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Ultrasound evaluation of fetal biophysical profile and its relationship with APGAR score

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Ultrasonographic evaluation of fetal biophysical profile that include fetal movement, breathing and heart rate for fetal well-being. To evaluate the fetal biophysical profile and its relationship with APGAR score. Methodology: Cross-sectional analytical study was conducted at Farhat Trust Medical Center using convenient sampling for the duration of 7 months. 120 pregnant females of 18-45 year of age were included in this study and females with any pelvic pathology were excluded from our study. Ultrasound Machine, Toshiba Xario Convex probe frequency 3.5 to 7.5 MHz was used. Significant association between BPP score and APGAR score was found. Out of 120 patients, there were 4 patients who had 4-6 BPP score and their APGAR score was 4-6, there were 37 patients who had 7-8 BPP score and out of 37, 14 patients had 4-6 APGAR score, 17 had 7-8 APGAR score, 6 had 9-10 APGAR score, there were 79 patients with 9-10 BPP score. Out of 79 patients 7 had 4-6 APGAR score, 56 had 7-8 APGAR score and 16 had 9-10 APGAR score.. The mean value of BPD was 88.1167 and SD value was 5.66900, mean value of HC was 255.7417 and SD value was 41.04363, mean value of AC was 268.4583 and SD value was 40.18380, mean value of FL was 77.3250 and SD value was 8.31134, mean value of AFI was 11.0408 and SD value was 3.09020, mean value of FHR was 130.7083 and SD value was 9.19663n and lastly EFW mean value was 2.7142 and their SD value was 0.40320. Out of 104 patients with normal movement, 103 had adequate amniotic fluid level and 1 had polyhydramnios. Out of 16 patients with sluggish movement, 5 had adequate amniotic fluid level, 9 had oligohydramnios and 2 had polyhydramnios. Out of 104 patients with normal movement, 103 had adequate amniotic fluid level and 1 had polyhydramnios. Out of 16 patients with sluggish movement, 5 had adequate amniotic fluid level, 9 had oligohydramnios and 2 had polyhydramnios. It is concluded that fetal biophysical profile scores on ultrasound are strongly associated with neonatal outcomes in terms of APGAR score.

Keywords: Oligo hydramnios, APGAR score, Fetal biophysical profile.

INTRODUCTION

A biophysical profile (BPP) includes ultrasound monitoring of fetal movements, fetal tone and fetal breathing, ultrasound assessment of liquor volume with or without assessment of the fetal heart rate. (Manandhar, 2013) The BPP is performed in an effort to identify babies that may be at risk of poor pregnancy outcome, so that additional assessments of wellbeing may be performed, or labour may be induced or a caesarean section performed to expedite birth. (Manning, 2002) Point of care ultrasound (POCUS) in obstetrics is an invaluable tool in the evaluation of the pregnant patient: (Habek et al. 2003) (Bano and Hussain 2010) (Baschat, 2001) and (Ebrashy et al. 2005) Given its ease of use and interpretation, a quick assessment can provide important information regarding the management of obstetric concerns. The biophysical profile (BPP) is a maximum 30-minute long

ultrasound assessment to assess fetal well-being coupled with a fetal heart rate tracing. (Czeresnia et al. 2013) The elements are a non-stress test, assessment of fluid index, fetal breathing movements, total body movements, and limb tone demonstrated by flexion and extension of the limbs. (Bardakci, 2010) The modified BPP is a shortened study that involves a non-stress test (NST) and amniotic fluid index (AFI). (Kim et al. 2003)

The primary objectives of the BPP are to reduce stillbirth and to detect hypoxia early enough to allow delivery in time to avoid permanent fetal damage resulting from fetal asphyxia. (Lalor. 2008) Before going into a discussion about the BPP, however, it is important to understand that the efficacy of any fetal surveillance method to prevent fetal death or damage depends on an understanding of the particular pathophysiological process that leads to neurologic damage or fetal death. (Habek et

al. 2003) and (Jamal, 2007)

The APGAR score, a tool used to assess well-being at 1 and 5 minutes after birth, incorporates five elements: respiratory effort, heart rate, reflex irritability, muscle tone, and color. (Manning, 2002) In the preterm infant, the APGAR score is directly related to birth weight and gestational age. Among premature infants, APGAR scores are significantly higher at 1 and 5 minutes in females. (Chen, 2011) In addition, male premature infants frequently require more vigorous resuscitation. (Sapoval, 2019) Higher APGAR scores in the preterm female infant may be related to the higher catecholamine levels found in female infants at birth, resulting in a more normal pressor response and improved cardiovascular stability. (Rambhatla et al. 2003) Following delivery, the infant adapts to the external environment by various physiological changes. (Liu et al 2013) The APGAR score is a method to evaluate these changes. Although it is a useful initial evaluation, APGAR score has some drawbacks. (Kakegawa et al. 2002) While the one-minute score indicates need for resuscitation and the 5-minute score may predict long-term prognosis. APGAR score alone cannot be used to conclude fetal distress. (Fonsecca et al. 2021)

The main objective of the study is to discuss the present and important aspects of the method, and the practical applications and interpretation of its findings, in order to help radiologists improve their knowledge in this specific area of fetal ultrasonography.

MATERIALS AND METHODS

Cross-sectional analytical study was conducted at Farhat Trust Medical Center using convenient sampling Technique for the duration of 7 months. 120 Pregnant females of all age group were included and females with any other pelvic pathology were excluded. Ultrasound Machine, Toshiba Xario Convex probe frequency 3.5 to 7.5 MHz was used. Collected data was stored in Microsoft Excel. Data was analyzed with SPSS version 21. Qualitative data was presented by percentage and frequency. Chi-square test was applied to check the relation between BPP and APGAR score. P-value less than 0.05 was considered significant.

RESULTS AND DISCUSSION

In our study, we found that, 120 cases there were the patients who have 4-6 BPP score and their APGAR score was 4-6, there were 14 patients who had 7-8 BPP score and had 4-6 APGAR score, 17 had 7-8 APGAR score, 6 had 9-10 APGAR score. Similar results were noted by Manning et al in 2009 with normal score of 8-10 in 97.5%, 6 score in 1.7%, 4 score in 0.52%, 2 score in 0.18% and 0 score in 0 % cases. 15 It was found in our study that neonates born to mother with low BPP had higher risk of having low APGAR score at 1 and 5 min and the relationship between them was statistically significant. A research study by Hina et al at Pakistan, reported positive

correlation between BPP score and APGAR score. (Mohsin, 2001) Similar results were found in study done by Bano et al. in which 70% babies had BPP ranged 9-10, 26% babies had BPP ranged 7-8 and 4% babies had biophysical profile score ranged from 4-6. (Bano, 2010) We found significant association between BPP score and APGAR score. Among the neonates born to women with low BPP score of 6 85.7% of neonates were admitted to NICU. In our study, statistically significant association between BPP score and neonatal outcome was noted. More number of deaths (5 out of 6 neonates constituting 71.4%) were found in neonates born to mothers with low BPP score (of 6). In a study conducted at Nashville TN modified ultrasonography based BPP was used which included expanded scores of foetal movements, foetal breathing and qualitative assessment of accelerated placental maturity and this method was compared with method of Vinzileos and applied to 180 high risk pregnancies to determine the correlation with perinatal outcome. Relationship of results of total score and perinatal outcome showed good predictive values with high specificity and sensitivity. (Rosa et al. 2019) Similar results were found in study conducted in Radiology department PGMI, government Lady Reading Hospital, Peshawar from December 2007 to June 2008. There were 5 deaths in neonates born to mothers with BPP score of 6 and 2 deaths (1.4%) in women with BPP score of 8. However, no deaths were noted in new-born born to women with BPP score of 10. Thus, relationship of results of total score and perinatal outcome showed good predictive values with specificity of 98.8% and sensitivity of 82.4%. Statistically significant association was found between 5 min APGAR score and outcome with p-value below 0.001. (Ullah, 2010) It is evident from the data presented that results of our study are comparable to the different studies.

Table 1: Frequency Distribution of APGAR Grading

	Frequency	Percent
Mildly depressed	46	38.3
Normal	74	61.7
Total	120	100.0

Out of 120 patients 74 (61.7%) had normal APGAR grading and 46 (38.3%) had mildly depressed APGAR grading.

Table 2: BPP score * APGAR score Cross tabulation

		APGAR score			Total	P-value
		4 - 6	7 - 8	9 10		
BPP score	4 - 6	4	0	0	4	0.000
	7 - 8	14	17	6	37	
	9 - 10	7	56	16	79	
Total		25	73	22	120	

There were the patients who have 4-6 BPP score and their APGAR score was 4-6, there were 14 patients who had 7-8 BPP score and had 4-6 APGAR score, 17 had 7-8 APGAR score, 6 had 9-10 APGAR score.

Significant association was found between BPP and APGAR score.

Table 3: Comparison between Age groups and number of abortions

		Abortion				Total
		0	1	2	3	
Age Group	18 - 30	73	16	6	0	95
	31 - 42	15	5	3	2	25
Total		88	21	9	2	120

In age group 18-30 years, 73 patients were with no abortion. 16 had one abortion, 6 had 2 abortion and there will be no female with 3 abortion. In age group 31-42 years, 15 had no abortion, 5 had one abortion, 3 had 2 abortions and 2 have 3 abortions.

Table 4: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
BPD	120	72.00	98.00	88.1167	5.66900
HC	120	180.00	301.00	255.7417	41.04363
AC	120	192.00	315.00	268.4583	40.18380
FL	120	60.00	90.00	77.3250	8.31134
AFI	120	3.20	23.00	11.0408	3.09020
FHR	120	100.00	140.00	130.7083	9.19663
EFW	120	1.70	3.80	2.7142	.40320

The mean value of BPD was 88.1167 and SD value was 5.66900, mean value of HC was 255.7417 and SD value was 41.04363, mean value of AC was 268.4583 and SD value was 40.18380, mean value of FL was 77.3250 and SD value was 8.31134, mean value of AFI was 11.0408 and SD value was 3.09020, mean value of FHR was 130.7083 and SD value was 9.19663 and lastly EFW mean value was 2.7142 and their SD value was 0.40320.

CONCLUSION

It is concluded that fetal biophysical profile scores on ultrasound are strongly associated with neonatal outcomes in terms of APGAR score.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

FBS, HS, TM, MH, BA and MAA was involved in data collection and writing the manuscript. SMYF, ZH and UA designed and supervised the project. SMYF reviewed the manuscript. All authors read and approved the final version.

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