.2)		
17-32	11(10.2)	33(30.6)	44(20.4)		
GA at FBP (weeks)				100.762	< 0.005
32-34	12(19.4)	30(27.8)	42(19.4)		
35-37	50(46.3)	34(31.5)	84(38.9)		
38-40	26(12.0)	21(19.4)	47(21.8)		
41-42	20(9.3)	23(21.3)	43(19.9)		
Number of Fetuses				1.019	0.313
1	105(97.2)	107(99.1)	212(98.1)		
2	3(2.8)	1(0.9)	4(1.9)		
Mother's Medical Condition					
Diabetes	39(36.1)	23(21.3)	62(28.7)	91.286	<0.005
Hypertension	32(29.6)	34(31.5)	66(30.6)		
Asthma	4(3.7)	6(5.6)	10(4.6)		
No Medical Condition	33(30.6)	45(41.7)	78(36.1)		
Indication for FBP				14.006	<0.005
Medical Condition	75(46.3)	63(38.9)	138(63.9)		
Postdate	23(21.3)	34(42.6)	57(26.4)		
Reduced	10(27.8)	11(18.5)	21(9.7)		
Mode of Delivery				5.699	0.058
SVD	50(46.3)	64(59.3)	114(52.8)		
Caesarean Section	47(43.5)	34(31.5)	81(37.5)		
Instrument Assisted	11(10.2)	10(9.3)	21(9.7)		

had other post-secondary school education while 39.8% (86) had secondary school certificate as their highest educational qualification. Majority of the patients 80(60.2%) were traders, only 19.4% (42) were full house wives.

Table 2 presents the descriptive analysis of the obstetrics biodata of the participants. The gestational age of booking for majority of the participants 130(60.2) was 8-16 weeks, only 42(19.4%) booked before 8 weeks of Eighty-four participants (38.9%) presented at 35-37weeks of gestation at which they had their fetal biophysical profile done. Forty-three patients (19.9%) presented after forty weeks of gestation. Ninety-eight percent of the patients presented with twin gestations. Majority of the patients with medical condition had hypertension in pregnancy 66(30.6%) while 62(28.7%) of them had diabetes in pregnancy. Medical conditions were the indication for fetal biophysical profile in the majority of the participants 138(63.9%).

Table 3: Categories of the Fetal Biophysical Profile Scores for the 2 groups

Variable	Proposed BPP n (%)	Manning's FBP n (%)	Total n (%)	Pearson's Test of Sig.	P- value
FBP Score				0.856	0.652
Optimal (Score of 10)	74(68.5)	75(69.4)	149(69.0)		
Suboptimal (Score of 6-8)	25(23.1)	23(21.3)	48(22.2)		
Poor (Score<6)	9(8.3)	10(9.3)	19(8.7)		
Total	108(100)	108(100)	216(100)		

Table 4: Comparing neonatal outcomes between the two groups

Variable	Proposed (pFBP) n (%)	Conventional (cFBP) n (%)	Total n (%)	Pearson's Test of Sig.	p-value
APGAR at 1 minute				7.728	0.005
APGAR Score > 7 (normal)	63(58.3)	50 (46.3)	120(52.3)		
4-6 (moderate asphyxia)	34(31.5)	48(44.4)	82(38.0)		
0-3(severe asphyxia)	11(10.2)	10(9.3)	21(9.7)		
Total	108(100)	108(100)	216(100)		
Neonatal Unit Admission				0.438	0.508
Yes	13(12.0)	11(10.2)	24(11.1)		
No	95(88%)	97(89.8)	192(88.9%)		
Total	108(100)	108(100)	216(100)		
Early Neonatal Death				7.090	0.029
Yes	2(0.9%)	2(0.9)	4(0.9)		
No	106(98.1%)	106(98.1)	212(98.1)		
Total	108(100)	108(100)	216(100)		

While the indication was post-datism in 57 (31.0%) of the participants and reduced perception of fetal movement in 21(9.7%). Majority of the participants in both groups (52.8%) delivered through normal spontaneous vaginal delivery while only 37.5% of the participants had caesarean section

Table 3 below presents the descriptive and inferential analysis of the results of Fetal Biophysical

Profile of the 2 study groups. Out of the 108 participants that had Manning's fetal biophysical profile, 75 (69.4%) were optimal (score of 10), 23(21.3%) were suboptimal (score 6-8) and 10(9.3%) were poor (score <6). In the group that had Fetal Biophysical Profile (FBP) with Real-time Fetal heart Counting (RFC) replacing CTG, 74 (68.5%) were optimal (score of 10), 27 (25.0%) were suboptimal (score 6-8) and 7(6.5%) were poor (score <6). Comparing the fetal biophysical profile results of the 2 groups with Chi-square analysis by cross-tabulation, Chi-square=0.856; p-value=0.652.

The result shows that there is similar frequency of occurrence of optimal, suboptimal and Poor fetal biophysical profile in both the Manning's fetal biophysical profile group and the group that had fetal biophysical profile in which CTG was replaced with real time fetal heart rate count. Suggesting that the rate of detecting poor fetal biophysical profile for the two methods are similar. The chi square p-value=0.856 indicating no significant difference between the two groups.

Table 4 Presents the descriptive and inferential analysis of the neonatal outcomes for the 2 study groups. In the Manning's Fetal Biophysical Profile group, 50(46.3%) had APGAR score >7, 48(44.4%) had APGAR score of 4-7 while 10(9.3%) had APGAR score of <4. Ten, 11(10.2%) were admitted into the Neonatal Intensive Care Unit (NICU) in this group. In the group that had the proposed fetal biophysical profile (pBPP) with CTG replaced with Real-time Fetal Heart rate counting (RFC), 63(58.3%) had APGAR score of >7, 34 (31.5%) had APGAR score of 4-7 while 11(10.2%) had APGAR score of <4. Chi square 7.728; p-value=0.005. Thirteen, 13(12.0%) were admitted into the Neonatal Intensive Care Unit (NICU) in this group. Chi-square=0.438; p-value=0.508. Two, 2(0.9%) cases of neonatal deaths were recorded each in the 2 groups. Chi square 7.090, p-value=0.029.

Table 5: Predictive values of proposed BPP on neonatal asphyxia

Assessment Result	Neonatal Outcome		Total
	Asphyxia	Normal	
Abnormal	31	3	34
Normal	14	60	74
Total	45	63	108
Positive predictive value	31/(31+3)%=91.2%		
Negative predictive value	60/(14+60)%=81.1%		

Table 5 below shows the predictive values of the proposed biophysical profile and the conventional biophysical profile. The positive predictive value of the proposed biophysical profile was 91.2% while the negative predictive value was found to be 81.1 %. However, the positive predictive value for the conventional biophysical profile was found to be 90.9%

in this study while the negative predictive value was 62.7%

Table 6: Predictive values of Manning's BPP on neonatal asphyxia

Assessment Result	Neonatal outcome		Total
	Asphyxia (Mild-Severe)	Normal	
Abnormal	30	3	33
Normal	28	47	75
Total	58	50	108

Positive predictive value 30/ (30+3) %=90.9%

Negative predictive value 47/ (28+47) %=62.7%

DISCUSSION

The majority of the participants booked at 8-16 weeks gestation, which is similar to earlier published average gestational age of booking for Antenatal care of 19 ± 7.3 years by Ifenne et al.,2012 from North-central Nigeria.¹⁰ A previous study by Omotayo et al had found 8-16weeks as the commoner gestational age of booking by Primigravida at the University of Medical Sciences Teaching Hospital, Akure.¹¹ Majority of the patients (54%) are artisans while 44% were business women. A study from a Nigerian tertiary hospital reported that maternal occupation did not significantly affect the gestational age at delivery but significantly affected the still birth rate ($p=0.002$).¹² The predominant age at presentation and Fetal Biophysical profile in this study was 35-37 weeks in 38.9% of the participants. Majority of the participants in both groups (52.8%) delivered through normal spontaneous vaginal delivery, this conforms with the findings of a similar study by Prabhu et al that reported that majority of participants 58.8%, had vaginal delivery¹³ but in contrast to the study published by Yogitha et al where over 50% of the participants in their study had caesarean section.¹⁴

Normal fetal biophysical profile results were returned in over 70% of the participants in both groups similar to the value reported in a study carried out at a teaching hospital in Nnewi where most of the participants 115 (71.9%) showed good BPP scores.¹⁵ The maximum fetal biophysical profile score for both groups in this study was 10. Some published articles have quoted 8 as maximum score for fetal biophysical profile.¹⁶ An earlier publication by Mannings had posited that when each of the four ultrasound variables are normal, the CTG may be excluded as it adds little to the predictive accuracy of the BPP as BPP score of 8/8 is reassuring.¹⁷ However this study suggests that for uniformity of reporting, a real time fetal heart rate count can be included to replace CTG when not available. The majority of the participants did their fetal biophysical profile at 35-37 weeks gestation/ the timing of fetal biophysical profile is recommended to

start at 32 weeks gestation for most fetal and most maternal conditions while it can begin earlier if there are multiple severe conditions according to Sapoval et al.,2023.¹⁸ This is because Fetal Biophysical profile is based on the principle that the fetal biophysical activities are controlled by centers in the fetal brain that are sensitive to varying degrees of hypoxia.¹⁹

Same study opined that the commonest indication for fetal biophysical profile is complaints of reduced perception of fetal movement while recognizing maternal conditions also as indications. (Sapoval et al., 2023) However, the commonest indication for fetal biophysical profile found in this study was maternal medical condition contrary to the findings by Sapoval et al. (2023)

Suggesting modification to fetal biophysical profile as being done by this study is not new as several groups have made minor amendments to the biophysical profile in the past such as Nageotte²⁰ who suggested using only 2 parameters (NST and Amniotic fluid volume for FBP. While Vintzileos suggested the addition of placenta age score to the conventional FBP to make six parameters.²¹

The fetal biophysical profile that is being proposed by this study using real time fetal heart rate to replace the NST component of the Manning's fetal biophysical profile envisages that the CTG Machine for the CTG may not be available. Previous published study by Prabhu et al have also suggested the possibility of CTG machine not being available in some settings and had proposed the use of 'Rapid Biophysical Profile (RBP) consisting of Amniotic fluid volume (AFI) assessment and sound provoked fetal movement (SPFM) detection score.²²

The simplicity of replacing the NST with real time fetal heart rate count and the non-requirement of CTG machine which may be a luxury in some low-income areas makes this proposed modification to the conventional FBP an alternative method of fetal assessment. Though, the detailed accuracy of the method in terms of sensitivity, specificity, false negativity, false positivity may be further extensively researched.

The positive and negative predictive values of conventional fetal biophysical profile in this study were 90.9% and 62.7% respectively while for the proposed fetal biophysical profile in this study, the positive and negative predictive values were 91.2% and 82.1% respectively. These shows a favourable comparison between the two forms of biophysical profiles in terms of predicting fetal compromise and does not contrast with the positive predictive of 91.7% reported by the original Manning's conventional fetal biophysical profile.⁹ The rate of admission to NICU was found to be 11% in the group that had Mannings fetal biophysical profile and 13% in the group that had the proposed fetal biophysical profile. These percentages are very close. In total, NICU admission rate was 23% in this study which is similar to

the findings of Singh et al., 2017 where 21.7% of the 180 babies of patients studied were admitted.²³

Limitation(S) of the Study

The limitation encountered was the difficulty of carrying out biophysical profile that has Non-Stress Test included because of non-availability of CTG machines at many of Fetal Biophysical Profile facilities and indeed many hospitals in this part of the world.

CONCLUSION

The positive predictive value of the proposed biophysical profile and that of the conventional method are similar. With the simplicity of replacing the NST with real time fetal heart rate count and the non-requirement of CTG machine, the proposed method can be a useful alternative in screening for potential fetal compromise when fetal biophysical profile is indicated especially where facility or expertise for Non-Stress Test (NST) with CTG is not available.

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Appendix: Description of Fetal Biophysical Profile

Manning's FBP			Proposed Biophysical Profile		
Parameter	Score 2	Score 0	Parameter	Score 2	Score 0
Fetal Tone	Normal fetal tone is one or more episodes of extension of a fetal extremity or trunk with return to flexion,	Absence of fetal tone is scored 0	Fetal Tone	Normal fetal tone is one or more episodes of extension of a fetal extremity or trunk with return to flexion,	Absence of fetal tone is scored 0
Fetal gross body movement	Normal fetal gross body movement is at least three discrete body or limb movements.	Abnormal fetal gross body movement is scored 0	Fetal gross body movement	Normal fetal gross body movement is at least three discrete body or limb movements.	Abnormal fetal gross body movement is scored 0
Fetal Breathing movement	Normal breathing movement is one or more episodes of rhythmic fetal breathing movements of 30 seconds or more within 30 minutes.	Abnormal fetal breathing movement is scored 0	Fetal breathing movement	Normal breathing movement is one or more episodes of rhythmic fetal breathing movements of 30 seconds or more within 30 minutes.	Abnormal fetal breathing movement is scored 0
Amniotic fluid volume	Normal amniotic fluid is a single 2 cm x 2 cm pocket is considered adequate or AFI greater than 5.0cm.	Less amniotic fluid findings is scored 0	Amniotic fluid volume	Normal amniotic fluid is a single 2 cm x 2 cm pocket is considered adequate or AFI greater than 5.0cm	Less amniotic fluid findings is scored 0
<i>None Stress Test</i>	A reactiveNST is assigned 2 points.	A Non-reactive NST scored 0	<i>Real Time fetal heart rate count with USS</i> (Normal is 120-160)	Difference between the highest count and the lowest count of 5-25 beats within normal limit is scored 2.	Difference between the highest count and the lowest count less than 5 beats/greater than 25 beats or any abnormal count is scored 0.