DOI: https://doi.org/10.54393/pjhs.v3i01.49

PAKISTAN JOURNAL OF Health Sciences
https://thejas.com.pk/index.php/tjas
Volume 3, Issue 1 (Jan - Jun 2022)

Original Article

Assessment of High-Risk Pregnancies using Biophysical Profile

Niha Dilnawaz[1], Akash John[1], Abid Ali[1], Naweera Ahmed[1] and Aiman Zafar[1]

[1]Department of Allied Health Sciences, University Institute of Radiological and Medical Imaging Sciences University of Chenab, Gujrat, Pakistan

ARTICLE INFO

Key Words:
Biophysical profile (BPP), non-stress test (NST), intra-uterine growth restriction(IUGR).

How to Cite:
Dilnawaz, N. ., John, A., Ali, A. ., Ahmed, N. ., & Zafar, A. . (2022). Assessment of High-Risk Pregnancies using Biophysical Profile: Assessment of High-Risk Pregnancies using Biophysical Profile. Pakistan Journal of Health Sciences, 3(01). https://doi.org/10.54393/pjhs.v3i01.49

***Corresponding Author:**
Niha Dilnawaz
Department of Allied Health Sciences, University Institute of Radiological and Medical Imaging Sciences University of Chenab, Gujrat, Pakistan

Received Date:22nd May, 2022
Acceptace Date:23rd June, 2022
Published Date:30th June, 2022

ABSTRACT

Objective: The purpose of the current study was to know the importance of using BPP for primary fetal surveillance in predicting fetal outcome. **Methods:** A total of 70 individuals with high risk pregnancies were included from 16-45 years examined through ultrasound and Doppler (Toshiba Xario 100 colour Doppler (C5-2 convex probe) having a real-time frequency range of 3.0 to 5.0 MHZ) at a private hospital in Gujranwala from October 2021 to March 2022. A Convenient sampling approach was used to collect data through informed consent forms. Data was collected using SPSS 21. **Results:** The current study included 70 patients who were examined using Doppler for fetal well-being. Study concluded to have correlation between age groups and development of fetal anomalies of age group 16-25years 44(62.9%), 26-35 years 21(30.0%), 36-45 years (7.1%). Most of the females in gestational weeks 34-37 weeks. Frequency of high-risk pregnancy most common is hypertension 25(35.7%) followed by other such as low fetal movement 10(14.3%), oligohydramnios 8(11.4%) and the least common is diabetes mellitus. Reactive 50(71.4%), and non-reactive 20(28.6%). Result shows the frequency of biophysical profile score in total number of patients included. Biophysical profile score 0-2 in 16(22.9%), 4-6 BPP score in 42(66%) and 8-10 BPP in 12(17.1%) patients. The frequency of IUGR in relation to biophysical profile score showing 18(72.0%), in 0-2 BPP score and 7(28%) in 4-6 BPP score. **Conclusions:** Normal BPP assures good fetal status and perinatal outcome. Abnormal BPP indicates that the fetus may be compromised. The study concluded that BPP has significant role in predicting fetal outcome.

INTRODUCTION

It is widely known that no health issue is more essential for a nation than maternal and perinatal mortality [1]. The field of obstetrics has progressed dramatically since the days when 'delivery' referred to the delivery of the infant only rather than its whole health [2]. Caesarean section was then thought to be risky, if not lethal [3]. With the passage of time, however, more attention is being paid to the well-being and result of the fetus, as well as a safe and concise birth [4]. High-risk pregnancies account for around a quarter to a third of all pregnancies, and they most likely to result in fetal morbidity and fatality [5]. The high-risk pregnancies must be recognized so that appropriate surveillance and prompt interventions can be implemented, reducing perinatal morbidity and mortality [6]. The mother's hypertensive problems are responsible for the majority of them [7]. The most common multisystem illness during pregnancy is preeclampsia which can cause hypertension, reduced amniotic fluid, maternal abnormal findings, intrauterine growth restriction, or impaired fetal growth [8]. This accounts for approximately 6-10% of all pregnancies. Preterm births account for around 20% of them [9]. Every year, over 7.3 million perinatal fatalities occur worldwide, the majority of which occur in Asia [10]. In 2020, Pakistan's neonatal death rate was around 58.60 mortalities per 1,000 births [11]. The overall neonatal death rate was found to be 111.1 percent (per 1000 births). In comparison to urban regions (93.3), it was higher in rural areas (121.2) [12]. Preeclampsia (gestational age < 37 weeks) complicate 0.5-1.6 percent and severe preeclampsia (gestational age < 35 weeks)

DOI: https://doi.org/10.54393/pjhs.v3i01.49

complicate 0.4 percent of pregnancies [13]. Women who have had preeclampsia before, as well as those who have diabetes, chronic hypertension, or a multi-fetal pregnancy, have a higher risk of premature preeclampsia [14]. In such high-risk circumstances, The biophysical profile of fetus is among the most widely used procedures for assessing the health of a fetus [15]. Manning et al. described the initial biophysical profile, which included a study of five factors: respiratory activity, fetal tone, fetal body movement, amniotic fluid index, and non-stress test [16]. This includes two phases i.e. ultrasonographic examination as well as Doppler to measure the fetal cardiac activity. The importance of high-resolution dynamic ultrasonographic imaging in advancement of fetal medicine cannot be underestimated [17]. The ability to "visualize" the fetus and its environment, as well as monitor fetal actions and responses to intrinsic and extrinsic stimuli, fundamentally transforms the factual and psychologic basis of fetal medicine practice [18]. With this technological advancement comes a better understanding of disease and the ability to treat and, in some circumstances, cure it. Another fundamental concept is that, on a larger scale, our ability to reliably classify fetal responses to potentially harmful maternal illness states (such as hypertension) is improving our understanding of how maternal health affects fetal health [19]. A separate non-stress examination of the fetal heart rate can be conducted as the part of BPP. Each of the five ultrasonography parameters, as well as the non-stress test, is given a score of 0 or 2. (there is no 1 point) [20]. A total score of 8 indicates appropriate prenatal oxygen levels and acid-base balance, as well as a well-perfused and oxygenated fetal brain, whereas a score of 4 indicates fetal impairment [21]. If a compromised fetus is identified, the physician should be able to perform measures to prevent negative fetal/neonatal outcomes [22]. High risk pregnancies has quite high mortality rate and needs early detection to prevent loss at any greater level. Assessment as biophysical profile of the fetus is one of the best methods to evaluate fetal health. Ultrasound plays important role in early detection and management of any pregnancy related complications. It is a non-ionizing, non-invasive modality with minimal effect on tissues of the body and most preferable diagnostic modality in high risk pregnancies.

METHODS

Total 70 individuals with high risk pregnancies were included from 16-45 years examined through ultrasound and Doppler (Toshiba Xario 100 colour Doppler (C5-2 convex probe) having a real-time frequency range of 3.0 to 5.0 MHZ) at a private hospital in Gujranwala from October 2021 to March 2022. Women with high risk pregnancies of age group 16-45 year were included. A consent form was taken from all the patients for data collection. The test assesses the baby's cardiac activity, respiration activity, movements, muscle tone, and amniotic fluid level by combining fetal heart rate monitoring (non-stress test) and ultrasound of fetus. After the complete evaluation, a score is assigned to the non-stress test and ultrasound measurements based on whether or not specified criteria are met. The results are referred to as reactive if the baby's heartbeat accelerates to a certain level above the baseline twice or more than 10 seconds per 20-minute time interval before 32 weeks of pregnancy (normal). If the baby's heartbeat does not fulfil the criteria listed above, the results are called non-reactive. The fetus is maybe inactive or asleep during the test due to which it gives non-reactive result.

RESULTS

The current study included 70 patients who were examined using Doppler for fetal well-being. Table 1 shows that the age groups of mothers: 16-25years 44(62.9%), 26-35 years 21(30.0%), 36-45 years (7.1%) and the gestational age in weeks. Most of the females in gestational weeks 34-37 weeks 26(37.1%). 20(28.6%) were from gestational age 30-33weeks. 16(22.9%) were from gestational age 38-41weeks. Only 8(11.4%) were from gestational age 42-45weeks. Table 2 shows the amniotic fluid result including 48(68.6)% >6cm, 16(22.9) 3-6cm and 6(8.6%) in <3cm. Table 2 also shows the weight of fetus including 40(57.1%) 2.4-3.4kgs, 25(35.7%) 1.4-2.4kgs, 4(5.7%) <1.4kg and only 1(1.4%) >3.4kgs. Reactive 50(71.4%), and non-reactive 20(28.6%) stress test is shown in table 2. The frequency of high-risk pregnancy in which the most common is hypertension 25(35.7%) followed by other such as low fetal movement 10(14.3%), bad Obstetric history 10(14.3%), Oligohydramnios 8(11.4%) and the least common is diabetes mellitus and hypothyroidism 1(1.4%) (Table 3). Table 4 shows the frequency of biophysical profile score in total number of patients included. Showing biophysical profile score 0-2 in 16(22.9%), 4-6 BPP score in 42(66%) and 8-10 BPP in 12(17.1%) patients, the frequency of IUGR in relation to biophysical profile score showing 18(72.0%), in 0-2 BPP score and 7(28%) in 4-6 BPP score.

DOI: https://doi.org/10.54393/pjhs.v3i01.49

Age groups of mothers			
Valid	**Frequency(%)**	**Valid%**	**Cumulative %**
16-25years	44(62.9)	62.9	62.9
26-35years	21(30.0)	30.0	92.9
36-45years	5(7.1)	7.1	100.0
Total	70(100.0)	100.0	
Gestational age in weeks			
Valid	**Frequency(%)**	**Valid%**	**Cumulative %**
	30-33weeks (20)	28.6	28.6
	34-37weeks (26)	37.1	65.7
	38-41weeks(16)	22.9	88.6
	42-45weeks(8)	11.4	100.0
	Total(70)	100.0	

Table 1: Age groups of mothers in years and their gestational age in weeks

Amniotic fluid Index test			
Valid	**Frequency(%)**	**Valid%**	**Cumulative %**
>6cms	48 (68.6)	68.6	68.6
3-6cms	16(22.9)	22.9	91.4
<3cms	6(8.6)	8.6	100.0
Total	70(100.0)	100.0	
Weight of fetus in kgs			
Valid	**Frequency(%)**	**Valid%**	**Cumulative %**
	<1.4(4)	5.7	5.7
	1.4-2.4 (25)	35.7	41.4
	2.4-3.4(40)	57.1	98.6
	>3.4(1)	1.4	100.0
	Total(70)	100.0	
Non- stress test results			
Valid	**Frequency(%)**	**Valid%**	**Cumulative %**
	Reactive (50)	71.4	71.4
	Non- reactive (20)	28.6	100.0
	Total (70)	100.0	

Table 2: Amniotic fluid Index test results, weight of fetus and Non-stress test results

Amniotic fluid Index test			
Valid	**Frequency(%)**	**Valid%**	**Cumulative %**
	Hypertension (25)(10)	35.7	35.7
	Low Fetal Movement (10)	14.3	50.0
	Polyhydramnios (2)	2.9	52.9
	Bad Obstetric History (10)	14.3	67.1
	Diabetes Mellitus (1)	1.4	68.6
	Hypothyroidism (1)	1.4	70.0
	Placental Abruption (2)	2.9	72.9
	Placenta Previa (3)	4.3	77.1
	Obesity (3)	4.3	81.4
	Multiple Pregnancies (2)	2.9	84.3
	Oligohydramnios (8)	11.4	95.7
	PCOS (3)	4.3	100.0
	Total (70)	100.0	

Table 3: Risk factors of high-risk pregnancies

Fetal outcome			
Biophysical profile score		**IUGR**	**Still Birth**
0-2	16(22.9)	18(72.0)	3(75.0)
4-6	42(60.0)	7(28.0)	1(25.0)
8-10	12(17.1)	0(0)	0(0)
Total	70(100.0)	25(100)	4(100)
IUGR			
Valid	**Frequency(%)**	**Valid%**	**Cumulative %**
0-2	16(22.9)	22.9	22.9
4-6	42(60.0)	60.0	82.9
8-10	12(17.1)	17.1	100.0
Total	70(100.0)	100.0	

Biophysical profile score			
Valid	**Frequency(%)**	**Valid%**	**Cumulative %**
0-2	18 (72.0)	72.0	72.0
4-6	7 (28.0)	28.0	100.0
Total	25 (100.0)	100.0	

Table 4: Fetal outcome, IUGR and Biophysical profile score

DISCUSSION

The primary goal of fetal surveillance during pregnancy is to identify any possible harmful factors that could result in fetal morbidity and mortality. The best approach for identifying the fetus at risk is the biophysical profile using Doppler. Every year, over 7.3 million perinatal fatalities occur internationally, the majority of which occur in Asia. In 2020, Pakistan's neonatal death rate was around 58.60 mortalities per 1,000 births. Total 70 high risk pregnant patients were considered into current study. The age groups included were 16-25y, 26-35y and 36-45y. Fetal respiratory motions, body movements, fetal tone, cardiac activity, and amniotic fluid volume were the five characteristics taken into consideration. Each parameter was given a score of 2 for a normal reading and a score of 0 for abnormal. Maximum four procedures were performed on a single patient. The study concluded that there is a significant relationship between age groups and risk of high pregnancies showing that age 16-25y have more tendency to fetal anomalies 44(22.9%) followed by 26-35 years 21(30.0%), 36-45 years (7.1%). Further results show that there is a relationship between gestational weeks and incidence of high-risk pregnancies. Most common in 34-37 weeks 26(37.1%) followed by 20(28.6%) in 30-33weeks, 16(22.9%) in 38-41weeks and only 8(11.4%) in 42-45weeks. In addition, current study shows that amniotic fluid index has correlation with high risk pregnancies 48(68.6) % >6cm, 16(22.9) 3-6cm and 6(8.6%) in <3cm. The current study shows no as such relation with fetus weight to high risk pregnancy, including 40(57.1%) 2.4-3.4kgs, 25(35.7%) 1.4-2.4kgs, 4(5.7%) <1.4kg and only 1(1.4%) >3.4kgs. The study shows that the most common risk factor for high risk pregnancy is hypertension 25(35.7%) followed by other such as low fetal movement 10(14.3%), bad obstetric history 10(14.3%), oligohydramnios 8(11.4%) and the least common is diabetes mellitus and hypothyroidism 1(1.4%). A study by Dr. K. P. SOWMYA in 2010 also stated almost the same frequency of preeclampsia 26(37.14%), low fetal movement 9(12.6%), the ones with oligohydramnios 5(7.13%). Hypothyroidism and diabetes mellitus were found in 1(1.4%) patients. Further the study shows significance relation between biophysical profile score and high-risk pregnancy showing maximum patients in range 4-6 BPP score 42(60.0%) followed by 16(22.9%) patients in 0-2 BPP score [25]. In addition to this the current study shows quite significant relation between BPP score and IUGR 18(72.0%) in 0-2 BPP score, 7(28%) in 4-6 BPP score relatively.

DOI: https://doi.org/10.54393/pjhs.v3i01.49

CONCLUSION

In conclusion, normal BPP assures good fetal status and perinatal outcome. At the same time, abnormal BPP indicates that fetus could be compromised. As a primary antepartum fetal monitoring test BPP was significantly used in high risk pregnancy patients from age 16-45 years. The current study shows significance relation between biophysical profile score and high-risk pregnancy, 4-6 BPP score 42(60.0%) followed by 16(22.9%) patients in 0-2 BPP score. It also shows quite significant relation between BPP score and IUGR 18(72.0%) in 0-2 BPP score, 7(28%) in 4-6 BPP score relatively.

REFERENCES

[1] Betrán AP, Temmerman M, Kingdon C, Mohiddin A, Opiyo N, Torloni MR, et al. Interventions to reduce unnecessary caesarean sections in healthy women and babies. Lancet. 2018 Oct 13;392(10155):1358-1368. doi: 10.1016/S0140-6736(18)31927-5.

[2] Palmer WL, Bottle A, Aylin P. Association between day of delivery and obstetric outcomes: observational study. BMJ. 2015 Nov 24;351:h5774. doi: 10.1136/bmj.h5774.

[3] Mylonas I, Friese K. Indications for and risks of elective cesarean section. Deutsches Ärzteblatt International. 2015 Jul;112(29-30):489. -95. doi: 10.3238/arztebl.2015.0489.

[4] Lee S, Ayers S, Holden D. Risk perception of women during high risk pregnancy: a systematic review. Health, risk & society. 2012;14(6):511-531.

[5] English FA, Kenny LC, McCarthy FP. Risk factors and effective management of preeclampsia. Integrated Blood Pressure Control. 2015 Mar 3;8:7-12. doi: 10.2147/IBPC.S50641

[6] Osungbade KO, Ige OK. Public health perspectives of preeclampsia in developing countries: implication for health system strengthening. Journal of Pregnancy. 2011;2011:481095. doi: 10.1155/2011/481095.

[7] Redman CW. Hypertension in pregnancy: the NICE guidelines. Heart. 2011 Dec;97(23):1967-9. doi: 10.1136/heartjnl-2011-300949.

[8] August P, Sibai BM. Preeclampsia: Clinical features and diagnosis. Post TW, UpToDate. Waltham, MA: UpToDate. 2017 Dec.

[9] Bayou G, Berhan Y. Perinatal mortality and associated risk factors: a case control study. Ethiopian journal of health sciences. 2012;22(3).

[10] Beck S, Wojdyla D, Say L, Betran AP, Merialdi M, Requejo JH, et al. The worldwide incidence of preterm birth: a systematic review of maternal mortality and morbidity. Bull World Health Organ. 2010 Jan;88(1):31-8. doi: 10.2471/BLT.08.062554.

[11] knoema. Pakistan - Infant mortality rate. 2020.

[12] Pervez A, Chaudhry NA, Chaudhry FM, Ashfaq M. A survey of infant and under-5 mortality in Faisalabad Tehsil. JPMA. The Journal of the Pakistan Medical Association. 1991 Oct 1;41(10):244-5.

[13] Rasmussen S, Irgens LM. History of fetal growth restriction is more strongly associated with severe rather than milder pregnancy-induced hypertension. Hypertension. 2008 Apr;51(4):1231-8. doi: 10.1161/hypertensionaha.107.096248.

[14] Lykke JA, Langhoff-Roos J, Sibai BM, Funai EF, Triche EW, Paidas MJ. Hypertensive pregnancy disorders and subsequent cardiovascular morbidity and type 2 diabetes mellitus in the mother. Hypertension. 2009 Jun;53(6):944-51. doi: 10.1161/hypertensionaha.109.130765.

[15] Anupama MS, Dwarakanath L, Anand S. Comparative study of rapid biophysical profile and conventional biophysical profile in predicting perinatal outcome in high risk pregnancies. Age (Years).25(34):56.7. 2009 Jun;53(6):944-51. doi: 10.1161/hypertensionaha .109. 130765.

[16] Baschat AA, Gembruch U, Harman CR. The sequence of changes in Doppler and biophysical parameters as severe fetal growth restriction worsens. Ultrasound in Obstetrics and Gynecology 2001 Dec;18(6):571-7. doi: 10.1046/j.0960-7692.2001.00591.x.

[17] Manegold G, Tercanli S, Struben H, Huang D, Kang A. Is a routine ultrasound in the third trimester justified?–Additional fetal anomalies diagnosed after two previous unremarkable Ultrasound examinations. Ultraschall in der Medizin-European Journal of Ultrasound. 2011 Aug;32(04):381-386. doi: 10.1055/s-0029-1245799

[18] Bogin B. Patterns of human growth. Cambridge University Press; 2020 Nov 19.

[19] 19.Hassan SI, Gouda AMI, El-Monshed A, Kandeel HAM. Effect of cognitive behavioral therapy on anxiety, stress, depression, and coping pattern among pregnant women with preeclampsia. American Journal of Nursing. 2020;8(2):269-277.

[20] Lohana RU, Khatri M, Hariharan C. Correlation of non stress test with fetal outcome in term pregnancy (37-42 Weeks). International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2013;2(4):639-646.doi.org/10.5455/2320-1770.ijrcog20131229

[21] Sapoval J, Singh V, Carter RE. Ultrasound Biophysical Profile. 2019.

[22] Gruslin A, Lemyre B. Pre-eclampsia: fetal assessment and neonatal outcomes. Best practice & research Clinical obstetrics & gynaecology.

DOI: https://doi.org/10.54393/pjhs.v3i01.49

2011;25(4):491-507. doi.org/10.1016/j. bpobgyn.2011. 02.004

[23] Shaikh AB, Chidre YV. Comparison of the biophysical profile and modified biophysical profile in prediction of the fetal outcome in pregnancy induced hypertension. International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2017;6(4):1206-11.doi.org/10.18203/2320-1770.ijrcog20170935

[24] Payne BA, Kyle PM, Lim K, Lisonkova S, Magee LA, Pullar B, et al. An assessment of predictive value of the biophysical profile in women with preeclampsia using data from the fullPIERS database. Pregnancy Hypertension: An International Journal of Women's Cardiovascular Health. 2013;3(3):166-71. doi.org/10.1016/j.preghy.2013.03.001

[25] Sowmya K. Modified biophysical profile in antepartum fetal surveillance of high risk pregnancies: Rajiv Gandhi University Of Health Sciences, Karnataka, Bangalore; 2010.